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POVERTY ALLEVIATION AND ENVIRONMENTAL SUSTAINABILITY
THROUGH IMPROVED REGIMES OF TECHNOLOGY TRANSFER

Klaus Bosselmann



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TABLE OF CONTENTS

1. Introduction	21
2. Enabling environments for EST transfer	22
2.1. What is EST?	22
2.2. Barriers to EST Transfer	22
2.3. Removing Central Barriers to EST Transfer	23
2.4. Market Reform	23
3. EST transfer in Existing MEA's	24
3.1. Basics	24
3.2. Problems with EST in MEA's	24
3.2.1. Non-Binding Obligations	24
3.2.2. Transfer of EST versus IPR in MEAs	25
3.2.3. Differences between Transfer of Exploitation Technology and of Conservation Technology	25
3.2.4. Evaluation	26
4. Towards a Coherent Regime for EST Transfer	26
4.1. EST Transfer in Ozone Layer Depletion and Climate Change Regimes	26
4.1.1. Montreal's ODS and EST	27
4.1.2. Kyoto's CDM and EST	28
5. Implementing Comprehensive EST Transfer Solutions	31
5.1. Public Sector Intervention in EST Research and Dissemination	31
5.2. Harnessing Private Sector Actions through Regulation	31
5.3. An Independent EST Assessment and Transfer Organisation	31
6. Conclusion	32

1

INTRODUCTION

Already the Rio Declaration 1992 linked sustainable development closely with elimination of inequitable development and poverty. It also recognised this link for planning processes and decision-making.¹

The Johannesburg Declaration 2002 reaffirmed:

a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development, economic development, social development and environmental protection- at the local, national, regional and global levels.²

There is no doubt that achieving economic development in developing countries can only advance reduction of poverty.³ On the other hand, economic development is traditionally linked with environmental pollution and exploitation of natural resources.⁴ Environmental

degradation is not just caused by industrial activities, but also by non-industrial consumption of natural resources, for example, excessive artisan near-shore fishing and the loss of marine biodiversity or conversion of forests into farming land.

The crucial role of technological and industrial development for economic expansion and alleviating poverty in developing States is widely recognised. But this can result in even worse environmental burdens not just for developing countries but also for the ecological system of the Earth. Even if we don't think about the possibility of an 'ecological race to the bottom' by transferring polluting industries from developed to developing countries,⁵ we have to assume the limitation of the Earth's overall 'eco-capacity'.⁶ If those currently living in poverty, consumed at the rate of an average North American, the global consumption of energy and material would increase six-fold.⁷ Therefore, we must prevent any form of industrialisation in developing States from following the patterns of unsustainable development in industrialised States.

The aim of this article is to show that sustainable development requires closer ties between social, economic, technological and environmental objectives. Alleviating poverty, increasing economic-technological progress and reducing environmental degradation are

1 Principles 1, and 3-5, Rio Declaration on Environment and Development, in Report of the United Nations Conference of Environment and Development, Rio de Janeiro, UN Doc. A/CONF.151/26 (Vol. 1), Annex I (1992) [hereafter Rio Declaration].

2 Paragraph 5, Johannesburg Declaration, in United Nations Report of the World Summit on Sustainable Development, Johannesburg, UN Doc. A/CONF.199/20 (2002) [hereafter Johannesburg Declaration]. See also M. Munasinghe, O. Sunkel and C. de Miguel eds, *The Sustainability of Long-term Growth: Socioeconomic and Ecological Perspectives 2* (Cornwall: Edward Elgar, 2001). The integrated Nature of these elements for decision-making is recognised in chapter 8 of Agenda 21: Programme of Action for Sustainable Development, in Report of the United Nations Conference on Environment and Development, UN Doc. A/CONF.151/26/Rev.1 (Vol. 1), Annex II (1992) [hereafter Agenda 21].

3 M. Munasinghe et al., *Growth and Sustainability: An Overview* in M. Munasinghe et al., note 2 above. For the difference between economic development and economic growth see: E.J. Malecki, *Technology and Economic Development* 23 (Kuala Lumpur: Longman, 1991).

4 See paragraphs 12, 14 and 15 of the Johannesburg Declaration, note 2 above. See also R. Muradian, NEPA and the Environment: Envisaging the Ecological Consequences of Outward-Oriented Development in Africa 2 (African Forum for Envisioning Africa, 2002).

5 See R.J. Fowler, 'International Environmental Standards for Transnational Corporation', 25 *Environmental Law* 1, 11-12, 16-18 (1995), C.E. Frickman Young, 'Industrial Pollution and International Trade: The Brazilian Experience', in Munasinghe et al., note 2 above at 287-303, K.R. Gray, 'Foreign Direct Investment and Environmental Impacts - Is the Debate over?', 11(3) *RECIEL* 306, 307-309 (2002) and Munasinghe et al., note 2 above at 12.

6 See Paragraphs 1-3 of the proclamation contained in the 1972 Stockholm Declaration, Declaration of the United Nations Conference of the Human Environment, Stockholm, UN Doc. A/CONF.48/14/Rev.1, (1972) [hereafter Stockholm Declaration] and P. Weaver et al., *Sustainable Technology Development* 58 (Sheffield: Greenleaf, 2000). See also J. Baland and J. Platteau, *Halting Degradation of Natural Resources: Is there a Role for Rural Communities?* 16, 18, 33 (New York: FAO and Oxford University Press, 1996).

7 UN Economic and Social Council, International Council for Science, and the World Federation of Engineering Organizations, Multi-Stakeholder Dialogue Segment-Addendum: Dialogue Paper by the Scientific and Technological Communities, 2nd Session of the UNCSD WSSD Preparatory Committee, UN Doc. E/CN.17/2002/PC.2/6/Add.8, 9 (2002) [hereafter UNECOSOC].

not necessarily in conflict with each other. The example of technology transfer, if clearly defined, offers new opportunities for meeting the various objectives at the same time. If international cooperation, in particular through multilateral environmental agreements (MEAs), follows a coherent regime for the transfer of environmentally sound technology (EST), the well being of people, economic prosperity and protection of the environment can be pursued simultaneously. The paper will give an overview of current barriers to EST transfer and make suggestions for more efficient EST transfer regimes using the example of compliance mechanisms under the Kyoto Protocol.

