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Climate law and economic policy instruments: a new field of environmental law

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The Emerging Field of 'Climate Law'

Although questions hang over the fate of the Kyoto Protocol,¹ the control of greenhouse gases ('GHGs') has become an indelible feature of environmental law regimes worldwide. Indeed, it is timely to speak of a new field of environmental law, which could be described as 'climate law'. Britain, Canada, New Zealand, Sweden and other industrialised nations are pioneering a raft of policies, institutions and regulations for GHG emission control, renewable energy investment and other measures to minimise global warming. The emerging field of climate law may be seen as an eclectic offshoot of energy law and pollution law. Climate law, however, is not simply a collage of disparate elements from established legal fields. It is becoming the very core of environmental law, for no environmental problem is as pervasive or as long-term in its impact. Controlling global warming, in turn, helps resolve other environmental problems, such as urban pollution and biodiversity conservation.

There are several defining characteristics of climate law. The main characteristic is the extraordinary reliance on economic policy instruments ('EPIs') as the principal means of influencing energy use and GHG emissions. Indeed, no field of environmental law relies more on economic mechanisms. Carbon taxes and tradable pollution allowances are some of the economic tools being used by governments.² This dependence on economic tools can be explained by the policy problem that the benefits of reducing GHGs will incur in the future, but the costs will be borne today. As people tend to have a shallow ethical commitment to the welfare of posterity, especially over

the time horizons associated with global warming, measures to avoid dangerous climate change need to appeal primarily to money rather than to morality. Modern culture is too heterogeneous and ephemeral to allow shared moral responsibilities to arise to resolve complex and seemingly distant environmental problems. Consequently, in the alternative, we must make markets more environmentally literate by conveying stronger financial incentives for companies and individuals to reduce pollution. This will require harnessing a range of economic instruments and institutions as a means of climate policy. Governments are feeble at changing ethics and culture, but have some ability to alter the economic dynamics of markets.³

Economic instruments as a means of environmental policy can no longer be considered 'experimental'. They have been acknowledged in international environmental law for over a decade. For example, in 1992 from the United Nations Conference on Environment and Development (UNCED), both Agenda 21⁴ and the Rio Declaration on Environment and Development⁵ spoke of the seminal role of EPIs for achieving sustainable development. The well known 'polluter pays' principle appears in the environmental policy requirements of Article 174 of the amended Treaty of the European Union.⁶ The apotheosis of this trend in international environmental law came with the Kyoto Protocol, which embodies a range of so-called 'flexible mechanisms' including international emissions trading.

But this international trend is not some homogenous behemoth, as there are differences between jurisdictions as to their preferences for specific economic instruments, and some governments are uninterested in EPIs altogether.

* The author wishes to acknowledge the contributions of his research assistant, Michelle Campbell, in editing this article.

1 ILM (1998) 37, at 22.

2 See, by way of introduction, W.J. Mckibbin and P.J. Wilcoxon, 'The Role of Economics in Climate Change Policy', *Journal of Environmental Perspectives*, (2002) 16(2), at 107.

3 See D. Driesen, *The Economic Dynamics of Environmental Law* (MIT Press, 2003).

4 N. Robinson (ed.), *Agenda 21: Earth's Action Plan* (Oceania Publications, 1992), 127.

5 ILM (1992) 31, at 874. Principle 16.

6 OJ C340/3 (1997).

While tradable emissions permits are favoured in the United States, environmental taxes and other fiscal instruments are preferred by states of the European Union.⁷ Such variations owe more to nations' particular legal traditions and political circumstances than careful analysis by policy-makers of the relative advantages of the various EPIs. This article reveals why there has been a growing interest in EPIs, reviews their use in the emerging field of climate law, and evaluates the effects of the reforms and considers possible improvements.

Why economic instruments?

Economic policy instruments redefine the costs and benefits of alternative actions open to economic agents, with the aim of inducing behaviour that helps protect the environment. The instruments are much more than an expression of the 'polluter pays' principle, and there is a wide variety of choice.⁸ The dominant type is price-based measures, such as pollution taxes or subsidies to stimulate environmental protection investments. Alternatively, there are marketable rights-based measures, providing tradable entitlements to use natural resources or to emit pollutants within a pre-determined level.⁹ Other types of EPIs include liability rules, deposit-refund schemes and performance bonds.

From the standpoint of environmental policy, the theoretical literature suggests that EPIs offer several advantages.¹⁰ First, they promote efficiency gains through reallocation of pollution (for example, carbon) abatement costs. The costs of pollution reduction typically vary among firms, and efficient firms should seek to lower their pollution tax burden by investing in cleaner production technologies where this is cost effective. The methodological pluralism of EPIs allows each company to make cost savings by tailoring the means of reducing

pollution to their own circumstances. Second, EPIs provide innovation incentives; they give polluters an ongoing incentive to reduce emissions or save energy, whereas the financial incentive to exceed prescribed environmental regulatory standards is usually weaker.¹¹ Third, EPIs can also generate substantial revenues (for example through auctioning of tradable pollution allowances or eco-taxes) that can be recycled for environmental improvement investments. Apart from economic advantages, it has been argued that EPIs offer democratic benefits, as they should enable the public to focus on the fundamental questions regarding the appropriate level of pollution, such as GHG emissions, and the costs involved.¹² Such big picture issues may be obscured when the public is expected to focus on the minutiae of pollution licensing controls.

No doubt, some of the avowed advantages of EPIs remain speculative, with one OECD survey of international practice concluding that 'evidence is limited, assessments are based on scant data, and in-depth evaluations are scarce'.¹³ Importantly, among EPIs there can be differences in policy instrument effectiveness depending on the environmental problem to be addressed. For example, taxes may have advantages over tradable emissions allowances for controlling pollutants associated with local 'hot spots' such as sulphur dioxide.¹⁴

The theoretical literature acknowledges that EPIs are not without limitations. Unlike quantitative pollution regulation, eco-taxes have uncertain environmental effects, because it is difficult to predict the response of companies and consumers to a given tax level.¹⁵ Another problem can arise in large decentralised businesses, where head office decisions on pollution control in response to an EPI may not be effectively imparted to the branches. Large firms preoccupied with multifarious business issues may disregard costs imposed by eco-taxes or other EPIs as just another cost of 'doing business'. Thirdly, in many cases, the implementation of EPIs requires substantial re-regulation,

7 R.B. Stewart, 'Economic Incentives for Environmental Protection: Opportunities and Obstacles' in R.L. Revesz, P. Sands and R.B. Stewart (eds), *Environmental Law, the Economy and Sustainable Development* (Cambridge University Press, 2000), 171 at 203 to 220.

8 OECD, *The Polluter Pays Principle: Definition, Analysis and Implementation* (OECD, 1975). See further M. Massarrat, 'Sustainability Through Cost Internalisation', *Ecological Economics* (1997) 22(1), at 29.

9 See OECD, *How to Apply Economic Instruments* (OECD, 1999), at 10.

10 The following discussion draws upon T.H. Tietenberg, 'Economic Instruments for Environmental Regulation', *Oxford Review of Economic Policy* (1990) 6, at 17; T. Requate, 'Incentives to Innovate under Emission Taxes and Tradeable Permits', *European Journal of Political Economy* (1998) 14, at 139; R. Stavins and B. Whitehead, 'Dealing with Pollution: Market-based Incentives for Environmental Protection', *Environment* (1992) 34, at 30.

11 See R.G. Newell, A.B. Jaffe and R.N. Stavins, 'The Induced Innovation Hypothesis and Energy-Saving Technological Change', *Quarterly Journal of Economics*, (1999) 114(3), at 941.

12 See L. Heinzerling, 'Selling Pollution, Forcing Democracy', *Stanford Environmental Law Journal* (1995) 14, at 300.

13 OECD, *Economic Instruments for Pollution Control and Natural Resources Management in OECD Countries: A Survey* (OECD, 1999), at 96.

