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TECHNOLOGY TRANSFER AND CLIMATE CHANGE: ADDITIONAL CONSIDERATIONS FOR IMPLEMENTATION UNDER THE UNFCCC

Karen Sullivan

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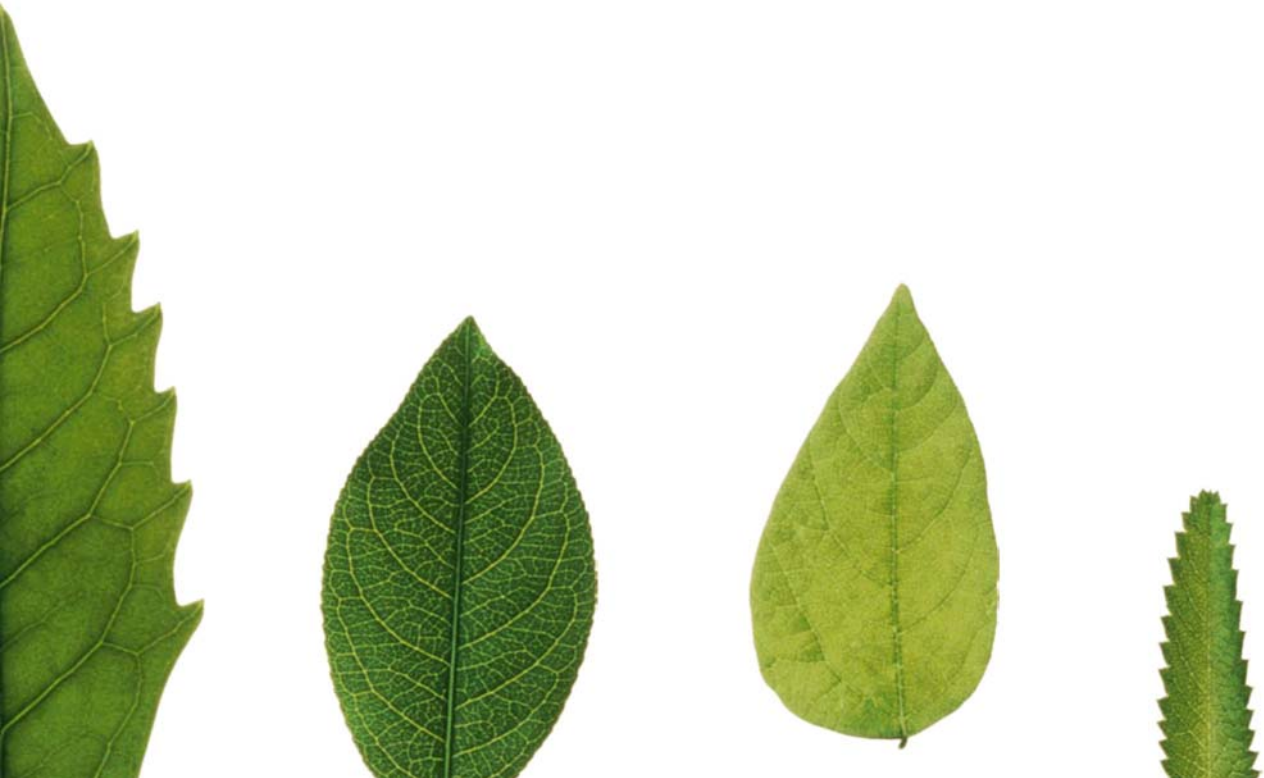

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Article

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Karen Sullivan, Director, Spectrum Intellectual Property Solutions Ltd., Taymar House, Flocklones, Invergowrie, Dundee DD2 5LE, Scotland. Email: Karen.Sullivan@spectrum-ips.net

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1 INTRODUCTION

Whilst there are a variety of views on what constitutes the most appropriate definition of the term 'technology transfer',[1] there is far greater consensus on the central importance of the process to the achievement of a number of international environmental and developmental goals. In 2005, a UN report from the Department of Economic and Social Affairs on sustainable forest management claimed that 'Policies promoting development and diffusion of technologies are probably among the most important factors affecting environmental protection. Moreover, technology transfer is one of the major factors shaping global income distribution'.[2]

It is clear, therefore, that the process of technology transfer is of general importance both in terms of promoting development[3] and protecting the environment from a range of threats.[4] This is reflected in many comprehensive works by various international organisations and bodies which have attempted to define the activities and infrastructure needed to accelerate or optimise the process of technology transfer in particular industrial sectors,[5] or to achieve the objectives of specific international treaties.[6] Despite this growing body of work, and some notable success stories, such as the implementation of the Montreal Protocol,[7] evidence persists that international technology transfer remains a less than efficient process in many circumstances. For example, despite a claim by the Centre for International Environmental Law, that 'Transfer of technology is one of the pillars of any international response to global climate change',[8] Anderson et al are critical of the process in the context of the UNFCCC, asserting that there has been a failure to implement the 'rapid and widespread transfer and diffusion of technologies' necessary to address climate change during the first 15 years of operation of the treaty.[9]

As previously mentioned, there is often a duality of purpose behind the inclusion of technology transfer provisions in environmental treaties, namely the achievement of development as well as various aspects of environmental protection or remediation.[10] Within the UNFCCC, Article 4.7 covers both technology transfer and development in respect of Developing Country Parties as follows:

1 K. Sullivan, 'Technology Transfer Provisions in Multilateral Environmental Agreements: A Commercial Perspective' 22 *Environmental Law and Management* 288, 291 (2010).