2 ENABLING ENVIRONMENTS FOR EST TRANSFER

2.1. What is EST?

Technology is the complete body of knowledge applicable to human endeavour (as well as the physical embodiments of this).⁸ Technology transfer can thus be broadly defined as the direct and/or indirect transfer of technology, technique, or knowledge that has been developed in one organisation to another, where it is adopted and used.⁹ Technology transfer is both tacit and non tacit.¹⁰ In the context of implementing sustainable development, technology transfer involves the dissemination of ESTs that 'protect the environment, are less polluting, use all resources in a more sustainable manner, recycle more of their wastes and products, and handle residual wastes in a more

acceptable manner than the technologies for which they are substitutes'.¹¹

Environmentally sound technology might not even be a single isolated physical entity or process; it might result from diverse parts that are tightly integrated with, and dependent upon, a myriad of other factors and forces.¹² Commercial EST products and services are aimed at 'meeting the simultaneous goals of creating profitable new markets, reducing environmental impacts, and improving people's lives'.¹³

Transfer of EST helps alleviate poverty because it enhances the technological capacity of developing States and therefore accelerates their economic development.¹⁴ Environmentally sound technology may also prevent people in developing countries from destroying the basis of their life-support through over-exploitation of natural resources. Furthermore, EST allows for decentralisation and localisation of technology, has potential for a domestic industry (with international markets) and is labour-intensive rather than capital-intensive, at least, potentially. It can also be said that EST will have best effects on human wealth in States where current levels of basic supplies, particularly in water and energy, are inadequate to meet demand or developmental requirements. Locally designed EST can greatly improve efficiency of the use of natural resources and sustenance of local communities. Transfer of EST will also stimulate institutional, organisational and managerial innovations and co-operations to direct endogenous technological capacity towards EST.¹⁵

2.2. Barriers to EST Transfer

Although the degree of investment is a factor, the equation for stimulating greater use of EST is more complex than simply increasing the level of investment.¹⁶ The use of many EST (in developed and

8 F. Menghistu, *International Transfer of Technology to Developing Countries: A Study on the Significance of Fiscal Policy for Technology Transfer for Development* 8-46 (Amsterdam: Kaal, 1988).

9 J. Melkers, D. Bugler and B. Bozeman, 'Technology Transfer and Economic Development', in R.D Bingham, and R Mier eds, *Theories of Local Economic Development: Perspectives from across the Disciplines* 233 (California: Sage, 1993) and Menghistu, note 8 above at 51.

10 IPCC, *Methodological and Technological Issues in Technology Transfer* 3, 15-16 (Cambridge: UNEP and WMO, 2000) [hereafter IPCC].

11 Chapter 34.1, Agenda 21, note 2 above.

12 J. Makower, *The Clean Revolution: Technologies from the Leading Edge* (California: Clean Dege and Global Business Network, 2001).

13 *Id* at 2.

14 M. Blakeney, *Legal Aspects of the Transfer of Technology to Developing Countries* 60-66 and 73 (Oxford: ESC, 1989).

15 Weaver et al., note 6 above at 55-56.

16 IPCC, note 10 above at 243-245 and G. Wilkins, *Technology Transfer for Renewable Energy: Overcoming Barriers in Developing Countries* 102 (London: Earthscan, 2002).

developing States) has not reached anywhere near the technical and economic potential that worldwide studies have attributed to them. Their diffusion has been considerably slower than might be expected based on an evaluation of their relative costs. This is attributed to the cumulative effect of a host of economic, social, and legal barriers.¹⁷ These barriers include:

- 1) Investment risk;
- 2) Cultural and language gaps;
- 3) No governmental agency to regulate/promote EST;
- 4) Low technical and other capabilities in developing States;
- 5) Inadequate infrastructure in developing States;
- 6) Insufficient investment in R&D, particularly technology adaptation;
- 7) Vested interests actively opposed to the use of EST;
- 8) Inability of developing State consumers to afford EST; and
- 9) Lack of confidence in new EST.¹⁸

2.3. Removing Central Barriers to EST Transfer

The issue of enabling environments – created through the removal of barriers, development of capacity, and implementation of positive measures – for EST development, transfer, and diffusion under the UNFCCC dates back to 1997 and it has been discussed in a variety of other fora.¹⁹

A comprehensive report on facilitating the levels of technology transfer required to meet the objectives

of the UNFCCC was eventually compiled by the IPCC.²⁰ It highlighted the interconnected nature of technology transfer to climate change and to sustainable development.

Although many areas of concern will be State and region-specific, common areas requiring attention are:

- 1) National systems of innovation;
- 2) Human and institutional capacity;
- 3) Sustainable markets; and
- 4) National legal institutions.

2.4. Market Reform

Many strategies focus on the development and replication of market-based ‘win-win’-solutions for foreign direct investment (mostly of transnational companies) as well as local private enterprise. Combined with the removal of negative subsidies and barriers to foreign investment, targeted fiscal incentives and the facilitation of technology transfer will stimulate the adoption for EST by private enterprise. Policy incentives must also remain in place for the duration of the required investment.²¹

Indirect trade options could include the creation of EST information clearinghouses and other programmes to support and facilitate EST transfer and the provision of complementary infrastructure and support services.²²

It is believed that many markets for EST will only require seeding actions, and financial incentives can

17 IPCC, note 10 above at 243, R.L. Ottinger and R. Williams, ‘Renewable Energy Sources’, 32 *Environmental Law* 331, 332-333 (2002), UN Environment Programme – Department of Trade, Industry and Economic, Cleaner Production Global Status Report 2002 vi –ix and 2-3 (UNEP: Nairobi, 2003) and Wilkins, note 16 above at 2.