14 Discussed in B.J. McLean, 'Evolution of Marketable Permits: The U.S. Experience with Sulphur Dioxide Allowances', *International Journal of Environmental and Pollution* (1997) 8(1/2), at 9.

15 This problem does not apply to tradable emissions allowances operating within a pre-determined emissions cap.

seemingly at odds with the market-based nature of EPIs.¹⁶ Fourth, in the absence of equivalent environmental controls in other countries, industries subject to EPIs may suffer adverse competitiveness effects.¹⁷ A final concern to note is that EPIs may clash with social policy goals, primarily because of the regressive effects of environmental taxes, such as on poor households' energy budgets.¹⁸

Whilst EPIs are obviously market-based in their methodology, they cannot be crudely equated with market liberalism dogma, since they are designed to address the environmental effects of uncoordinated free markets. In truth, economic instruments are an expression of 'ecological modernisation' policy. Ecological modernisation thinking, which arose in West Germany during the 1980s, does not perceive any fundamental schism between capitalism and environmental integrity. Rather, it suggests that through improved management techniques and technological solutions, environmental protection and economic development can be mutually supporting.¹⁹ Thus, businesses that are careful environmental managers should benefit financially from improvements in the efficiency and productivity of their operations, such as savings in materials consumed.²⁰ Incentive-based EPIs are a key means of achieving this synergy between environmental and economic goals.

The empirical evidence, however, reveals that businesses do not generally welcome EPIs, especially taxes. Fossil fuel industries vehemently opposed a carbon or energy tax when proposed by the European Union (EU) in the early 1990s.²¹ Economic instruments can compel industry to pay for what has been a free lunch under traditional regulation.²² And

EPIs magnify the costs of environmental policy, whereas such costs are more likely to be obscured under non-economic policy instruments. Apart from business interests, environmental organisations may find the idea that companies may be able to pollute morally distasteful. Adoption of EPIs has also been slowed by methodological uncertainties regarding their design and implementation.²³ Lately, a more receptive climate for EPIs has been emerging, and they are being used especially to address global warming. Hostility has waned as more information about the effects of EPIs has emerged from academic studies, pilot projects and other initiatives.²⁴ Governments have also become more interested in EPIs as a consequence of their commercialisation of public utilities such as water and energy supplies. On-going concerns with full cost-recovery in service and supply have encouraged policy-makers to look to the market. Command regulation, by contrast, has been subject to an increasing torrent of criticism owing to perceived inflexibilities and inefficiencies.²⁵

International climate law and economic instruments

Enhancing treaty implementation?

Governments' increased reliance on EPIs as a means of climate policy stems partly from developments in international law. A seismic shift in the character of international environmental treaties recently has seen greater detail given to the specification of how treaty obligations must be implemented. Treaties based largely on wishy-washy virtuous statements are being superseded by agreements that focus on how to do it. This includes technology exchanges, compliance reporting, and innovative economic instruments or other forms of incentives such as global environmental funds, emissions trading mechanisms and differentiation of responsibilities for developing and developed nations.

16 See R.W. McGee and W.E. Block, 'Pollution Trading as a Form of Market Socialism and the Search for a Real Market Solution to Environmental Pollution', *Fordham Environmental Law Journal* (1994) 6(1), at 58.

17 OECD, *Environmentally Related Taxes in OECD Countries: Issues and Strategies* (OECD, 2001), at 27 to 28.

18 D. Harrison, *The Distributive Effects of Economic Instruments for Environmental Policy* (OECD, 1994).

19 See J. Huber, *Die verlorene Unschuld der Ökologie* (Fischer Verlag, 1982).

20 M.E. Porter and V. der Linde, 'Green and Competitive: Ending the Stalemate', *Harvard Business Review* (1995) 73(5), at 120.

21 Energy intensive industries and major exporters gained important exemptions from the proposed tax: J. Sebenius, 'Towards a Winning Climate Coalition' in L. Mintzer and J. Leonard (eds), *Negotiating Climate Change* (Cambridge University Press, 1994), 227 at 294.

22 P. Newell and M. Paterson, 'A Climate for Business: Global Warming, the State and Capital' *Review of International Political Economy* (1998) 5(4), 679 at 688; see also 'Energy Taxes and Emission Permits Get Mixed Response from Business' *ENDS Report* (1998) 284, at 28 (discussing the opposition of UK industry to new measures to address GHG emissions).

23 See, for example, A.C. Christian, 'Designing a Carbon Tax: The Introduction of the Carbon-burned Tax (cbt)' *UCLA Journal of Environmental Law and Policy* (1992) 10(2): 221; OECD, *Implementation Strategies for Environmental Taxes* (OECD, 1996).

24 See, for example, Sweden, Ministry of the Environment and Natural Resources, *The Swedish Experience – Taxes and Charges in Environmental Policy* (Ministry of the Environment & Natural Resources, 1994).

25 The literature on this subject is immense, see, for example, R. Hahn and R. Stavins, 'Incentive-based Environmental Regulation: A New Era From an Old Idea', *Ecology Law Quarterly* (1991) 18(1), at 1; R.B. Stewart, 'Models for Environmental Regulation: Central Planning Versus Market-based Approaches' *Boston College Environmental Affairs Law Review* (1992) 19, at 547.

There are compelling reasons to include EPIs in international environmental agreements. First, there are likely to be greater cost-saving advantages from using EPIs in a multi-jurisdictional context given that marginal control costs generally vary more extensively among different jurisdictions than within a single jurisdiction.²⁶ Countries differ in economic structure, activity and scale, and just as these differences create opportunities of comparative advantage to exploit in international commodity trading, so too such differences create opportunities for cost-effectively reducing environmental damage through EPIs.²⁷ Emissions abatement costs in relation to GHGs vary widely among countries. In 1998 it was estimated that the cost of domestic reductions in the United States was US\$125 per tonne of carbon compared to US\$14 to 23 for such efforts in developing countries.²⁸ One university study concluded that inclusion of developing nations in an international GHG emissions trading scheme would reduce the cost of achieving the Kyoto Protocol targets in the first commitment period by some US\$120 billion without trading, and to US\$54 billion with trading.²⁹ Emissions trading should thus reduce the total international cost to achieve a desired global environmental standard. Because of these cost-efficiency gains, adoption of EPIs in treaties should encourage more participation in such treaties than competing policy instruments could deliver. Conventions that offer lower costs for parties to achieve desired environmental goals should thus be more attractive than alternative treaty proposals.

But there are potential drawbacks. First, for international emissions trading, there will be greater demands for international co-ordination because of the range of issues governments need to reach agreement on,

such as the rules for trading. The need for more decisions creates risks of states defecting or failing to reach agreement. Protracted disagreements over the operational rules of the Kyoto Protocol's emissions trading and ancillary economic tools illustrate such risks. Secondly, by drawing attention to the costs of environmental goals, the inclusion of EPIs in treaties makes it politically more difficult for governments to sign up – an effect of the Kyoto Protocol on the Australian and United States Governments.³⁰ Thirdly, EPIs raise equity concerns, such as possible disadvantages for poorer developing countries unable to compete effectively in international emissions markets.³¹ Equity concerns may also be exploited by nations to avoid commitments; for example, the United States explained its decision to not to ratify Kyoto as based on the Protocol's failure to impose emissions reduction obligations on large industrialising developing countries such as China and India, whom it did not believe deserved concessional treatment.³²

Among the various EPIs used internationally, taxation mechanisms are widely disfavoured. Langley-Hawthorne argues that 'an international tax ... would require management by some form of supra-national agency. This would raise the issue of revenue sharing and it would probably be difficult to obtain national participation in such a scheme. Similar difficulties are present when attempting to negotiate a multilateral agreement to harmonize national laws in order to impose a carbon tax.'³³ Among the few areas where international environmental taxation would appear feasible is in the commercial aviation industry, which is the fastest growing source of GHG emissions.³⁴ Already, the EU is considering this option.³⁵ An alternative to taxation is markets in environmental resources or pollution entitlements to correct the problems stemming from

26 Stewart, Note 7 above, at 222; see W. Fichter, M. Goebelt and O. Rentz, 'The Efficiency of International Cooperation in Mitigating Climate Change', *Energy Policy* (2001) 29(10), p. 817.