2 Department of Economic and Social Affairs, United Nations Forum on Forests Secretariat,Transfer of Environmentally Sound Technologies for Sustainable Forest Management – Framework and Applications, December 2005, [hereafter the DESA Report] available at http://www.un.org/esa/forests/pdf/publications/tests1205.pdf.

3 Technology transfer has, for many decades, been viewed as an important mechanism for closing the development gap between rich and poor nations and as such has been a theme of the UN Conference on Trade and Development since the 1960's. *See* Salient Issues in Technology Transfer, UNCTAD 1967-1991 available at http://stdev.unctad.org/compendium/themes/general.htm.

4 Technology transfer provisions are present in a number of key environmental treaties, as overviewed in Z.A.Sanusi, 'Technology Transfer under Multilateral Environmental Agreements: Analyzing the Synergies', UNU-IAS, Working Paper No. 134, July 2005, page 8, available at www.ias.unu.edu/binaries2/IASWorkingpaper134.pdf.

5 B. Metz et al eds, *Methodological and Technological Issues in Technology Transfer* (Cambridge: Cambridge University Press, 2002), available at http://www.ipcc.ch/ipccreports/sres/tectran/index.htm; Dept of Economic and Social Affairs (DESA), UN Forum of Forests Secretariat, 'Transfer of Environmentally Sound Technologies for Sustainable Forest Management – Framework and Applications', 2005, page 1, available at http://www.un.org/esa/forests/pdf/publications/tests1205.pdf.

6 S. Anderson, K. Sarma and K. Taddonio, *Technology Transfer for the Ozone Layer: Lessons for Climate Change* 1 (London: Earthscan, 2007).

7 *Id.* at 34-35.

8 Centre for International Environmental Law (CIEL), Climate Change and Technology Transfer: Principles and Procedures for Technology Transfer Mechanisms under the UNFCCC, report on their side event at the UN Framework Convention on Climate Change (UNFCCC) COP, Poznan, Poland (2008), available at http://www.ciel.org/Publications/PoznanReport_5Feb09.pdf.

9 *See* Anderson, Sarma and Taddonio, note 6 above at 296.

10 The Convention on Biological Diversity provides a good example in this respect, in that Article 16.1 requires Parties to transfer technologies to recipient states not only if relevant to conservation of biological diversity, but also the 'sustainable use' of such resources.

> 'The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology, and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties'.

Whilst this article does not make it explicit that technology transfer under the UNFCCC should be a means to such Parties achieving economic and social development as well as the environmental objectives of the convention, as set out in Article 2, it does appear to have been interpreted in that way by a number of parties.[11]

The background landscape to technology transfer in the context of the UNFCCC is therefore highly complex, as a result of, amongst other things, the following factors:

- The acknowledged complexity of the process of technology transfer itself,[12]
- The variable nature of barriers to effective technology transfer between the key industrial sectors involved in climate change, such as energy, transport, waste management and agriculture,[13]
- The added level of variation of the impact of such barriers to technology transfer, even within a single sector, depending on the size of the market within the recipient territory,[14]
- The tensions that may arise when seeking to deliver both environmental and developmental objectives via the single process of technology transfer and the varying priorities of developed and developing economies,[15]
- The diversity of technology needs under the convention to assist developed, developing and least developed nations to mitigate the effects of climate change, adapt to non-mitigated change, and move towards low carbon based economic growth trajectories,[16] and
- The fact that some of those technology needs cannot be met by technologies that are currently on the market.[17]

The Expert Group on Technology Transfer (EGTT), formed under the UNFCCC and reporting to the Subsidiary Bodies for Implementation[18] and Scientific and Technological Advice[19], therefore faced a significant challenge, when charged with the development of a long term strategy for technology transfer under the Convention.[20] The resultant strategy paper for the long term, post-2012, development, deployment, diffusion

11 V.P. Nanda, 'Climate Change and Developing Countries: The International Law Perspective', 16 (2) *ILSA Journal of International and Comparative Law* 539, 551-5 (2010). The Clean Development Mechanism (CDM) of the UNFCCC is a major mechanism of technology transfer under the treaty, and significant initiatives were put in place to ensure that sub-Saharan African countries in particular were able to participate in the developmental benefits of participation in the CDM, despite the environmental benefits delivered by the projects, namely greenhouse gas emission reductions being equivalent regardless of their country of generation.

12 This is exemplified by the Intergovernmental Panel on Climate Change definition of technology transfer as '… a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, NGO's and research/education institutions…. The broad and inclusive term 'transfer' encompasses diffusion of technologies and technology co-operation across and within countries'. *See* IPCC Report, note 5 above at Para 1.2.

13 *See* Metz et al, note 5 above, Chapter 3.

14 P. Beattie, 'The Intellectual Property Law and Economics of Innocent Fraud – The IP and Development Debate', 38/1 *International Review of Intellectual Property and Competition Law* 6, 18-19 (2007).

15 *See* Sullivan, note 1 above.