18 IPCC, note 10 above at 5, 19, and 105-141 and Wilkins, note 16 above at 120-144.

19 Report of the UNFCCC Workshop on Enabling Environments for Technology Transfer, 18th Session of the SBSTA, Ghent, Belgium, UN Framework Convention on Climate Change, UN Doc. FCCC/SBSTA/2003/INF (2003) at 5 [hereafter UNFCCC]. For biodiversity see, e.g., UNEP, Technology Transfer and Capacity-building, 9th Meeting of the SBSTA, UN Doc. UNEP/CBD/SBSTTA/9/INF/1 (2003). See also Agenda 21, note 2 above.

20 IPCC, note 10 above. An extensive compilation of climate-related technology transfer case studies across various industrial sectors is set out in chapter 16 of the IPCC report. See Wilkins, note 16 above at 144-146.

21 E. Braun, *Technology in Context: Technology Assessment for Managers* 105-107 (London: Routledge, 1998), A.S. Miller, ‘The Global Environment Facility and the Search for Financial Strategies to Foster Sustainable Development’, 24 *Vermont Law Review* 1229, 1237-1238 (2000), Ottinger, note 17 above at 339-340, UNFCCC, note 19 above at 7 and Wilkins, note 16 above at 88-90.

22 J. Mayer, *Globalisation, Technology Transfer and Skill Accumulation in Low-Income Countries* UNCTAD/OSG/DP/150 (Geneva: UNCTAD, 2000), Menghistu, note 8 above and G. Verhoosel, ‘Beyond the Unsustainable Rhetoric of Sustainable Development: Transferring Environmentally Sound Technologies’, 11 *Georgetown International Environmental Law Review* 49, 70-75 (1998).

be neutralised once sustainable EST markets come into fruition. If efforts to create an enabling market fail to stimulate a sufficient uptake of EST, governments can take a number of additional fiscal actions to 'push' and 'pull' private sector activity towards the development and transfer of EST.²³

It is possible at all stages of the EST development and transfer process to promote activities through the provision of taxation relief or direct economic support, if doing so is not inconsistent with trade regulations. Indirect financial assistance might be also provided for firms through national systems of innovation.²⁴

For States that have not accepted need for unfettered liberal policies there can also be trade related investment measures that circumscribe the activities of TNC and other foreign investors.²⁵

3 EST TRANSFER IN EXISTING MEAs

3.1. Basics

The technological dependency of most developing States, and particularly the least developed States, on EST transfer from developed States to reduce the environmental stress caused by industrialisation processes is almost total.²⁶

23 IPCC, note 10 above, 164-165, P.H. Gray 'The Role of Transnational Corporations in International Trade' in J.H. Dunning and KP Sauvant eds, *Transnational Corporations and World Development* 256 (Kent: UN and International Thomson Press, 1996), Menghistu, note 8 above and Verhoosel note 22 above.

24 Blakeney note 14 above at 75-78, Menghistu, note 8 above at 212-216 and Verhoosel note 22 above.

25 D. Elson, 'Transnational Corporations: Dominance and Dependency in the World Economy', in S Corbridge ed., *Development Studies: A Reader* 398 (London: Edward Arnold, 1995) and S.J. Rubin & D. Wallace, 'Transnational Corporations and National Law', in J.H. Dunning & KP Sauvant eds, *Transnational Corporations and World Development* 497 (Kent: UN and International Thomson Business Press, 1996).

26 Menghistu, note 8 above at 1.

Consequently, Agenda 21, the soft law²⁷ blueprint for sustainable development, is rife with references to technology and technology transfer as the solutions (or at least partial solutions) to many of the problems of sustainability. The need to apply, develop, or transfer technology, is mentioned in over 50 sections of Agenda 21.²⁸ It also emphasises the importance of EST for sustainable economic development in order to prevent outmoded and environmentally destructive technologies from being put into place in developing States as they industrialise.²⁹ But exact details of EST transfers were not decided³⁰ and the generic process of transferring EST can, until now, be seen as stillborn.³¹

3.2. Problems with EST in MEAs

Multilateral Environmental Agreements often aim for preventing developing countries from following the patterns of high-polluting, unsustainable industrialisation in developed countries. Typical means for supporting sustainable development is EST transfer combined with financial assistance. The idea is to prevent development from becoming unsustainable rather than reversing unsustainable development that has already occurred.³²

3.2.1. Non-Binding Obligations

In reality, however, technology transfer for sustainable development often remains in the

27 Not legally binding status of persuasive and interpretative value in international law.

28 See D. Sitarz, *Agenda 21: The Earth Summit Strategy to Save our Planet* (Colorado: EarthPress, 1993). See also UNCTAD, Scientific and Technological Aspects of Sustainable Development: Progress Achieved and Problems Encountered in the Application of Science and Technology for Sustainable Development, UN Doc. E/CN.16/1995/12,21 (1995), at 1, 5.

29 A critical element of chapter 7 of Agenda 21, Sitarz, note 28 above at 12-13 and 20-21.

30 Chapter 34, Agenda 21, note 2 above, Sitarz note 28 above, Foreword and Wilkins, note 16 above at 49.

31 Third World Network, Earth Summit Plus 5 Briefing No.4: Technology Transfer, Intellectual Property Rights and the Environment (1997), available www.twinside.org/title/tec-cn.htm.

32 J. Abdel-Khalik, 'Prescriptive Treaties in Global Warning: Applying the Factors leading to the Montreal Protocol', *22 Michigan Journal of International Law* 489, 508 (2001) and S. Vaughan, 'Trade and Environment: Some North-South Considerations', *27 Cornell International Law Journal* 591, 603-604 (1994).

conceptual phase due to its investiture in the realm of 'soft law'.³³ Even within most binding hard law international agreements, a considerable gap exists between the intentions expressed in the agreed technology transfer provisions and the resulting actions.³⁴ Many technology-related provisions rely on national measures for their implementation. For example, Article 16 of the 1992 UN Convention on Biological Diversity³⁵ (UNCBD) requires the adoption of 'legislative, administrative or policy measures, as appropriate' to provide access to, the transfer of and the joint development of technology. Clauses that provide that 'all parties' shall 'cooperate', 'encourage', 'facilitate', or 'promote' EST transfer, allow for too many discretions and loopholes. The problem of implementation magnifies when there is an insufficient, or non-existent, definition of what constitutes an EST (let alone addressing the issues of measuring compliance and the fulfilment of obligations).³⁶

3.2.2. *Transfer of EST versus IPR in MEAs*

Intellectual Property Rights (IPR) have been protected to some extent in all modern multilateral environmental agreements. For example, Articles 266 and 267 of 1982 UN Convention on the Law of the Seas³⁷ (UNCLOS) require the transfer of technology 'on fair and reasonable terms and conditions' and 'favourable economic and legal conditions for the transfer of marine technology for the benefit of all parties concerned on an equitable basis' but also refers to 'all legitimate interests, *inter alia*, the rights and duties of holders, suppliers and recipients of marine technology'.