27 See generally S.C. Peck and T.S. Teisberg, 'CO₂ Emissions Control: Comparing Policy Instruments', *Energy Policy* (1993) 21(3), at 222; T.H. Tietenberg, *Emissions Trading* (Resources for the Future, 1985); R.F. Kosobud and T.A. Daly, 'Tradable Cumulative CO₂ Permits and Global Warming Control', *Energy Journal* (1994), 15(2), at 213.

28 Discussed in L. Rajamani, 'Re-negotiating Kyoto: A Review of the Sixth Conference of Parties to the Framework Convention on Climate Change', *Colorado Journal of International Law and Policy: 2000 Yearbook* (2000), 201 at 215 to 216.

29 Cited in T. Moore, 'The Value of Greenhouse Gas Emission Trading', *EPRI Journal* (2000) Summer, 19 at 24. However, other studies are more cautious, and highlight the risk of market collusion and dominance that could distort the efficiency of emissions trading and diminish the expected economic gains: see, for example, H. Westkog, 'Market Power in a System of Tradeable CO₂ Quotas', *Energy Journal* (1996) 17(3), at 85.

30 See N. Matsuo, 'Analysis of the U.S.'s New Climate Initiative: The Attitude of the Bush Administration Towards Climate Change', *International Review for Environmental Strategies* (2002) 3(1), at 177.

31 See K.A. Baumert, J.F. Perkaus and N. Kete, 'Great Expectations: Can International Emissions Trading Deliver an Equitable Climate Regime?' *Climate Policy* (2003) 3(2), at 137.

32 K.A. Baumert and N. Kete, *The U.S., Developing Countries, and Climate Protection: Leadership or Stalemate?* (World Resources Institute, 2001).

33 C. Langley-Hawthorne, 'An International Market for Transferable Gas Emission Permits to Promote Climate Change', *Fordham Environmental Law Journal* (1998) 9, 261 at 273 to 274.

34 Although air travel presently accounts for only 3 per cent of global carbon emissions, the Intergovernmental Panel on Climate Change (IPCC) expects airplane travel to account for 15 per cent of all carbon emissions in 2050: IPCC, *Special Report on Aviation and the Global Atmosphere* (IPCC, 1999).

35 On 7 September 2000, the EU Parliament adopted a non-binding resolution calling for a kerosene tax on airline flights out of the EU in an effort to reduce GHG emissions attributed to the airline industry: *Environmental News Daily* (7 September 2000).

externalities and degradation of public goods. The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer was the first international environmental agreement to incorporate a mechanism to enable state parties to trade in their environmental responsibilities.³⁶ The Montreal Protocol was an important precedent for the Kyoto Protocol.

The Kyoto Protocol's economic mechanisms

The Kyoto target is to have average reductions of 5.2 per cent from each Annex I industrial nation's 1990 baseline emissions rate, to be achieved within the commitment period 2008–2012. To achieve these reductions, the Kyoto Protocol offers several flexible mechanisms that co-opt market forces. The Protocol contains five mechanisms to give state parties flexibility in implementing their obligations. The economic effects of the 'flexible mechanisms' crucially depend on how the rules of these mechanisms are structured. Uncertainties regarding the operational arrangements for the flexible mechanisms and the compliance procedures were largely ironed out at the Marrakech Conference of the Parties in November 2001, following several years of tortuous negotiations.³⁷

There are two 'internal' mechanisms, namely the basket of CO₂ and other greenhouse gases (a party can choose which gases to focus on reducing),³⁸ and the land-use changes and forestry provisions – the so-called 'sinks' – which allow a party an alternative means to control carbon emissions.

The most important of the three 'external' mechanisms is international emissions trading. The Protocol allows Annex B³⁹ industrialised countries to trade their 'assigned amount units',⁴⁰ that is, the target level of emissions for the party during the commitment period.⁴¹ Such trading must be 'supplemental' to domestic actions. The emissions 'cap' for parties is derived from the aggregate of their assigned amounts. Through the Joint Implementation (JI)

mechanism, industrial nations may also trade in emissions reduction units by investing in emissions-reducing or sink-enhancing projects in another industrial nation, provided such reduction in emissions or enhancement of carbon sinks is 'additional to any that would otherwise occur'.⁴² The Clean Development Mechanism (CDM) allows industrial countries to invest in projects in non-Annex I parties and to use the 'certified emissions reductions' ('CERs') that derive from the projects towards compliance with their Protocol commitments.⁴³ The CERs must be additional to any reductions that would otherwise occur, and projects must be approved and supervised by the CDM Executive Board – an entity appointed by the conference of the parties.⁴⁴

The credits acquired through these instruments are, with certain restrictions, fungible, and can also be banked for future use in subsequent commitment periods beyond 2012.⁴⁵ Under each mechanism, a state party facing high costs in meeting its emissions targets could purchase credit for reductions undertaken more cost effectively by another party. Alternatively, a state party that exceeds its expectations can benefit by selling its surplus emissions credits. Thus, by exploiting the marginal cost differentials between countries, emissions trading allows GHG reductions at the lowest price. Vrolijk and Grubb estimate that the average cost reduction from allowing emissions trading and joint implementation is almost 60 per cent compared to that without these EPIs.⁴⁶ The main sources of cheap reductions for JI projects will likely occur in the economies in transition of Eastern Europe and the former Soviet Union.⁴⁷ These countries are much less efficient energy users and have experienced significant emissions reductions since 1990: by 2001, some 50 per cent in the case of Ukraine, and 35 per cent in Russia.⁴⁸ In addition to economic efficiency gains, the Kyoto mechanisms should facilitate markets in environmentally friendly technologies. For example, utilisation of the CDM should stimulate investment in renewable energy technologies. Although, by allowing countries to meet emissions targets through afforestation and other sinks, the CDM rules may reduce

36 Concluded at Montreal, 16 September 1987; entered into force 1 January 1989. ILM (1987) 26, at 1550.

37 See S. Dessai and E.L. Schipper, 'The Marrakech Accords to the Kyoto Protocol: Analysis and Future Prospects', *Global Environmental Change* (2003) 13(2), at 149.

38 The non-CO₂ gases have a higher global warming potential than carbon, thus providing a wider range of opportunities to develop clean production processes so as to reduce overall abatement costs in the long term: see C. Vrolijk and M. Grubb, *Quantifying Kyoto: How Will COP-6 Decisions Affect the Market?* (Royal Institute of International Affairs, 2001), at 3.

39 Annex B parties are a subgroup of the parties listed in Annex I of the FCCC.

40 Kyoto Protocol, Article 3(7).

41 *Ibid.*, Article 17.

42 *Ibid.*, Article 6(1)(b).

43 *Ibid.*, Article 12(3)(b).

44 *Ibid.*, Article 12(4) to (5).

45 *Ibid.*, Article 3(13).

46 Vrolijk and Grubb, Note 38 above, at 6.

47 S. Frankhauser and L. Lavric, 'The Investment Climate for Climate Investment: Joint Implementation In Transition Countries', *Climate Policy* (2003) 3(4), at 417.