16 Second Synthesis Report on technology needs identified by Parties not included in Annex I to the Convention 2009, Subsidiary Body for Scientific and Technological Advice, available at http://unfccc.int/resource/docs/2009/sbsta/eng/inf01.pdf.

17 'Strategy paper for the long-term perspective beyond 2012, including sectoral approaches, to facilitate the development, deployment, diffusion and transfer of technologies under the Convention'p7 Footnote 4, available at http://unfccc.int/resource/docs/2009/sb/eng/03.pdf [hereafter the Tech Transfer Strategy].

18 Formed under Article 10 of the UNFCCC.

19 Formed under Article 9 of the UNFCCC.

20 This work was mandated by the Conference of the Parties, by its decision 3/CP.13.

and transfer of technologies under the UNFCCC (hereafter the 'Tech Transfer Strategy'),[21] is a detailed and robust analysis of the activities needed to achieve the necessary degree of technological development and utilisation to deliver the desired greenhouse gas stabilisation levels, and hence limitation of global warming and its impacts. The imperative nature of the success of the Tech Transfer Strategy is well articulated by the IPCC AR4, as follows:

> 'There is a high agreement and much evidence that all stabilisation levels assessed can be achieved by deployment of a portfolio of technologies that are either currently available or expected to be commercialised in coming decades, assuming appropriate and effective strategies are in place for their development, acquisition, deployment and diffusion and addressing related barriers'.[22]

Whilst some may question the wisdom of reliance on technology alone to limit greenhouse gas emissions to the necessary levels, and advocate reliance on other emission reducing measures, such as reducing demand for emissions intensive goods and services[23], there can be little argument with the premise that we require the application of technology to mitigate global warming and its impact on mankind, to the maximum extent achievable by such means.

This article, therefore, recognises the very high quality of the UNFCCC Tech Transfer Strategy produced by the EGTT, but in light of the criticality of 'getting it right', seeks to assess whether the strategy as currently articulated, adequately addresses the complex background factors already stated, the limitations exposed by the operational experience of the Clean Development Mechanism (CDM) to date,[24] and the often stated necessity of a 'needs driven' approach to technology transfer.[25] The aim of this assessment is to identify further issues for consideration by the SBI and the SBSTA as they refine the technology transfer strategy and move towards its implementation, in particular with respect to the operation of the technology transfer organisation proposed to co-ordinate such activity.[26] For the sake of clarity, relevant issues will be assessed under the general categories of tactical and strategic considerations.

2 TACTICAL CONSIDERATIONS

These are issues which arise at the operational level of implementation of the UNFCCC technology transfer strategy.

2.1 Addressing the Complexity of the Technology Transfer Process

The scope of the work by the EGTT is clearly set out in the strategy documentation,[27] from which it is clear that many of the complexities of both the technology transfer process and its application in the context of the objectives of the UNFCCC are within the contemplation of the working group.[28] However, the EGTT makes it explicit at the outset of this section that their consideration in conducting this work is to advance the 'development, demonstration and diffusion' of technologies for the mitigation of and adaptation to, climate change.[29] This structured approach, which

21 *See* Tech Transfer Strategy, note 17 above.

22 *See* IPCC AR4, note 17 above, p. 20.

23 N. Stern, Review on the Economics of Climate Change 2006, Executive Summary, xii available at http://www.hm-treasury.gov.uk/sternreview_summary.htm.

24 The CDM, prescribed by Article 12 of the UNFCCC, provides a flexibility mechanism, whereby countries with obligations to reduce GHG emissions can fund GHG reduction projects in developing countries to earn credits for emissions reductions that can be used to meet their domestic emissions targets.

25 *See* Sullivan, note 1 above at 298-9 and United Nations Framework Convention on Climate Change Second Synthesis Report on Technology Needs Identified by Parties not Included in Annex I to the Convention 6 (2009), available at http://unfccc.int/resource/docs/2009/sbsta/eng/inf01.pdf.

26 *See* Tech Transfer Strategy, note 17 above and UNFCCC, Draft Decision -/CP.16, Outcome of the Work of the Ad Hoc Working Group on Long-term Co-operative Action Under the Convention 17, para. 117 (2010) 117 (hereafter the Cancun Agreement) available at http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_lca.pdf.

27 *See* Tech Transfer Strategy, note 17 above at 4, Section C.

28 *See* Tech Transfer Strategy, note 17 above at 5.

29 *See* Tech Transfer Strategy, note 17 above at 4, point 6(a).

represents only one view of the progressive stages of technological innovation and deployment, is central to the subsequent strategy.[30] It is noteworthy that this wording differs from the IPCC approach, which is cited in the strategy, and refers to 'development, acquisition, deployment and diffusion' of relevant technologies as part of the overall technology transfer process.[31] This difference is highlighted, because as a result, the strategy gives no substantive consideration to an 'acquisition' or 'procurement' element as part of the array of efforts to get the right technologies to the relevant territories as efficiently and cost effectively as possible.