More recently, Article 16 of the UNCD creates an obligation on developed States to 'provide and/or facilitate access for and transfer to...technologies...relevant to conservation and sustainable use of biological diversity or make use of genetic resources...' under 'fair and most favourable terms'. This transfer 'shall be provided on terms which recognise and are consistent with the adequate and effective protection of intellectual property rights'. Insofar as 'appropriate' there is an 'aim that the private sector facilitates access to, joint development and transfer of technology... for the benefit of both governmental institutions and the private sector of developing countries'. However, there is a provision that there shall be cooperation to make sure that '...patents and other intellectual property rights ... are supportive of and do not run counter to its objectives' (the UNCBD).

There is a suggestion that recent instruments, in line with the overall trend towards the strengthening and expansion of IPR protection, emphasize the protection of the interests of IPR holders.³⁸ However, even with its relatively supportive position on IPR, Article 16 (in binding hard law international agreement) was largely responsible for the resulting USA declaration opposing the UNCBD.

3.2.3. *Differences between Transfer of Exploitation Technology and of Conservation Technology*

States have a considerable discretion in the actions they actually undertake in relation to most technology transfer mechanisms.³⁹ As a result, certain kinds of technology will be favoured in actions to meet technology transfer commitments. For example both UNCLOS and UNCBD are dual technology transfer regimes. The negotiation and implementation of the relevant 'exploitation' technology clauses (which could provide more efficient competition with donor States from developing State enterprises) have proven to be far more complicated than for 'conservation' technology transfer (in which developed States have a direct interest as they will help to maintain the global commons and provide resources for all).⁴⁰

33 F.P. Salimbeni, 'US Business and Technology Transfer in the Post-UNCED Environment', 17 *Maryland Journal of International Law & Trade* 31, 33 (1993) and Verhoosel, note 23 above at 49.

34 UNCTAD, International Arrangements for Transfer of Technology: Best Practices for Access to and Measures to Encourage Transfer of Technology with a View to Capacity Building in Developing Countries, especially in Least Developed countries, UN Doc. TD/B/COM.2/EM.9/2 (2001) at 5-6, 14-15, 20.

35 Convention on Biological Diversity, Rio de Janeiro, 5 June 1992, 31 *Int'l Leg. Mat.* 818 (1992).

36 Verhoosel, note 23 above at 57-60 and 62-63.

37 United Nations Convention on the Law of the Sea, Montego Bay, 10 December 1982, 559 *UNTS* 285 (1982).

38 Mayer, note 22 above at 19.

39 Verhoosel, note 23 above at 54.

40 *Id.*

While the transfer of conservation EST is an important component of efforts to make development sustainable, such actions must be combined with the transfer of exploitation and production EST if the negative effects of industrialisation processes are to be minimised.

3.2.4. Evaluation

There is no coherent framework for EST transfer in MEAs. Looking at individual MEAs, we can identify several fundamental problems. First, the rules concerning EST in MEAs are often not binding or limited to 'best efforts' commitments. Second, there is as yet no transfer concept to balance the needs of developing States with the increasing demands for the protection of IPR. Third, binding rules for EST transfer are mostly concerned with conservation EST, not with exploitation EST. Both forms are needed to allow developing States to increase their competitiveness with developed States, thus helping to develop the economy and ease poverty.

4 TOWARDS A COHERENT REGIME FOR EST TRANSFER

Following the patterns of 'Environmental Realpolitik' the current international development framework favours voluntary transfers of EST and other technology on a commercial basis (and with the protection of IPR). With this mechanism for transfer in place, it is important that sufficient funds are being utilised by the actors involved in the transfer process to direct the resulting industrialisation patterns in developing States into providing for appropriate and sustainable development.⁴¹ Whether the private sector can play a key role in improving environmental stress is heavily

⁴¹ There is currently not enough financial assistance available to support EST transfer, See UNECOSOC, Transfer of Environmentally Sound Technologies, Cooperation and Capacity-building, Environmentally Sound Management for Biotechnology, UNCSD WSSSD Preparatory Committee Meeting, UN Doc. E/CN.17/2001/PC/11 (2001) at 2.

dependent on governments providing a policy framework that stimulates demand for, as well as the supply of, EST. There should be founded public-private R&D and technology partnerships, both within and between States, because in that way the public sector can leverage public policy objectives and also provide commercial benefits for the private sector participants.⁴²

As many transnational corporations (TNC) use the options afforded by globalisation with little regard for the provision of social or environmental objectives, there is an urgent need for internationally agreed standards to govern social and environmental liabilities of TNC.⁴³

A key role for the creation of EST transfer could be played by the development and replication of market-based 'win-win' solutions. This is because on the one hand, the owners of the IPR protected EST are mostly not willing to transfer their knowledge without having an economical benefit from it.⁴⁴ Therefore it seems reasonable to link developing State's compliance in MEAs with the receipt of financial and technical assistance. On the other hand, it can be useful to link developing party's compliance to MEAs with the receipt of financial and technical assistance.

4.1. EST Transfer in Ozone Layer Depletion and Climate Change Regimes

There are two EST transfer regimes that can be called coherent. Both regimes, the ODS control regime for ozone-depleting substances (ODS) and Kyoto's clean development mechanism (CDM) have been implemented and financed through the Global Environment Facility (GEF) and each incorporates elements of the North-South Compact.