48 *Ibid.*, 7. See further T. Sabonis-Helf, 'Catching Air? Climate change policy in Russia, Ukraine and Kazakhstan', *Climate Policy* (2003) 3(2), at 159.

motivation to pursue new technologies that actually reduce emissions in the long term.⁴⁹

Preventing leakage of GHG emissions to non-parties will be crucial to the success of the Kyoto Protocol. 'Carbon leakage' arises when carbon emissions abatement in a group of nations is offset by increased emissions in non-abating nations.⁵⁰ As developing countries are not bound to the Kyoto's carbon constraints, polluting industries in the West may prefer to relocate some of their production to such countries. The CDM attempts to mitigate this problem by providing developing countries with an incentive to participate in clean energy projects. Monitoring and compliance mechanisms are also crucial for combating carbon leakage: without credible monitoring, reporting and verification, unsubstantiated credits may be laundered.⁵¹ A further aspect of the Kyoto Protocol that has a bearing on the carbon leakage is the requirement that emissions reductions achieved through the Protocol's flexible mechanisms should be *supplemental* to domestic emissions-reducing actions.⁵² In other words, governments cannot aim to achieve their Kyoto targets by primarily buying emissions credits on international markets in order to avoid reforming their domestic economies. Whilst there may be some loss of potential economic efficiency gains arising from the supplemental rule, by committing industrialised nations to undertaking domestic reform the rule helps promote intra-generational equity.⁵³

In addition to the flexible mechanisms, the climate treaty regime contains another type of EPI. The UN Framework Convention on Climate Change (FCCC) required industrialised states parties to finance adaptation programmes in developing countries particularly vulnerable to the adverse effects of global warming,⁵⁴ and to finance the full cost that developing countries incur in complying with their emissions reporting obligations.⁵⁵ A Special

Climate Change Fund was established to help finance activities to abate CO₂ emissions in the areas of technology transfer, energy, transport, land use and waste management, and to assist developing countries diversify their economies. A Least Developed Countries Fund has also been created to enhance the capacity of these countries to respond to the challenges of global warming, including preparation of National Adaptation Programmes of Action.⁵⁶ Thirdly, a Kyoto Protocol Adaptation Fund, financed principally from a share of the proceeds of the CDM, will support concrete measures to adaptation projects and programmes in developing countries that ratify the Protocol.⁵⁷

Fiscal instruments: pollution taxes

Although largely rejected in international treaties except levies to contribute to environmental funds, at a national level, taxes on GHG emissions are often found.⁵⁸ Pollution charges and taxes theoretically internalise the cost of the social and environmental 'externalities' of development and thereby provide financial incentives to discourage pollution.⁵⁹ Virtually all industrialised nations apply environmental charges today in some contexts, primarily in relation to wastewater discharges, air pollution and municipal waste collection. Pollution emissions charges are favoured for fixed point sources such as factories, which may be monitored relatively easily. Charges are also levied on environmentally damaging products, such as pesticides.⁶⁰ Environmental charges have been widely applied within the EU, with the Benelux and Scandinavian countries having the most extensive practice.⁶¹ The first countries to systematically tax fossil fuels in the name of climate protection were Finland and Sweden in the late 1980s, and later Denmark, the Netherlands and Norway in the early

49 See M. Jung, *The Role of Forestry Sinks in the CDM – Analysing the Effects of Policy Decisions on the Carbon Market* (Hamburg Institute of International Economics, 2003).

50 See S. Felder and T. Rutherford, 'Unilateral CO₂ Reductions and Carbon Leakage: the Consequences of International Trade in Basic Materials', *Journal of Environmental Economics and Management* (1993) 25, at 162.

51 See A. Nentjes and G. Klaassen, 'On the Quality of Compliance Mechanisms in the Kyoto Protocol', *Energy Policy* (2004) 32(4), at 531.

52 Kyoto Protocol, Article 6(1)(d).

53 Rajamani, Note 28 above, at 215; A.D. Ellerman, 'Supplementarity: An Invitation to Monopsony?' *Energy Journal* (2000) 21(4), at 29.

54 United Nations Framework Convention on Climate Change, ILM (1992) 31, at 848, Article 4.4.

55 *Ibid.*, Articles 4.3 and 12.

56 These two funds operate under the auspices of the Global Environment Facility.

57 See European Commission, *Summary of the key elements of the Bonn agreement on climate change* (23 July 2001), at <www.europa.eu.int/comm/environment/climat/pressbckgnd.htm>.

58 The general rationale for taxation mechanisms in environmental policy is outlined in OECD, *Taxation and the Environment* (OECD, 1993).

59 See H. Gensler, 'The Economics of Pollution Taxes' *Journal of Natural Resources and Environmental Law* (1994) 10(1), at 1.

60 See OECD, *Applying Economic Instruments to Packaging Waste: Practical Issues for Product Charges and Deposit-Refund Systems* (OECD, 1993).

61 Among the growing literature, see European Commission, *Evaluation of Environmental Effects of Environmental Taxes* (European Commission, March 1999); P. Ekins, 'European Environmental Taxes and Charges: Recent Experience, Issues and Trends' *Ecological Economics* (1999) 31, at 39.

1990s.⁶² While gasoline and other energy products have long been taxed in most countries, this has not been because of concerns about global warming. Petrol taxes have been largely a revenue-raising device. Mostly, to date, charge systems have had limited incentive effects on businesses because they serve to fund the administrative overheads of environmental agencies rather than to reflect, and capture, environmental costs.⁶³

There is hesitation on the part of governments to impose high pollution taxes.⁶⁴ The reason is that they increase businesses' costs of production and thus the price of commodities. These financial increases, in turn, can have sectoral and macro-economic repercussions, depending on how the pollution taxes are implemented and on the use of the revenues they generate. There are concerns about the size of the cost of pollution taxes compared with their benefits of improved environmental quality and protecting public health. And even if the public generally accepts that the benefits of a pollution tax regime would far outweigh its costs, there could still be concerns about the distribution of these benefits and costs in society. Damage from GHG emissions is dispersed and delayed across generations. The costs of carbon taxes, on the other hand, are immediate and easily visible, and would be felt by well-identified constituencies. Of special concern is that companies will be disadvantaged *vis-à-vis* competitors (particularly those that operate internationally) who do not have to pay pollution taxes.⁶⁵ The failure of the US Government to introduce its planned British thermal unit ('BTU') tax in 1993 testified to the limits of direct environmental taxation.⁶⁶ Similarly, the European Commission in 1991 advanced proposals for a EU-wide carbon tax, but the idea collapsed in the face of resistance from industry and several

Member States.⁶⁷ Thus, governments have tended to prefer to extend general consumption taxes on domestic energy and to augment road fuel duties rather than be seen to introduce 'new' environmental taxes.

Since the Kyoto Protocol, various governments have become more receptive to fossil fuel taxes. The EU is an enthusiastic proponent of EPIs, and in 1997 the European Commission published a *Communication on Environmental Taxes and Charges in the Internal Market*.⁶⁸ The United Kingdom, formerly a staunch opponent of carbon taxation,⁶⁹ introduced a climate change levy ('CCL') in April 2001.⁷⁰ The levy applies to energy used by industry and the public sector, but not households, transportation or registered charities. Renewable energy (with the exception of large scale hydropower) is exempt from the CCL. The levy operates, on an economy-wide basis, on a roughly revenue-neutral basis, as it is offset by a 0.3 per cent reduction in all employers' national insurance contributions. Despite such concessions, the levy has attracted considerable criticism from industry bodies (although these have been tempered in recent years) and the CCL has yet to lead to any obvious changes in energy use or new investment in environmentally friendly technologies.⁷¹

Examples from other countries include a recommendation by a Japanese Environment Ministry advisory panel in August 2003 for the adoption of an economy-wide carbon tax on fossil fuels by 2005.⁷² The panel reasoned that if Japan introduces a 30,000 yen tax per ton of carbon emitted, it can cut CO₂ emissions by 2 per cent in 2010 from 1990 levels. The Irish Government has promised to introduce a carbon tax at the end of 2004.⁷³ In New Zealand, a tax on emissions from the agricultural sector has been considered (in addition to a carbon charge to be introduced from 2007). The euphemistically described 'research levy' would fund research into controlling methane emissions from New Zealand's estimated 10

62 See J. Vehmas *et al.*, 'Environmental Taxes on Fuels and Electricity – Some Experiences from the Nordic Countries', *Energy Policy* (1998) 27, at 343.