This omission is potentially relevant in addressing the frequently expressed concern of developing states that intellectual property rights (IPRs) protecting environmentally sustainable technologies (ESTs) held by the private sectors of developed countries, represent a barrier to their timely and affordable access to such technologies.[32] A suggested remedy to this perceived barrier is the 'acquisition' of such rights on a buy-out basis.[33] However, access to such rights on a 'bare licence'[34] basis rarely results in a successful transfer of technology.[35] A more comprehensive and private sector-friendly scheme for the acquisition of EST's, is that suggested by Doi,[36] namely the formation of an environmental 'patent commons' to facilitate the purchase of fully costed 'bundles' of rights, technology and know how to provide efficient and effective transfer of technology. This has the potential to motivate the private sector to engage actively in a market level transaction, thereby aligning the interests of both the technology transferor and the recipient country – an important factor in achieving success and sustainability of the transfer.[37]

Taking the acquisition approach a stage further, one might envisage an international organisation procuring the research and development work needed to deliver the specific innovations in common demand by a number of developing countries or small island states. The second synthesis report on technology needs of non-developed states, conducted by the UNFCCC Secretariat, identifies such technologies.[38] If such a procurement approach were undertaken on commercial terms which would result in the ownership or control of,[39] or paid up licence access to,[40] both the technology and the accompanying IPR, a transactional basis already established in a number of public sector areas, then the aforementioned barrier would be overcome. Such an approach may also have the added advantage of delivering technologies which are fit for purpose in the territory for which they were intended, rather than trying to adapt or retrofit technologies intended for Northern hemisphere application.

30 *See* Tech Transfer Strategy, note 17 above at 24-98.

31 *See* quotation in p 6 above, and note that emphasis on the word 'acquisition' was added to highlight the difference between the IPCC and EGTT working definitions of technology transfer.

32 Nitya Nanda and Nidhi Srivastava, 'Clean Technology Transfer and Intellectual Property Rights', 9/3 *Sustainable Development Law & Policy, Spring* 42-46, 68-69 (2009) available at http://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?artsicle=1133&context=sdlp&sei-redir=1#search="Clean+Technology+Transfer+and+Intellectual+Property+Rights.

33 *Id.* at 45.

34 The term 'bare licence' is usually used to describe a situation where the owner or controller of a patented technology grants a licence to use a technology to a third party, but with no associated instruction, documentation, quality control data, consultancy or other transfer of know-how on how to work the invention, optimise its performance or trouble-shoot any problems that arise. Such a licence gives freedom to operate to its recipient, but does not usually represent an effective technology transfer unless the recipient of the licence is already an expert practitioner in the relevant technological field.

35 F. K. Beier, 'Does Compulsory Use of Patents Promote Technology Transfer to Developing Countries?' 8/12 *European Intellectual Property Review* 363 (1986).

36 H. Doi, 'Japan's Green Technology Plan', 1 February 2010, available at http://www.managingip.com/article/2386712/Japans-green-technology-plan.html. The author describes the 'packages' of resources needed for successful technology transfer as opposed to the bare licensing of patents.

37 *See* Sullivan, note 1 above at 296-8.

38 *See* UNCCC, Second Synthesis Report, note 25 above.

39 K. Sullivan, 'Complex Work, Basic Principles', Winter *Biopartnering Today* 9-11 (2006). Intermediary Technology Institutes use public funds to procure development and ownership of new technologies for which there is demonstrable unmet market demand.

40 The Ministry of Defence retains a fully paid up, irrevocable non-exclusive licence with the ability to sub-licence the intellectual property arising from research and development work that it fully funds. See the terms and conditions pertaining to Intellectual Property Rights, page 8 available at http://www.aof.mod.uk/aofcontent/tactical/toolkit/downloads/defcons/pdf/705.pdf.

2.2 Taking Account of Inter-sectoral Variation

The International Panel on Climate Control, on examining ways to enhance technology transfer, articulated a generic barrier to transfer of environmentally sustainable technologies (ESTs) as being the 'existence of externalities in the economy',[41] that is to say that environmental costs are rarely internalised by industry, making environmentally damaging or unsustainable practices a more economically attractive option than their environmentally sustainable counterparts. This effect is more influential in some sectors than others, but a universal approach to reducing the economic advantages of bad environmental practice, and thereby transforming the market for ESTs is viable as a trans-sectoral approach.[42] Measures such as removal of subsidies, for example, or imposition of standards are potential routes to improving the competitiveness of ESTs in general. However, they also note that whilst some market barriers may be common, in that they are 'more or less relevant for all sectors', many are specific for each sector.[43] Similarly, the pathways via which technology transfer occurs and the variety or importance of actors involved in such pathways, also varies from sector to sector.[44] The Conference of Parties of the UNFCCC recognises the importance of sectoral drivers of technology transfer, and by its decision 1/CP.13, it called upon the EGTT, in elaborating its long term technology transfer strategy, '…for the consideration of co-operative sectoral approaches and sector-specific actions'.[45] The EGTT responded to this, with a consideration of a sectoral approach, along with nationally focussed, project-led and key-initiative led approaches, and how each of these may interact with either a centralised, decentralised or hybrid model of a UNFCCC technology transfer organisation.[46]

Whilst credit must be given for the clarity with which the EGTT presented the resultant models, there were, however, two major limitations to the strategy as presented. In the first instance, an analysis of strengths and weaknesses of the various models was rudimentary and did not lay a strong foundation for future options analysis by the State Parties to the UNFCCC. Secondly, there was no recognition of the fact that sectoral differences in implementation, industry structure and the existing landscape of international bodies, could mean that a centralised model may be applicable in some sectors, whilst a decentralised or hybrid model may work more effectively in others. Similarly, throughout the strategy document, proposed plans of activities are addressed at the generic level, with little or no attempt to exemplify how these may vary in importance or impact at the sectoral level.[47] As a consequence, what specific sectoral operating models and infrastructures may look like, or their third party relationships in any given sector were not considered.