⁴² This was also realised by the G8. See G8, Science and Technology for Sustainable Development: A G8 Action Plan, G8 Evian Summit (2003), document available www.g8.gc.ca/sumdocs2003-en.asp.

⁴³ Until now, such a legal framework has never been adopted. See A.A. Fatouros, 'Transnational Corporations: Looking for an International Legal Framework for Transnational Corporations', in J. H. Dunning et al. note 25 above at 521.

⁴⁴ E.J. Malecki, *Technology and Economic Development* 275-279 (Kuala Lumpur: Longman 1991) and Menghistu, note 8 above at 83.

4.1.1. Montreal's ODS and EST

Technology transfer under the ODS control regime is governed by the adjusted and amended Articles⁴⁵ of the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer.⁴⁶ The preamble of the Montreal Protocol sets out those precautionary measures, equitably undertaken to control ODS emissions, will take into account technical and economic considerations and bear in mind the developmental needs of developing States. The preamble of the Montreal Protocol further sets out that special provision will need to be made for developing States; and that this shall include the provision of 'additional financial resources and access to relevant technologies'. Article 5 (5) sets out the capacity of developing States to comply with the ODS control regime 'will depend upon the effective implementation the financial cooperation as provided by Article 10 and the transfer of technology as provided by Article 10A.'

Under Article 9 (1) of the Montreal Protocol, Parties shall cooperate to carry out research and development ('R&D') and exchange information on the:

a) Best technology for improving the containment, recovery, recycling, or destruction of controlled substances or otherwise reducing their emission;

b) Possible alternatives to controlled substances, to products containing such substances, and to products manufactured with them; and

c) Costs and benefits of relevant control strategies.

Under Article 10A:⁴⁷

Each Party shall take every practicable step, consistent with the programmes supported by the financial mechanism, to ensure that:

a) The best available, environmentally safe substitutes and related technologies are expeditiously transferred to Parties operating under paragraph 1 of Article 5;⁴⁸ and

b) The transfers referred to in subparagraph a) occur under fair and most favourable conditions.

Meeting of the Parties (MOP) –1 decision 4 established the original work plan for Articles 9 and 10.⁴⁹ It involved the conducting of workshops, demonstrations and training courses and secondment of experts and consultants to developing States. Retrofit technologies that negated the need for ODS was an early focus on the plan. Initiatives were also undertaken to promote synergies with other international development and financing organisations.

As the technical requirements became more apparent, MOP-2 decision 11 established an Ad-hoc Technical Advisory Committee on Destruction Technologies and MOP-8 decision 7 established an Informal Group on Technology Transfer to report on impediments to technology transfer and identify solutions to overcome them. UNEP's Technology and Economic Assessment Panel ('TEAP') also undertakes a considerable amount of work.

Most of the costs of eliminating ODS are borne jointly by the Multilateral Fund for the Implementation of the Montreal Protocol ('Multilateral Fund'),⁵⁰ business enterprises, and

45 MOP-2 adopted the London Amendment in 1990, MOP-4 the Copenhagen Amendment in 1992, MOP-9 the Montreal Amendment in 1997, and MOP-11 the Beijing Amendment in 1999. For those States which have ratified them, they entered into force on 10 August 1992, 14 June 1994, 10 November 1999, and 25 February 2002, respectively. As of 28 November 2002, 164 States had ratified the London amendment, 142 the Copenhagen Amendment, 84 the Montreal Amendment, and 41 the Beijing Amendment. UNEP, Report of the Conference of the Parties to the Vienna Convention for the Protection of the Ozone Layer, 6th COP VC, UN.Doc. UNEP/OzL.Conv.6/7 (2002) at 3.

46 Protocol on Substances that Deplete the Ozone Layer, Montreal, 16 September 1987 and Vienna Convention for the Protection of the Ozone Layer, 22 Mar. 1985, 26 *Int'l Leg. Mat.* 1516 (1987) [hereafter Vienna Convention]. For both instruments including all amendments and decisions of the Meetings of the Parties to the Montreal Protocol [hereafter MOP] and Conferences of the Parties to the Vienna Convention [hereafter COP VC] until the end of 2002. See UNEP, Handbook for the International Treaties for the Protection of the Ozone Layer (Nairobi: Ozone Secretariat and UNON, 6th ed. 2003). The UNEP Handbook is available at www.unep.org/ozone.

47 Inserted by Article 1(u) of the London Amendment to the Montreal Protocol. UNEP, note 46 above.

48 Developing States are known as Montreal Protocol Article 5(1) States within the ODS control regime.

49 The original Article 10 was based upon technical assistance.

50 The website of the Multilateral Fund Secretariat is at <http://www.unmfs.org>.

consumers.⁵¹ This combination is seen as one of the most critical factors of control regime's success to date.⁵² As developing States had made it clear that they would not be cajoled into compliance if it would come at the cost of their economic development, developed States implemented the financial mechanism originally intended to help developing States meet the added costs of ODS control regime compliance.⁵³ Since 1991, the transfer of technology has been facilitated through the implementing agencies of the Multilateral Fund.

This Multilateral Fund, which now works in an integrated fashion at a State-level, with State-driven ODS phasing-out agendas and institutional strengthening to assist developing States, meets the incremental costs to developing States of implementing the objectives of the ODS control regime.⁵⁴

The experiences made with this Multilateral Fund are very satisfactory, as developed States were by and large, holding up their side for this multinational environmental agreement and therefore in the triennium to 2003, no project had been refused

because of a lack of resources in the Multilateral Fund.⁵⁵

With purpose to assess the environmental acceptability of each of the alternatives on the growing list of ODS substitutes and to keep abreast of new technological developments annual requests were made at COP VC and MOPs for the UNEP TEAP.⁵⁶ These annual reports have a significant impact upon the ongoing decision-making of the ODS control regime.

To address concerns, that transitional substances and potent greenhouse gases were being selected as ODS alternatives merely on an economic basis, MOP-5 decision 8 explicated that TEAP assessments were to be made against environmental, health and safety, technical, economic, social and country-specific criteria rather than merely their ability to reduce the release of ozone depleting substances.