63 P. Thalmann, 'Environmental Taxes: Analytical Framework' in C. Jeanrenaud, (ed.), *Environmental Policy Between Regulation and Market* (Springer Verlag, 1997), 35 at 40 to 42.

64 See T.S. Aidt, *On the Political Economy of Green Tax Reforms*, Working Paper (University of Aarhus, 1997).

65 See generally R. Baron *et al.*, *Competitiveness Issues Related to Carbon/Energy Taxation* (OECD, 1997). In the United Kingdom, for instance, see D. Maddison and D. Pearce, 'The UK and Global Warming Policy' in T.S. Gray (ed.), *UK Environmental Policy in the 1990s* (Macmillan, 1995), 123 at 127 to 128.

66 See D. Erlandson, 'The Btu Tax Experience: What Happened and Why It Happened', *Pace Environmental Law Review* (1994) 12(1), at 173.

67 European Commission, *Proposal for a Council Directive Introducing a Tax on Carbon Dioxide Emissions and Energy*, COM (92) 226 final (1992). In 1995 the Commission advanced an alternative proposal, but this was also rejected: see *Amended Proposal for a Council Directive Introducing a Tax on Carbon Dioxide Emissions and Energy*, COM (95)172 final (1995).

68 COM (97), 9 February 1997.

69 Maddison and Pearce, Note 65 above, at 138 to 139.

70 B.J. Richardson and K. Chanwai, 'The UK's Climate Change Levy: Is It Working?' *Journal of Environmental Law* (2003) 15(1), at 39.

71 *Ibid.*

72 K. Shimizu, 'Environment Panel Calls for Carbon Tax in 2005', *The Japan Times* (31 August 2003).

73 Ireland, Department of Finance, 'Minister for Finance Announces Consultation Process on Proposed Carbon Energy Tax' (13 July 2003).

million cattle and 45 million sheep. But the levy proposal has faced vociferous opposition from farmers, and its status is presently uncertain.⁷⁴ Such political pressures point to a weakness of EPIs; because, unlike conventional regulation, environmental charges explicitly reveal the costs involved, they are prone to generating considerable opposition from penalised interests.

Some governments are softening the impact of GHG taxes by allowing businesses to negotiate agreements that provide for improved energy management in return for a partial or total exemption from the taxes. Thus, British companies can reduce their CCL liability by up to 80 per cent by entering into a Climate Change Agreement with the government to meet targets for improving energy efficiency or reducing emissions.⁷⁵ Only designated energy-intensive industries (for example, the steel industry) may participate in the agreements.⁷⁶ Similarly, in Denmark and Germany, companies with high energy consumption can obtain a rebate on their CO₂ taxes in return for entering into energy efficiency agreements.⁷⁷ In November 2002, the New Zealand Government announced that companies within the 'competitiveness at risk' economic group, defined as those export-oriented companies for whom international exports comprise a substantial portion of their business, would be exempt from the planned CO₂ charge if they entered into agreements providing for commitments to achieve energy intensity targets. So far, it appears that the climate change agreements are unlikely to induce significant changes in energy use and efficiency because the targets tend to be weak and lack credible legal sanctions.⁷⁸

Beyond such ad hoc fiscal measures, the greening of the entire taxation system, referred to as 'ecological tax reform' or 'ecological fiscal reform', is another possibility. The sobriquet is based on a simple idea: shift taxes off employment and enterprise, and onto waste, pollution and scarce resources.⁷⁹ Ecological tax reform should be revenue-neutral, aiming merely to shift the tax burden to

produce outcomes that are more favourable for the environment, rather than to increase taxes. The European Commission has endorsed this approach, proposing that eco-tax revenues be applied 'to decrease other taxes which are perceived as distorting the economy (such as labour taxes)'.⁸⁰ In this way, ecological tax reform may offer the politically attractive 'double dividend' of improving environmental quality while reducing economy-stifling taxes on labour and capital.⁸¹ A number of national governments are investigating ecological tax reform, such as the pioneering study conducted by Canada's National Roundtable on the Environment and the Economy.⁸² Several EU countries have begun to hypothecate eco-tax revenues to counter public opposition to green taxation.⁸³ These include the Scandinavian states, The Netherlands and Germany.⁸⁴ So far, Denmark is considered to have gone the furthest down this path, and in 2001 some 6 per cent of its tax revenue came from eco-taxes.⁸⁵

Overall, while governmental experience with environmental taxation is growing, further research and work is needed to achieve optimal results. A recent study of Norway's carbon tax found that since its introduction in 1991, total emissions had increased but there had been a significant reduction in emissions per unit of GDP over the period due to reduced energy intensity, changes in the energy mix and reduced process emissions.⁸⁶ The Norwegian study found that the effect of the carbon tax had been undermined by extensive tax exemptions and relatively inelastic demand in the sectors in which the tax was implemented.⁸⁷

74 B. Scott, "Fat Tax" Decision A Victory for Farmers', *Gisborne Herald* (18 October 2003).

75 Department of Environment, Food & Rural Affairs, 'Climate Change Agreements', at <www.defra.gov.uk/environment/ccl/index.htm>.

76 The scheme is restricted to 'energy intensive' industries, as defined in Schedule 1 of the Pollution Prevention and Control (England and Wales) Regulations 2000.

77 M.M. Roggenkamp et al. (eds), *Energy Law in Europe* (Oxford University Press, 2001), at 412 to 413.

78 D. Waller, *The Climate Change Levy and Negotiated Agreements*, Discussion paper (Association for the Conservation of Energy, 2001).

79 See G. Robert, S. Barg and A. Gillies (eds), *Green Budget Reform: An International Casebook of Leading Practices* (Earthscan, 1995).

80 European Commission, *Environmental Taxes and Charges in the Single Market*, COM(97) 9 final, clause 7.

81 See K. Bubna-Litic and L. de Leeuw, 'Can our Taxation System Support "New" Sustainable Industries?' *Environmental and Planning Law Journal* (1999) 16(2), at 140; T. Barker, 'Taxing Pollution Instead of Employment', *Energy and Environment* (1993) 6.

82 Canada, National Roundtable on the Environment and the Economy (NREE), *Toward a Canadian Agenda for Ecological Fiscal Reform: First Steps* (NREE, Ottawa, 2002).

83 See B. Bosquet, 'Environmental Tax Reform: Does it Work? A Survey of the Empirical Evidence', *Ecological Economics* (2000) 34: 19 at 21 to 22.

84 See A. Blanke, 'Ecological Tax Reform in Germany and Interest Groups', *International Review for Environmental Strategies* (2002) 3(1), at 81.

85 Environment Policy Committee, 'Environmentally Related Taxation in OECD Countries: Issues and Strategies' (OECD, 2001), at 34.

86 A. Bruvoll and B.M. Larsen, 'Greenhouse Gas Emissions in Norway: Do Carbon Taxes Work?' *Energy Policy* (2004) 32(4), at 493.

87 See, more generally, P. Ekins and S. Speck, 'Competitiveness and Exemptions from environmental taxes in Europe', *Environmental and Resource Economics* (1999) 13 (4), at 360.

Complex methodological difficulties concerning the design of carbon and other GHG taxes still need to be addressed. Moreover, the wider uptake of such taxes may be constrained by regressive distributional effects unless special concessions can be introduced that do not unduly compromise economic efficiency goals.⁸⁸ The political acceptability of taxes also requires that their competitiveness effects be addressed, such as by reducing taxes in other economic sectors or through international harmonisation of environmental taxation.⁸⁹ Without international standards, progressive countries may have little choice but to grant numerous exceptions and refunds to industry by means of protection – actions that hardly advance climate policy. An alternative possibility is tradable pollution and resource use rights to achieve environmental policy goals.