2.3 Addressing the Impact of Market Size-induced Variation

As previously mentioned, the debate continues about the degree to which the IPR protection around ESTs may hinder their effective diffusion, particularly in the context of developed to developing country transactions, where the latter may have a weak indigenous regime for the protection of intangible assets.[48] However, an interesting addition to this debate arises from studies such as that by Beattie et al, which demonstrate that where the recipient market size is sufficiently large, then a weak IPR regime becomes less of a barrier to technology transfer, as a result of the impact that market size has on the risk-return ratio to the transferor.[49] Thus, whilst the strategy document advocates the need for 'good IP protection',[50] it fails to recognise that not only

41 *See* IPCC Report, note 5 above, at Section 2.2.1. para. 2.
42 *Id.* at para 3.
43 *See* IPCC Report, note 5 above, Section 3, para 6.
44 *See* Sullivan, note 1 above at 290-5 and IPCC Report, note 5 above, Section 3.
45 *See* Decision -/CP.13, Development and Transfer of Technologies under the Subsidiary Body for Scientific and Technological Advice, UNFCCC, Annex II, Section 3(d) (ii), available at http://unfccc.int/files/meetings/cop_13/application/pdf/cp_tt_sbsta.pdf.
46 *See* Tech Transfer Strategy, note 17 above at 39-49.
47 *See* Tech Transfer Strategy, note 17 above, Sections IV and V.
48 *See* Nanda and Srivastava, note 32 above.
49 *See* Beattie, note 14 above at 18 and P. Nunnenkamp and J. Spatz, Intellectual Property Rights and Foreign Direct Investment: The Role of Industry and Host Country Characteristics (Kiel Working Paper No. 1167, Kiel Institute for World Economics, 29 June 2003), available at http://www.ifw-members.ifw-kiel.de/publications/intellectual-property-rights-and-foreign-direct-investment-the-role-of-industry-and-host-country-characteristics/kap1167.pdf.
50 *See* Tech Transfer Strategy, note 17 above, Section IV, D Table 4, p. 21.

will this issue be of sector-specific importance, but it will also be less critical in some territories than in others.[51] It is not unreasonable to extrapolate that a similar 'market size effect' may operate with respect to other potential barriers to technology transfer, for example, risks associated with weaknesses in national legal institutions of developing states, resulting in elevated contract, property or regulatory risks.[52] Certain categories of risk associated with foreign trade can already be protected against by either private insurance,[53] or government operated schemes,[54] and there seems to be no intrinsic reason why such cover should not be extended to cover such additional categories of risk. Where the size of the potential market opportunity is of sufficient scale that commercial operators begin to consider that the possible rewards of technology transfer may outweigh the risks, the wider availability of insurance to address the risk of deficiencies may be more expeditious in encouraging, and hence expanding the scale of, private sector led transactions, than trying to bring all such territories to an internationally recognised standard of legal or intellectual property practice. Such an approach should possibly be considered when prioritising capacity building activities under the UNFCCC technology transfer. This proposal in no way means to undermine the long term aspiration of global harmonisation of standards of legal and intellectual property protection, but seeks only to offer a route to increasing technology transfer to states with otherwise commercially attractive levels of market potential, pending the longer term adoption of such standards.

2.4 Recognising the Challenges of a 'Database of Everything' Approach

One of the options proposed by the EGTT to enhance the transfer of existing technologies, is to provide comprehensive information on which developing countries may base their assessment of technologies that may meet their needs for mitigation and adaption under the UNFCCC. Specifically, they propose to establish a system:

> 'to enable all developing countries to get reliable data about the technical and economic feasibility of new technologies and their accessibility, with the goal of facilitating technology choices and investment decisions'.[55]

They go on to suggest that the outputs could include, inter alia, 'assessments of technologies that are available and suitable for particular requirements' and 'data on current and projected technology costs, performance characteristics and greenhouse gas and other impacts', and that such information could be derived by conducting an 'annual, unbiased assessment of technologies and best practices and their feasibility'.[56] Whilst such detailed analyses are routinely undertaken by manufacturers within the private sector for the purposes of marketing,[57] or for consumer information purposes,[58] they are usually restricted to either a single specific technology or to a limited class of technologies, such as household goods. In the context of climate change, relevant mitigation or adaptation technologies span the identified key sectors of building, energy supply, industry, transportation, agriculture, forestry, travel, industry and waste management,[59] from which it becomes immediately apparent that the scope of the

51 Some sectors have little reliance on IPR protection, but rather rely on massive infrastructural investment and know how barriers to protect market position. *See* Nanda and Srivastava, note 32 above at 43.

52 These are categories of commercial risk identified as generic barriers to technology transfer within the IPCC Report, *see* note 5 above, Section 1.5, Table TS3.