Such assessment criteria will need to be inserted into, and rigorously pursued in, any EST transfer regime that hopes to have a positive effect on sustainability.

In summary, we can say that the Montreal Protocol is working, and ozone layer depletion is expected to begin to ameliorate during the next decade or so, although the ODS regime cannot rest on its laurels.

4.1.2. Kyoto's CDM and EST

A comprehensive solution to the problem of climate change will necessitate the development of a long-term framework to encompass sustainable development in developing States. Otherwise, greenhouse gas emissions will increase in proportion to economic growth in developing states.

Therefore, the Kyoto Protocol to the UNFCCC ('Kyoto Protocol')⁵⁷ requires industrialised States to

51 Intergovernmental Panel on Climate Change, *Methodological and Technological issues in Technology Transfer* 89-90 (Cambridge: UNEP and World Meteorological Organisation, 2000).

52 Abdel Khalik note 32 above and A.S. Miller, 'Externalities, Technology, and Sustainable Development: Environmental Policy in the New World Economy', 3 *Widener Law Symposium* 287, 288-289 (1988). Like reviews of the GEF trust funds, reviews of the Multilateral Fund have been satisfied with its performance but call for continued improvements. See MOP-5 decision 7, MOP-7 decision 22 and Annex, MOP-8 decision 5.

53 The need for a carrot, reflective of the North-South Compact, to be added to the ongoing presence of the stick was noted in the call for the immediate implementation of a financial mechanism and transfer of technology in MOP-1 decision 13 and MOP-2 decision 8 established an interim financial mechanism from 1 January 1991. Khalik note 32 above at 509-510, M.A. Drumbl, 'Poverty, Wealth, and Obligation in International Environmental Law', 76 *Tulane Law Review* 843, 866, 869-870 (2002) and B. Ling, 'Developing Countries and Ozone Layer Protection: Issues, Principles, and Implications', 6 *Tulane Law Review* 91 (1992).

54 Third World Network, note 31 above. The Multilateral Fund interpretation and application of incremental costs has been criticised by recipient States. UNEP, Report of the 6th Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer, UN Doc. UNEP/OzL.Pro.6/7, (1994)10 and 12.

55 UNEP, Report of the 7th Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer, UN Doc. UNEP/OzL.Pro.7/12 (1995) at 13-14. 56 *Id.* at 6.

57 Adopted COP-3 decision 1. See UNFCCC, Report of the Conference of the Parties on its Third Session. Addendum: Part Two: Action Taken by the Conference of the Parties at its Third Session, 3rd COP, UN Doc.FCCC/CP.1997/7/Add.1, Annex (1997).

reduce their GHG emissions by an average of 5.2 per cent from 1990 levels for the first commitment period (between 2008 and 2012).⁵⁸ To implement this obligation, the Kyoto Protocol anticipates an initial allocation of what have since come to be identified as 'assigned amount units' (AAUs) corresponding to each participating State's emission cap.⁵⁹

The Kyoto Protocol recognises that each State's action in relation to climate change, including policies for the research, development, and promotion of EST, are a part of the promotion of sustainable development. As a result, actions taken in furtherance of the Kyoto Protocol and the UNFCCC shall be implemented in a way that minimises adverse social, environmental, and economic impacts on developing States.

The Kyoto Protocol has got different flexible mechanisms, to help States meet their emissions goals, especially by making the AAUs tradable internationally.

Concerning EST, it establishes a clean development mechanism (CDM), which allows developed States to implement their reduction commitments by undertaking projects in developing States. Through CDM, there is considerable scope for EST transfer to developing States for sustainable development.

Although large amount of governmental assistance will still be required, the Kyoto Protocol is a quest for 'win-win'-situations through the creation of public-private partnerships (involving all States) conducive to EST transfer from the private sector (including an emphasis on government-supports FDI in developing States through the CDM). The CDM will also transfer 2 per cent of its proceeds to the Kyoto Protocol Adaptation Fund in order to assist developing States that are particularly vulnerable to the effects of climate change achieve sustainable development.

⁵⁸ The Kyoto Protocol was meant to enter into force after not less than 55 Parties to the UNFCCC, including Annex 1 States which account in total for at least 55 per cent of total carbon dioxide emissions in 1990, had deposited their instruments of ratification. Article 25 Kyoto Protocol.

⁵⁹ However, when estimated levels of economic growth are factored in, this is a 29.2 per cent reduction in GHG emission levels from a business as usual scenario. Drumbl, note 53 above at 876-877. Varying national circumstances in reflected varying national targets set out in Annex 1 of the Kyoto Protocol.

CDM also brings together the need for developed countries to initiate investments in carbon emissions reductions, with the availability of low cost carbon emissions reductions opportunities in developing countries. Enterprises in developed countries can invest in establishing EST in developing countries. Because of the lower technological baseline in developing countries even greater reductions in carbon emissions might result than in developed countries using similar technologies. In return, the investing enterprise gets a stream of carbon emissions reductions (as compared baseline).⁶⁰

This makes clear that Kyoto's CDM can be used as a very efficient instrument for promoting EST transfer.

Along with the creation of the Kyoto Protocol, the agenda for the transfer of technology under the UNFCCC was established at the COP-3. This agenda built upon by the Buenos Aires Plan of Action,⁶¹ which was a compilation of decisions made about EST within the UNFCCC and Kyoto Protocol framework. It represented decisions made on financing, the development and transfer of technology to developing States.⁶² The issues of capacity building and development of indigenous EST in developing States were subsumed within the enunciation of developed State obligation to transfer climate-related EST to developing States.⁶³ The Buenos Aires Plan of Action further enunciated the important role of the private sector in transferring climate-related EST and repeated the need to provide it with an enabling environment to let it carry out its activities. In the subsequent years emphasis was placed on market based mechanisms for EST transfer.

⁶⁰ See TERI, Issues and Options for Implementing CDM projects.