Fiscal Instruments: subsidies

In addition to fossil fuel charges, governments have been promoting energy conservation and efficiency through financial grants and tax concessions.⁹⁰ Tax benefits for households purchasing renewable energy, insulation work in buildings and heating regulation material are now offered in many jurisdictions. Companies are also claiming accelerated tax depreciation of energy-saving equipment and renewable energy production equipment. The range of fiscal instruments adopted is very extensive. The US Federal Government, for example, offers a tax credit for electricity produced from wind, biomass and poultry waste, where the electricity is sold to an unrelated third party. Denmark offers reduced vehicle registration fees for energy efficient cars. Canada exempts ethanol fuel made from biomass that is blended with gasoline from excise tax. Germany offers property owners financial grants to modernise their buildings to enhance efficiency in production and use of indoor heat.

Many countries offer up-front investment tax exemptions and grants for renewable energy projects. These initiatives sometimes take the form of competitive funding

schemes for climate change mitigation projects, financed directly through fossil fuel taxes or consolidated revenue. Subsidising the cost of special projects offers important public benefits. It can support the development and testing of experimental technologies for emissions control or renewable energy, which private financial markets may be unwilling to support. The financial support can take a variety of forms, including direct grants and taxation concessions.

The New Zealand Government, for instance, has established a 'Projects to Reduce Emissions' initiative, that provides financial grants to projects that achieve set reductions in GHG emissions through new investments in renewable energy technologies or energy efficiency technologies, which otherwise would be uneconomic.⁹¹ During 2003, the government approved 15 Climate Change Projects, including wind farms and hydro-electricity schemes, out of a total of 46 bids received. The United Kingdom has established, to complement the Climate Change Levy, the Enhanced Capital Allowances (ECAs) scheme where investment in energy-efficient products (for example pipe-work insulation and thermal screens) enables companies to reclaim 100 per cent of the capital allowance in the first year.⁹² The ECAs are administered by the Carbon Trust, established in April 2001 as an independent, non profit-making company, to recycle a portion of the Levy receipts to quicken the adoption of low carbon technologies.

Tradable emissions allowances

Whereas eco-taxes involve the state imposing a 'price' for using the environment so as to induce people to change their environmental behaviour, tradable emissions allowances work on the converse basis. Thus, here the market determines the price (in this case of traded emissions allowances) while the state dictates the behaviour through the emissions 'cap' – the total number of pollution allowances distributed.⁹³ In theory, the creation of exclusive and transferable pollution rights provide businesses with an incentive to be more efficient users of the environment.⁹⁴

88 See D.E. DeWitt, *Who Bears the Burden of Energy Taxes?* (Resources for the Future, 1991). Some other studies, however, suggest that distributive impacts are not significant nor widespread: see Z.X. Zhang and A. Baranzini, 'What do We Know about Carbon Taxes? An Inquiry into their Impacts on Competitiveness and Distribution of Income', *Energy Policy* (2004) 32(4), at 507.

89 See generally T. Barker and J. Kohler (eds), *International Competitiveness and Environmental Policies* (Edward Elgar, 1998).

90 See generally P.D. Cameron and D. Zillman (eds), *Kyoto: From Principles to Practice* (Kluwer, 2002).

91 New Zealand Climate Change Office, at <www.climatechange.govt.nz/policy-initiatives/projects/index.html>.

92 UK Enhanced Capital Allowances, at <www.eca.gov.uk>.

93 The literature on this subject is extensive: see, for example, Tietenberg, Note 27 above; P. Koutstaal, *Economic Policy and Climate Change: Tradable Permits for Reducing Carbon Emissions* (Edward Elgar, 1997).

94 D.A. Malueg, 'Emission Credit Trading and the Incentive to Adopt New Pollution Abatement Technology', *Journal of Environmental Economics and Management* (1989) 16, at 52.

Trading allows polluters to tailor their regulatory burdens by transferring the burdens to where they can be borne most cheaply, and thus allow society to obtain the same level of overall environmental protection at a lower cost than conventional pollution law.

A question that arises, therefore, is whether trading is better than taxing. Many economists see tradable pollution allowances as superior to pollution taxes, since emissions trading gives individual firms the chance to reduce their costs or add value through the trading of emissions units. It encourages firms with low pollution abatement costs to reduce their emissions and to sell their emissions units to those with higher abatement costs, resulting in a lower cost to the economy overall.⁹⁵ Beyond such generalities, however, problems can arise when one looks at the complexities of specific pollutants. For some types of GHG emissions, it may not be practical to involve actual emitters in a trading scheme. Vehicle emissions are an example; requiring all motorists to purchase (and have the ability to trade) emissions units in order to operate a car would be unrealistic. This problem could be resolved, though, if the obligation to hold emissions allowances were laid on petrol stations or oil companies.

The United States pioneered tradable pollution rights. They originated in the 1970s in the air pollution control programmes of the Federal Environmental Protection Agency.⁹⁶ In 1990 the US Clean Air Act⁹⁷ was amended to establish a national market for sulphur dioxide emissions allowances for the power industry.⁹⁸ Emissions trading schemes also feature at a state and regional level in the United States, notably California's Regional Clean Air Incentives Market (known as 'RECLAIM'), which was introduced in 1994 to reduce nitrogen oxides and sulphur oxides in Los Angeles.⁹⁹ Substantial cost savings have been traced to these initiatives.¹⁰⁰

EU interest in marketable permits has grown because of their potential to control GHG emissions.¹⁰¹ Denmark was the first EU Member State to legislate for a limited trading system for CO₂ quotas for its major electricity producers.¹⁰² Trading is undertaken within a cap and trade system operated by the Danish Energy Agency, and permits were grandfathered to firms based on GHG emissions levels between 1994 and 1998. Sweden is considering a proposal for a national trading scheme to replace its carbon tax. Britain launched a pilot system of transferable GHG emissions allowances in early 2002, as an adjunct to the climate change levy.¹⁰³ Participating companies bid at an auction for a share of the £215 'incentive monies' available to entities that meet agreed emissions reduction targets over the period of the scheme. The 34 organisations that took on legally binding reduction targets have the choice of trading just CO₂ emissions or all six GHGs covered by the Kyoto Protocol. The average emissions reduction target set by the auction was 11 per cent below participants' historic baseline emissions, which should save about 1.1 MtCe of emissions annually that would otherwise occur.¹⁰⁴

Rather than allow a proliferation of uncoordinated national schemes, in October 2003 the EU adopted a Directive of the European Parliament and of the Council establishing a scheme for greenhouse gas emissions allowance trading within the Community.¹⁰⁵ It provides for the established of an EU-wide, emissions trading scheme in CO₂ among large fixed point sources from January 2005. It will be the largest emissions trading scheme in the world to date. The EU Directive is restricted to CO₂ emissions (which amount to 80 per cent of the EU's GHG emissions), and trading will be open only to major industrial facilities. The Directive empowers each EU Member State to grant CO₂ allowances to companies, within its allocated national allowance, which may then be traded across the EU among eligible businesses.

In addition to the traditional cost-efficiency and environmental gain arguments, several advantages should

95 See Tietenberg, Note 27 above.

96 W. Griffin, 'The EPA's Emissions Trading Policy: A Clouded Past, But a Bright Future', *Northern Kentucky Law Review* (1992) 20(1), 207 at 218 to 233.

97 Pub. L. No. 101-549, 104 Stat. 2399, Pub. L. No. 104-316, 1001 Stat. 3838 (amending 42 USC 7401-7642 (1955)).

98 See R. Rico, 'The U.S. Allowance Trading System for Sulphur Dioxide: An Update on Market Experience', *Environmental and Resource Economics* (1995) 5, at 115.

99 See V. Foster and R. W. Hahn, 'Designing More Efficient Markets: Lessons from Los Angeles Smog Control', *Journal of Law and Economics* (1995) 38(April), at 19.