53 Zurich's Emerging Markets Unit Provides Political Risk Insurance for Hydropower Project, 12th March 2008, available at http://www.allbusiness.com/energy-utilities/utilities-industry-electric-power/7745802-1.html.

54 The Export Credit Guarantee Scheme, run by the UK Government, provides insurance against non-payment by overseas creditors, for further information *see* http://www.ecgd.gov.uk. It is conceivable that developed nation governments could extend such a scheme to cover designated categories of risk associated with the transfer of ESTs to certain developing nations.

55 *See* Tech Transfer Strategy, Note 17 above, Section IV, Subsection D, Table 4, p.21.

56 *Id.*

57 Private sector manufacturers will routinely provide not only technical specifications for their own products, but comparative performance or price data for leading competitive products.

58 Consumer organisations such as 'Which?' in the UK perform comparisons of multiple categories of consumer products, but these are household level purchases, as opposed to potentially large, national infrastructural procurements.

59 *See* IPCC Report, note 17 above, Section 3 and UNFCCC, note 18 above, Article 4(1)(c).

exercise would be of immense proportions. The potential scale of the exercise could be limited if there were a clear policy decision on what constituted 'priority' technologies within each of these sectors, or at least an agreed mechanism to determine which technologies should be included in such a database. However, an appropriate foundation for such decisions is lacking, due to the fact that there is no clear definition within the UNFCCC of what constitutes an 'environmentally sustainable technology', despite this being a key term of the treaty on which technology transfer implementation actions are founded.[60] This deficiency has already led to an unanticipated predominance of quick-fix 'end-of-pipe' technologies in the first wave of CDM projects implemented,[61] and will inevitably add to the difficulty of delineation of content in a technical database.

The complexity of this approach is further exacerbated by the fact that states wishing to implement any given technology will vary in terms of internal skills capacity to utilise, maintain or adapt technology, financial resources to acquire it, infrastructure to which it may need compatibility, state measures that would affect its financial viability, and geography or climate to which it must be applicable. One must ask the question, that even if such an exhaustive exercise is logistically possible on an annual basis, would the cost be prohibitive? An ex ante cost/benefit analysis of such an approach would seem to be prudent in light of the obvious challenges to meaningful implementation.

In the event that the database approach is adopted along the lines proposed, then the stated qualification that it should be 'unbiased' becomes relevant.[62] Given the huge commercial value to the private sector of some energy related projects, for example,[63] it is not inconceivable that those undertaking the technology assessments may come under undue influence from the corporate sector or even government bodies, to provide positive assessments. To maintain confidence in the contents of the database, and therefore any practical utility, there must be both transparency in the methodology of its generation, and safeguards in place to prevent external influence or even corruption in respect of technology assessments. This in turn leads to the issue of potential liability in the event that in adopting a given technology, a state acted in reliance on the information provided in the database, which was either incompetently or fraudulently generated. If the information is to be provided on a 'no liability' basis, and the technology adopter is expected to undertake their own due diligence, to which the database entries are expected to be only an aid, then this factor should be weighed into the ex ante cost-benefit analysis previously recommended.

As suggested above, policy decisions on what constitutes priority 'environmentally sustainable technologies' in each sector, could serve to limit the database construction to a more manageable task, and this issue will be addressed under 'Strategic Issues' below.

2.5 Recognising the Challenges Regarding Transferability of Learning from other Multilateral Environmental Agreements (MEAs)

One of the most successfully implemented MEA's is the Montreal Protocol which the Technology Transfer Strategy document recognises 'has succeeded in orchestrating a coordinated implementation programme in developing countries for the reduction of ozone-depleting substances and processes'.[64] It also rightly recognises that 'the issue of development and transfer of technologies under the Montreal Protocol, however, is not analogous to developing and deploying climate technologies on a large scale, as is required to meet the climate change challenge'.[65] I would suggest that this statement is not entirely correct, and overlooks the fact that within the diverse range of climate change mitigation or adaptation technologies, there will be a category which by nature of their replacing or amending existing products or processes in extant endogenous

60 *See* UNFCCC, note 18 above, Article 4(5), available at http://unfccc.int/essential_background/convention/background/items/1362.php.

61 J. De Sepibus, 'Reforming the Clean Development Mechanism to Accelerate Technology Transfer' 21/4 *Environmental Law and Management* 189, 195 (2009).

62 *See* Tech Transfer Strategy, note 17 above, Section IV, Subsection D, Table 4, p.21.

63 The cost of constructing a geothermal energy plant in Indonesia, commencing in 1991, is estimated at US$200 million *see* http://www.power-technology.com/projects/wayang-windu/.

64 *See* Tech Transfer Strategy, note 17 above, Annex III, point 1, p.63.

65 *Id.,* Section V, point 55, p.25.

industries with minimal technological barriers, may be transferred with a high degree of success via Montreal Protocol-like processes.