⁶¹ Largely related to technology transfer and adopted at COP-4. See UNFCCC, Report of the Conference of the Parties on its Fourth Session. Addendum: Part Two: Action Taken by the Conference of the Parties at its Fourth Session, 4th COP, UN Doc.FCCC/CP/1998/16/Add.1 (1998).

⁶² Especially LDC as set out in Articles 4.8 and 4.9, Framework Convention on Climate Change (FCCC), New York, 9 May 1992, 31 ILM 849 (1992) [hereafter FCCC] and Articles 2.3 and 3.14, Kyoto Protocol to the United Nations Framework Convention on Climate Change, Kyoto, 11 December 1997.

⁶³ Also included were decisions on JI under the pilot phase (COP-4 decision 7). FCCC note 62 above.

Later on, the Marrakech Accords⁶⁴ established the rules for the operation of the Kyoto Protocol and called for an increase in the level of GEF financing. As the USA had not ratified the Protocol, clear segregation of funds under the UNFCCC and the Kyoto Protocol was required.⁶⁵ As a result, there are three new trust funds: the UNFCCC LDC fund, the UNFCCC Special Climate Change Fund (SCC Fund) and the Kyoto Protocol Adaptation Fund.⁶⁶ The SCC Fund, which is operated pursuant to the UNFCCC, provides finances for technology transfer and therefore is to be used in a manner that is complementary with the GEF's 4 climate change mitigation operational programs.⁶⁷

Unfortunately, the implementation of adoption measures to date has been limited.⁶⁸ Therefore it has been proposed that the executive committee of the SCC Fund should be governed by the objectives of the WSSD as a framework when defining the scope of SCC Fund activities. However, this is important as proponents of sustainable development believe that efforts to combat climate change should revolve around the development objectives and needs of developing States rather than GHG emission targets. The UNFCCC and Kyoto Protocol will need to establish the long-term economic infrastructure and create developmental synergies with all other relevant international organisations if developing States are to make the transition to becoming climate-friendly economies as they industrialise. By that way, the potential benefits of EST transfer for sustainable industrialisation would be enormous.⁶⁹

Guidance for CDM and Adaptation Fund activities, including rules on incremental costs and definitions of 'additional activities' under Kyoto Protocol Article 12.5 c) will therefore be of critical importance.⁷⁰ It is also necessary to implement capacity building in developing States like they were adopted in the 'Marrakech Accords' through 'learning by doing as a part of specific State-driven national sustainable development agendas, as otherwise the conditions in developing states will often not allow them to even use the needed EST. Emphasis should also be placed on the development of national climate focus points and national adaptation action plans ('NAPA) through the UNFCCC 3-stage adaptation plan.⁷¹

Activities listed and detailed in the technology transfer framework espoused in the Marrakesh Accords broadly cover 5 areas which include technology needs assessment, the provision of information on EST, the creation of an enabling environment/removal of barriers at each stage of the technology transfer process, capacity building, and the creation of transfer mechanisms.⁷² There is a focus on government actions to stimulate private and public sector EST transfer, involving the reform of trade policies, other economic/tax/intellectual property policies and the legal and administrative environment. Developed States shall improve the access of developing States to publicly funded technologies and other EST programmes, including the promotion of joint R&D.

As the entire project cycle for CDM activities was also established within the Marrakesh Accords and a prompt start to these activities was facilitated.⁷³ The Marrakesh Accords expressly address the question of carbon sinks.⁷⁴ Sinks are excluded from

64 Comprising 23 interrelated decisions by COP-7. See UNFCCC, Report of the Conference of the Parties on its Seventh Session. Addendum: Part Two: Action Taken by the Conference of the Parties at its Seventh Session (Volume I), 7th COP, UN Doc. FCCC/CP/2001/13/Add.1 (2001), The Marrakesh Accords [hereafter Marrakesh Accords].

65 Drumbl note 53 above at 650-651.

66 COP-7, decisions 7 and 10.

67 COP-7, decisions 4, 5, and 7, Marrakesh Accords, *See also* GEF, Arrangements for the Establishment of the New Climate Change Funds, 19th GEF Council Meeting, 3-4, UN Doc. GEF/C.19/6 (2002) at 17.

68 R. Verheyen, 'Adaptation to the Impacts of Anthropogenic Climate Change - The International Legal Framework', 11 (2) *RECIEL* 133, 142-143 (2002).

69 UNFCCC, Summary of Views from Parties on Activities, Programmes and Measures of the Special Climate Change Fund, 18th Session of the SBI, UN Doc. FCCC/SBI/2003/INF.3 (2003).

70 Munasinghe note 3 above at 64 and J. Werksman, K.A. Baumert and N.K. Dubash, Will International Investment Rules Obstruct Climate Protection Policies? 3 (World Resources Institute Climate Notes 1, 2001).

71 COP-7 decision 4, Marrakesh Accords at Annex: Framework for Capacity Building in Developing Countries.

72 *Id.*

73 COP-7 decision 17 and Annex, UNFCCC, note 19 above. Under Article 12.10 of the Kyoto Protocol, CERS have been able to be transferred for CDM for CDM projects since 2000 and Wilkins, note 16 above at 1-2.

74 COP-6 decision 5 and COP-7 decision 11, Marrakesh Accords. *See also* the draft decision-/CMP1.

the first calculation of baselines for the first commitment period of 2008-2012. Also, due to the commitment period reserve adopted, most States cannot trade more than 10 per cent of their emissions budget. Within the CDM, the net credits received for forestation and reforestation during the first commitment period may not exceed 1 per cent of the State's base-year emissions. However, there are no overall limits on supplements to safeguard against the trading of too much 'hot air' amongst developed States and States with economies in transition.⁷⁵

5

IMPLEMENTING COMPREHENSIVE EST TRANSFER SOLUTIONS

5.1. Public Sector Intervention in EST Research and Dissemination

There is a need for greater governmental intervention at the national and international level, especially the need for sector-wide plans for the development, transfer, and implementation of EST in individual States. New EST should be developed and the cost of EST lowered. Therefore the funding of EST research and development should further be encouraged. International organisations should not only promote access to EST, but also play a greater role in the facilitation of international EST research and development collaborations.⁷⁶

As the CDM process requires host countries' enterprises to be competitive to be attractive business partners, it is important to build up a significant

CDM capacity in host countries' governments and enterprises. Therefore a substantial front-up investment might be necessary.⁷⁷

5.2. Harnessing Private Sector Actions through Regulation

Private-sector development has become the official mantra of international development organisations. But the potential for unsustainable industrialisation is great.⁷⁸ The overall effect of a few billion dollars of GEF-backed private sector activity will be drowned in the hundreds of billions of dollars backed by the Export Credit Agency (ECA) and spent on developing fossil fuel economies. ECA needs to be reformed into an instrument more supportive of sustainable private sector actions.