100 See R. N. Stavins, 'What Have We Learned from the Grand Policy-Experiment? Positive and Normative Lessons from SO₂ Allowance Trading', *Journal of Economic Perspectives* (1998) 12(3), at 69.

101 For a good analysis of the feasibility of a trading mechanism for GHG emissions in a European context, see P. Koutstaal, *Economic Policy and Climate Change: Tradeable Permits for Reducing Carbon Emissions* (Edward Elgar, 1997).

102 Act No. 376 of 2 June 1999.

103 For details of the UK scheme, see Department of the Environment, Transport and the Regions, 'Business and Climate Change', at <www.environment.detr.gov.uk/climateoffice/10.htm>.

104 Department of Environment, Food and Rural Affairs (DEFRA), *The UK's Third National Communication Under the United Nations Framework Convention on Climate Change* (DEFRA, 2001), at 31.

105 OJ L275/32.

flow from the EU-wide trading market.¹⁰⁶ Firstly, by establishing an EU-wide common price for a ton of carbon, price distortions that would arise if states established their own disparate national GHG trading systems are avoided. Secondly, trading is compatible with policies to liberalise energy markets in the EU. And, finally, the Directive should enable EU Member States to gain early experience in international emissions trading before the Kyoto Protocol system begins.

An alternative to these tradable emissions reduction targets is energy *intensity* targets. Canada's climate change action plan of 2002 outlines a trading scheme for large industrial emitters based on *energy intensity* targets.¹⁰⁷ It works on the basis that the government and industries negotiate agreements to determine performance targets based on past actions, technological change, and overall impacts including the need to accommodate sector growth. The negotiated agreements are normally targets for reducing energy intensity rather than a simple emissions reduction. Participating companies are able to trade among themselves to find the most cost-effective way to meet their energy intensity targets. This approach is obviously problematic, as it does not necessarily entail an absolute reduction in emissions.

Despite differences in the various emissions trading schemes, they share many more common features. These include credible emissions baselines, monitoring and verification procedures, and proof of ownership of the emissions reductions. Embryonic and fragmented, the global market for trading GHG emissions is beginning to flourish. The World Bank estimates that between 1996 and 2002, at least 200 million tCO₂e have been traded in some 150 deals, with some 67 million tons of CO₂e traded in 2002 alone.¹⁰⁸ The UN Environmental Programme estimates that the market will soar to \$2 trillion by 2012.¹⁰⁹

But emissions trading is not favoured by some nations, for different reasons. The Australian government announced in January 2004 that it axed plans to adopt a national CO₂ trading system, citing as reasons continuing uncertainty over whether the Kyoto Protocol would come into effect and doubts about whether emissions trading offers industry

sufficient incentives to reduce emissions.¹¹⁰ The New Zealand Government has also apparently lost interest in emissions trading, indicating in its Confirmed Policy Package of November 2002 that it will instead introduce a carbon charge, capped at NZ\$25 per tonne. However, the government has retained the option for emissions trading 'if conditions permit', which according to the government means if there is a stable international market, and if the price is reliably under \$25 per tonne of CO₂ equivalent.¹¹¹

Economic supports for renewable electricity markets

Taxing fossil fuels may not be enough to tilt the market in favour of non-fossil fuels. Other EPIs may be needed to enhance investment in the renewable energy market.¹¹² Some governments are attempting to create protected sub-markets for renewable energy through price-support measures and tradable renewable electricity certificates.

Several states have sought to kick-start their renewable energy sector by obliging electricity providers to accept a certain percentage of electricity supply from clean fuels. Under a tradable renewable electricity certificate ('TREC') system, electricity providers are required to source a small but growing minimum percentage of the nation's power supply from renewable sources like wind, solar, biomass and geothermal energy.¹¹³ The TREC schemes can be adapted for electricity generators or retailers. Electricity utilities are able to trade their certificates among themselves to find the most cost-effective means of achieving the renewable energy obligations. The TREC mechanism is necessary to help level the playing field for renewables. The fossil fuel and nuclear power industries are mature, yet often continue to receive considerable state subsidies. Moreover, the market price of fossil and nuclear energy does not include the cost of the damage that they cause to the environment and human health. Conversely, the market does not give a value to the environmental and social benefits of renewable energies.

There are several examples of TREC schemes. Australia's Renewable Energy (Electricity) Act 2000, requires electricity *retailers* to purchase a minimum proportion (with periodic increases over a ten-year period) of their electricity

106 See G.T. Svendsen and M. Vesterdal, 'Potential Gains from CO₂ Trading in the EU', *European Environment* (2003) 13(6), at 303.

107 *Government of Canada Action Plan on Climate Change* (Environment Canada, 2002).

108 Prototype Carbon Fund, *Annual Report 2002* (World Bank, 2003), at 35.

109 UNEP, 'Financial Sector, Governments and Business Must Act on Climate Change or Face the Consequences', UNEP Press Release (8 October 2002).

110 S. Peatling and M. Riley, 'Greenhouse Gas Scheme Gets the Axe', *Sydney Morning Herald* (12 January, 2004).

111 Ministerial Group on Climate Change, *Climate Change 1: Confirmation of Preferred Policy Package*, 2002.

112 D.A. Fuchs and J. Maarten 'Green Electricity in the Market Place: The Policy Challenge', *Energy Policy* (2002) 30(6), at 525.

113 See P.E. Morthorst, 'The Development of a Green Certificate Market' *Energy Policy* (2000) 28(15), at 1085.

from renewable sources, and retailers may trade their obligations among themselves so that the improvements can be made where they are most cost effective. This scheme creates a 'demand pull' for electricity from renewable sources and stimulates additional investment in renewable electricity supply. Alternatively, Britain's Utilities Act 2000 obliges electricity *generators* to supply an increasing minimum proportion of their electricity from renewable sources. The obligation can also be met by buying renewable energy supplies from other generators with an 'excess' supply. It creates a 'supply push' for renewables and stimulates additional investment in renewable electricity supply.¹¹⁴ Under both international examples, energy utilities that fail to meet their requirement must pay a penalty charge for excess non-renewable electricity. The United States has pioneered so-called 'renewables portfolio standards' ('RPS') that share some similar features to TRECs. Renewables portfolio standards have been legislated in numerous states, including Texas, Connecticut, Iowa, Maine, Minnesota, Arizona, Nevada, and Wisconsin.¹¹⁵ In September 2002, California legislated a requirement that its electricity generators supply 20 per cent of their electricity from renewable energy no later than 2017 – the most stringent RPS to date in the United States.¹¹⁶

The main advantage of a TREC scheme is that it improves economic efficiency. Electricity suppliers and distributors will have incentives to find the most cost-effective way to meet their certificate obligations. Low-cost energy providers will be able to meet their certificate obligations quickest and sell their certificates first. But, for obvious reasons, a countervailing weakness is that low-cost (and possibly low-promising) energy technology options might push higher-cost more promising options (like offshore wind) out of the market. The preference for low-cost technologies could be partly ameliorated by introducing technology bands of comparable competitive technologies. However, a problem with this solution is it diminishes the liquidity of the certificates market, as instead of a single certificate traded in one single certificate market there would be separate certificates for electricity sourced from biomass, wind, biomass, solar-thermal, and so on.

Some further conclusions about the value of TRECs can be drawn from the Dutch experience, which has operated

a TREC system since 1996.¹¹⁷ The Dutch system has so far produced mixed results, partly owing to the lack of binding targets until the end of 1999. The Dutch experience shows that: (1) the government must set clear intermediate and long-term targets (policy predictability); (2) energy certificates should be valid for more than one period (flexibility to allow for 'banking' of certificates); and (3) the stability and liquidity of the market can suffer where the TREC is confined to a small domestic economy (as in The Netherlands).