In support of this assertion, I would point to a category of projects being progressed under the CDM scheme, which represent effective mitigation technologies, applied to existing plants, which reduce nitrous oxide release as a by-product of adipic acid production, and result in HFC-23 destruction, the latter being a by-product of HFC-22 manufacture (HFC-22 being used in Teflon production and as an environmentally friendly refrigerant).[66] In 2009, only five projects of the 63 registered under the CDM at that time fell into these two categories, but they accounted for almost 82 per cent of the total emission reduction of all of the projects.[67] Identifying ESTs of this kind which could effectively be implemented via established channels and activities, such as those utilised during the implementation of the Montreal Protocol, may be a far more cost effective way of ensuring their application than via the CDM as currently operated. Wara made just such a compelling financial case in respect of one of these technologies - HFC-23 abatement. His findings indicated that strategic manipulation of baselines under the CDM, together with the potent nature of the compound, resulted in the inflation of credit issuance (and hence associated 'cost' associated with carbon credits generated by the programme), with the ensuing result that the direct cost of abatement of the developing world's HFC-23 emissions estimated at $31m per year, will instead likely cost the developed world somewhere between 250-750m Euros by means of the CDM subsidy.[68]

This demonstrates further that a 'one size fits all' approach to technology transfer is not only inapplicable to different sectors, but possibly also inapplicable to different types of technology within a given sector. The transferability of learning from other MEAs is therefore a complex issue, but it is clearly important not to eliminate learning on the basis that it is not globally applicable, as it may be both applicable and effective in respect of the transfer of certain categories of technology. Such an analysis may be facilitated by the adoption of a Categorisation of Technology Transfer, as proposed by Sullivan.[69] The proposal is that transfers be categorised according to the type of technology being transferred, that is, for example, whether it is commoditised, high technology or at the cutting edge of development, and the channel via which the transfer is being made, such as to endogenous industry or via foreign direct investment. This would provide far greater transparency as to the type of technology transfer occurring under any MEA or in any particular sector, and hence give greater clarity as to the extent to which lessons learned are directly transferable.

3 STRATEGIC CONSIDERATIONS

3.1 Strategic Objectives of the UNFCCC – Resolving Tensions Between Equity in Development and the Timely Stabilisation of Climate Change

Article 2 of the UNFCCC is unequivocal in setting out the overriding objective of the treaty as being to achieve 'the stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system', and further that 'such a level should be achieved within a timeframe sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to allow economic development to proceed in a sustainable manner'. Despite this clarity of objective, a secondary principles appear to be operating to undermine the primacy of GHG reduction as a global objective.

The principle of 'Common but Differentiated Responsibilities' enshrined in Article 4 of the UNFCCC places the immediate responsibility for mitigating and adapting to climate change on developed nations, on the basis of their culpability for having generated the

66 M. Wara, 'Measuring the Clean Development Mechanism's Performance and Potential', 55 *UCLA Law Review* 1778, 1779 (2008).

67 *See* Nanda and Srivastava, note 32 above.

68 *See* Wara, note 66 above at 1781, 1788.

69 *See* Sullivan, note 1 above at 290, 295.

historic emissions leading to current warming levels,[70] and their greater economic and technical ability to meet such obligations.[71] Prima facie, this would appear to be both equitable and expedient, but further consideration of the basis of this premise raises doubt as to both the fairness and expediency of this approach. In terms of culpability, the GHG emissions associated with economic development since the times of the industrial revolution have been made by the developed nations, until relatively recent times, in ignorance of the potential effect of such activity on the climate. On this basis, that they should accept liability for the cumulative historic effects of such activity, and the additional mitigation of the effects of increasing GHG emissions by developing countries, who will be making such emissions in the full knowledge of their potentially damaging effects on the climate, does not appear to be so well founded on the principles of equity.

The argument is made that it is only equitable for developing countries to be able to continue unabated carbon fuel based development, to alleviate poverty, in the way that developed nations have already done.[72] The sustainability of this argument requires the examination of the inextricable interplay of expediency and equity. Small scale emissions by developing nations or small island states, that will have a significant impact on poverty but only marginal impact on global warming would clearly win out in the balance of fairness, but if such GHG emissions are at a level which would substantially undermine the global endeavour to reach the objective of climate stabilisation, then expediency should triumph. The reality is that if climate change is not stabilised, then all countries will suffer. It may be instructive to draw an analogy between the ongoing challenge of climate change and the recent global financial crisis, commonly referred to as the 'credit crunch'. The responsibility for the crisis lay in the actions of a limited number of actors, including banks creating innovative yet complex securitised debt derivatives – ostensibly to spread risk but in reality concentrating it in the banking sector,[73] credit rating agencies,[74] and institutional investors driving short termism in their need for high yields.[75] The government regulatory function was also arguably to blame for failing to curb the risks as they latterly became apparent.[76] The parallel with development induced global warming, is that for the majority of the time, the perpetrators were behaving legally and with significant positive outcomes – job creation, wealth creation, high returns to pension funds, which was why they were subject to only 'light touch' regulation by the government.[77] Once the unsustainable nature of their activity became apparent, and the global financial crisis ensued, it fell to the public sector to take measures to secure financial stability.[78] Opting out of the rescue plan was not an option for anyone. The risk of global financial meltdown is so unthinkable, that every sector of society has had to bear the financial consequences of paying for the rescue package, and will probably do so for a generation, even though they had little or no part in the causes of the crisis. No-one is suggesting that such unsustainable financial practices continue for those who failed to make a profit from them before the bubble burst. Expediency won out over

70 *See* UNFCCC, note 18 above, Preamble, para. 3.

71 *Id.,* Article 3.1 available at http://unfccc.int/essential_background/convention/background/items/1355.php.