As they are profit-maximising entities, the private sector should not be given free reign to develop and invest as they see fit. Thus, the environmental and social elements of sustainable development need to be instilled in them by governmental actions. For example, maximising 'spill over effects' could be a regular required area of corporate responsibility for TNC engaging in foreign direct investment.⁷⁹

The globalisation of previously domestic policy issues actually calls for more international checks and balances to govern TNC and foreign investor performance. Such measures could eliminate any occurrence of the pollution haven hypothesis.

5.3. An Independent EST Assessment and Transfer Organisation

With an increased focus on the transfer and use of EST, it will become an imperative to establish whether technologies are actually EST. With sufficient international support, standards could be established and updated by an independent EST body in collaboration with national and

⁷⁵ IPCC, note 10 above at 293-297, Verheyen, note 68 above at 138 and D. Wirth, 'The Sixth Session (Part Two) and the Seventh Session of the Conference of the Parties to the Framework Convention on Climate Change', 96 *American Journal of International Law* 648, 651-652 (2002).

⁷⁶ UNECOSOC, Transfer of Environmentally Sound Technologies, Cooperation and Capacity-Building, Environmentally Sound Management of Biotechnology, UNCSO WSSD Preparatory Committee Meeting, UN Doc. E/CN.17/2001/PC/11 (2001) at 2.

⁷⁷ The Energy and Research Institute (TERI), *The CDM maze: issues and options*, S. 2.

⁷⁸ Muradian, note 4 at 6.

⁷⁹ OECD Global Forum on International Investment: Attracting International Investment for Development (OECD: Paris, 2003).

international standard bodies, including the GEF Science and Technology Advice Panel, the International Standards Organisation, and the UNEP Technology and Assessment Panel. Such a body could also play an important role in fostering the global development and dissemination of EST if it adopted a clearinghouse function.⁸⁰

6 CONCLUSION

There are economic, social and legal (rather than technical) barriers preventing EST transfer from a wider use in international agreements. Removing these barriers requires greater political and regulatory efforts both domestically and internationally. However, it is most important to realize the critical role of EST for environmental sustainability and poverty alleviation.⁸¹

To enable EST transfer, developed States need to improve domestic market conditions such as removal of negative subsidies and barriers to foreign investment, targeted fiscal incentives and law reforms favouring sustainable production and use of energy. There is no realistic perspective for international EST transfer as long as it is disadvantaged domestically.

A coherent, effective EST transfer regime has not yet emerged in international law. Regimes in existing MEAs are hampered by three fundamental problems:

(1) Inherent flaws: lack of definition, non-binding character and vagueness of obligations and ineffective compliance mechanisms;

(2) Unhealthy competition with IPR: MEAs are less concerned with EST transfer (and related means of environmental sustainability and poverty alleviation) than with IPR protection; and

(3) A too narrow concept of EST: the transfer of exploitation and production EST is neglected in favour of conservation EST.

All these fundamental problems call for the development of a coherent EST transfer regime that can be used in MEAs as well as in trade and technology agreements.

A coherent EST transfer regime is only possible through greater governmental intervention at the national and international level, including environmental regulations, national systems of innovation, and creating an enabling environment for EST. However, such intervention should lead to effective public-private R&D partnerships, both within and between States. Partnerships, if guided by law, could ensure IPR protection and EST innovation more efficiently than purely State-driven or market-driven EST transfers.

In search for a model, the ODS control regime under the Vienna Convention and the Montreal Protocol has been rather successful. With the Multilateral Fund, business enterprises and consumers jointly bearing the cost of eliminating ODS an effective mechanism of EST transfer has been found. It provided a strong driving force for global technological innovation. Important was also, that the transfer of any CFC-using equipment to developing States was prevented.

The CDM under the Kyoto Protocol allows for considerable scope for EST transfer. The creation of public-private partnerships (within and between States) can be conducive for EST. Enterprises in developed countries can invest in EST in developing countries which may be very efficient considering the lower technological baseline there. The experience with the Multilateral Fund can be very valuable for setting up a similar Fund under Kyoto's CDM. This could work more efficiently than the SCC suffering from implementation problems and a too narrow focus.

Successful technology transfer programmes will not be driven by their environmental benefits alone, but because they meet other economic needs. Therefore

⁸⁰ Point 18(a), WSSD Plan of Implementation and IPCC, note 10 above at 85. For details of the potential use of management systems within the context of international trade, see G. van Calster, 'The Management of Environmental Regulations by International Organisations', in I. Fletcher, L. Mistelis and M. Cremona eds, *Foundations and Perspectives of International Trade Law* 109-113 (London: Sweet & Maxwell, 2001).

⁸¹ K. Bosselmann, 'Ethical Implications of Energy for Sustainable Development', in A.J. Bradbrook et al. eds, *The Law of Energy for Sustainable Development* 74-92 (Cambridge University Press, 2005).

adopting cleaner production methods and implementing EST can create 'win-win' situations. The promotion of such situations is the next best option to private sector regulation, if international institutions are sufficiently funded to do so. Yet, increasing funds for overseas development assistance will not itself be the solution to problems like climate change.

More important than money is the mindset guiding EST. The Millennium Development Goals will not be achieved unless guided by a true ethos of sustainability. Such an ethos that links sustainability to the elimination of poverty cannot automatically be assumed. It is for the rich to follow this ethos and see EST as indispensable for alleviating poverty.

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