An alternative measure to nurture renewable electricity markets is to guarantee purchase prices for renewable electricity. The guaranteed prices are a premium above the charges for non-renewable electricity and are set at a level that allows renewable electricity suppliers to compete more effectively. The premium can be funded in a variety of ways such as a special levy on electricity consumers or from existing government revenue. Empirical studies suggest energy consumers can be prepared, where they have been properly educated, to pay a modest premium to support investments in both renewable energy resources.¹¹⁸ However funded, the guaranteed price should stimulate investment in renewable electricity supply that otherwise would not occur. As the renewable energy sector finds its feet in the market, subsidies could be reduced.

Guaranteed feed-in tariff schemes have been a popular choice in Austria, Denmark and Germany. The EU common rules in the EU internal market for electricity allow Member States to require renewable electricity preference in dispatching.¹¹⁹ Germany has introduced the most extensive price supports for renewable electricity. Energy production from renewables is subsidised at federal, state and municipality levels. Germany's Renewable Energy Law 2001 requires producers of electricity from renewable sources to sell to the power grid at prices guaranteed by law. The premium is funded from a special levy on electricity consumers. Non-price support measures also complement the price guarantees. Germany's Energy Act 1998 gives renewable energy sources privileged access to the power grids in cases of limited capacity, and provides that new supply installations will not be subject to a permitting requirement where they primarily use renewable energies.

114 See B. Richardson, 'Taxing and Trading in Corporate Energy Activities: Pioneering UK Reforms to Address Climate Change', *International Company and Commercial Law Review* (2003) 14, at 18

115 See, for example, O. Langniss and R. Wiser, 'The Renewables Portfolio Standard in Texas. An Early Assessment', *Energy Policy* (2003) 31(6), at 527.

116 SB 1078, Sher, Chapter 516, Statutes of 2002, under Public Utilities Code ss381, 383.5, 399.11 to 399.15, and 445.

117 See J. Drillis, 'Renewable Portfolio Standard and Certificates-Trading on the Dutch Electricity Market', *International Journal of Global Energy Issues* (2000) 14(2), at 1.

118 See, for example, J. Zarnikau, 'Consumer Demand for 'Green Power' and Energy Efficiency', *Energy Policy* (2003) 31(15), at 1661.

119 Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity, Article 8(3).

Although the EU Treaty's state aid rules potentially restrict public subsidies in the renewable energy sector, in a landmark ruling in March 2001 the European Court of Justice upheld the German guaranteed feed-in tariff schemes as not being a violation of EU state aid rules.¹²⁰

A major disadvantage of guaranteed electricity feed-in tariffs lies in the fact that they often do not provide enough incentives for investors to drive down costs by means of technological innovation and/or improvement of operations. Also, it is very difficult to find (and regularly adjust) an optimal tariff level for each of the renewable energy technologies included in the scheme that avoids excessive profit margins, enhances at least some degree of economic efficiency, and promotes all technologies in the manner and to the extent desired. Finally, with such a price-driven instrument the achievement of a particular quantity target cannot be safeguarded. The German law attempts to get around this problem by providing for an annual reduction of the guaranteed feed-in tariffs for certain technologies after 2002 (biomass 1 per cent, wind 1.5 per cent, photovoltaics 5 per cent), in order to reflect expected technological progress.¹²¹

A third EPI that can help the renewable energy market is a bidding or tendering-based system, which have been introduced in the United Kingdom, France and Ireland. Bidding systems contain elements both of guaranteed price systems and tradable certificate systems. Generators compete on price for contracts to supply a certain amount of renewable electricity. Usually the bids are sought for different bands of technology (for example, solar, wind), with the cheapest bids in each technology band being preferred. The most widely studied scheme is Britain's former Non-Fossil Fuel Obligation (NFFO) system that was successful in lowering prices of electricity generated from renewable energy sources, thus improving economic efficiency.¹²² However, its impact on the total volume of green electricity generated was limited, and the transaction costs of the system were high (that is, preparing bids, and their evaluation of authorities).¹²³

Conclusions

Can economic policy instruments alone provide the machinery to address climate change? The answer is surely no. Governments will continue to rely on national planning, building codes, conventional pollution licensing and other non-economic tools. But the engine room of climate law is undoubtedly EPIs. No single EPI appears to be preferred universally; rather, a package of economic instruments will continue to be applied, with the choices influenced by, *inter alia*, prevailing market conditions and regulatory traditions.

So far, experience with taxes, emissions trading and other EPIs reveals mixed results in terms of improved cost efficiency and environmental gains.¹²⁴ Some preliminary insights can be drawn from existing national experience. First, ideal systems are rarely assembled from the outset, and have to be modified over time in the light of improved understanding. Second, in virtually any application, establishment of an EPI requires enunciation of a substantial policy and regulatory framework.¹²⁵ This is not merely to protect environmental goals, but to provide certainty for participants. For a tradable emissions scheme, regulators need to work out the basis for the initial allocation of emission rights, and establish credible monitoring and compliance controls.¹²⁶ With more extensive experience, it is likely that the role of EPIs will grow, and there are certainly no other policy instrument contenders for their role.

However, complementary institutional and regulatory reforms to stimulate investment in the non-fossil fuel energy sector are needed. For example, improved financial incentives to invest in wind power will be undermined if municipal authorities that control building approvals remain hostile to visually intrusive wind farms. According to a report of the UK House of Commission Environmental Audit Committee, the success rate of development applications for renewable energy projects in England and Wales during the 1990s was only about 26 per cent.¹²⁷ The

120 ECJ Case No. C-379/98, 13 May 2001.

121 Roggenkamp, Note 77 above, at 557 to 561.

122 C. Mitchell, 'The Renewables NFFO: A Review', *Energy Policy* (1995) 23, at 1077.

123 M. Grubb and R. Vigotti, *Renewable Energy Strategies for Europe: Vol. II: Electricity Systems and Primary Electricity Sources* (Royal Institute of Economic Affairs, 1997).

124 See D.J. Dudek and J. Palmisano, 'Emissions Trading: Why is this Thoroughbred Hobbled?' *Columbia Journal of Environmental Law* (1988) 13(2), at 217.

125 *Ibid.*, 221, arguing that 'the success of particular emissions trading tools requires the definition of facilities' emission control obligations, creating a system of granting "credits" for doing better than the control obligation, establishing administrative means for certifying these credits, and establishing uses for these credits'.

126 OECD, *Lessons from Existing Trading Systems for International Greenhouse Gas Emission Trading* (OECD, 1998), at 40, 44.

127 House of Commons, Select Committee on Environmental Audit, *A Sustainable Energy Strategy? Renewables and the PIU Report* (July 2002), at 58.

connection of power generated from renewable energy projects to the national electricity grid is a further source of concern. Deregulation of electricity markets has tended to benefit large energy suppliers, such as nuclear stations and coal/gas plants, which have the necessary economies of scale and market leverage. For small energy generators, whose supplies may be variable and less reliable, there is a danger of breaching contracted supply levels and so incurring heavy financial penalties.

A final observation is that the burden of EPIs as a means of climate law has been mostly on the commercial and industrial sectors. Governments have been reluctant to target consumers, perhaps owing to fear of an electoral backlash. The United Kingdom's Climate Change Levy, for example, exempts motorists and residential households. The British government earlier in 1999 realised the political stakes involved when fuel price protests in 1999 caused the government to abandon its fuel duty escalator of annual petrol tax increases above the rate of inflation. The Australian Government has rejected carbon taxes altogether. On the other hand, the New Zealand Government is planning a carbon charge that is predicted to add between 2 and 6 per cent to the price of petrol and about 5 per cent to residential electricity costs. The Scandinavian countries have already demonstrated a preparedness to tax consumer energy consumption. But, on the whole, governments have tended to rely on soft, non-intrusive measures, including reduced consumption taxes on home energy efficiency services and materials, energy efficiency labelling schemes, and periodic consumer education campaigns.¹²⁸

128 For example, the Energy Efficiency Commitment, and the Home Energy Efficiency Scheme: DEFRA, Note 104 above, at 32.