72 M. J. Bortscheller, 'Equitable but Ineffective: How the Principle of Common but Differentiated Responsibilities Hobbles the Global Fight Against Climate Change' 10/2 *Sustainable Development Law and Policy*, Winter 49, 50 (2010).

73 J. Ford, 'A Greedy Giant out of Control', 152 Prospect, 22 November 2008 and K. Sullivan, 'Environmental Regulation: Lessons from the Credit Crunch', 21/4 *Environmental Law and Management* 195, 199 (2009).

74 T. Bulford, 'Who will Rate the Rating Agencies?', September 2008, available at http://www.fleetstreetinvest.co.uk/economy/international-economies/credit-rating-agencies-credit-crunch-00854.html commented that the credit rating agencies were remunerated by those wishing to gain favourable credit risk ratings for their products. If they rated a product as being high risk, then clients would 'shop around' for agencies giving a more positive view of the risk profile of the product.

75 *See* Ford, note 73 above at 25.

76 R. Tomasic, 'Corporate Rescue, Governance and Risk Taking in Northern Rock: Part 2', 29/11 *Company Lawyer* 330, 335 (2008).

77 B. Rider, 'Where Angels Fear!', Editorial, 29/9 *Company Lawyer* 257 (2008) and J. Brandling-Harris, 'FSA to be Given Power to Veto Exchange Rules Conflicting with UK Regulation', 27/12 *Company Law.* 369 (2006), quoting Ed Balls, then Economic Secretary to the Treasury as saying 'The government's interest in this area is specific and clear: to safeguard the light touch and proportionate regulatory regime that has made London a magnet for international business'.

78 E. Rowley, 'Bank Bail Out Adds £1.5 Trillion to Debt' 2011, available at http://www.creditcrunch.co.uk/forum/topic/8640-bank-bail-out-to-add-l15-trillion-to-debt/.

fairness, because a failure to tackle the crisis would have led to the collapse of the global banking system, which was simply an unthinkable option. The parallel with the climate crisis is stark.

In this context, it is unsustainable that large, economically active developing countries such as China, now the largest GHG emitting country, claim that it would be unfair to deprive them of their right to continue to freely emit GHGs as they develop, on the basis that developed countries have already done so.[79] Bortscheller makes two pertinent points in regard to the fact that the apparent equity of the Principle of Common but Differentiated Responsibilities renders the global effort to stabilise climate change under the UNFCCC ineffective. Firstly, she states that

'emissions from China and other developing nations are growing so fast today that even if all developed countries reduced their emissions to zero, emissions from developing countries will cause global concentrations of GHGs to increase by over eighteen per cent in sixty years. This would be a dramatic increase, as GHG concentrations have increased by thirty-five percent in the last 200 years, and this comparatively gradual shift has set in motion the current climate change crisis'.[80]

She further goes on to note that because this principle is 'chiefly backward-looking, it does not provide any mechanism to adapt to the evolving global reality'.[81] Her proposal is that the UNFCCC be amended to include a third category of nation state, namely those with high-emitting, emerging economies, such as China, India and Indonesia, and that such states should be subject to legally binding GHG emission reduction targets, albeit initially at a lower level of reduction than fully developed states, whilst still continuing to receive developing nation benefits of technology transfer.[82] Whilst China's commitment to voluntary levels of GHG reduction at Cancun is to be applauded,[83] the full inclusion of China and comparable economies amongst the countries subject to binding targets under the UNFCCC is clearly a desirable ambition. I would therefore like to suggest an extension to Bortscheller's proposal, in that those developing states with high-emitting emerging economies which enter this 'third category' of UNFCCC states parties, should receive preferential status, in terms of receipt of technology transfer and the associated financial support. This would achieve the dual aim of bringing key developing nations under the umbrella of binding targets under the treaty and ensuring that technology transfer effort and resources are directed to those nations whose unabated activity present the greatest future threat to climate change stabilisation.

Does this proposal constitute an equitable approach? Probably not, particularly from the perspective of the least developed states. Nanda has reported the significant efforts made by the UNFCCC, UNEP and the UNDP to increase the participation of least developed nations, particularly sub-Saharan African countries, in the CDM under the auspices of the Nairobi framework,[84] so that they are able to receive an equitable share of development be and so such a proposal would certainly challenge existing implementation policy. I therefore return to the tension between a globally equitable approach to supporting sustainable development and expediency in stabilising climate change.

Looking to the UN's own environmental body, UNEP, their 2009 yearbook report concludes that '…. evidence suggests that we may be within a few years of crossing tipping points with potential to disrupt seasonal weather patterns that support the agriculture activities of half the human population..'[85] Given the scale of risk that this possibility presents, it is imperative that a strategic decision is made regarding the balance of equity in terms of development and stabilisation of climate change. Equity is clearly always desirable, but where its operation represents a significant impediment to the achievement of the primary operational objective of the UNFCCC, namely the urgent mitigation of GHG emissions, then expediency must surely prevail.

79 *See* Bortscheller, note 72 above at 50-51.

80 *Id.* at 51.

81 *Id.*

82 *Id.* at 53.

83 B. Pontin, 'Cancun and the New Voluntarism in International Climate Change Law and Policy' (Editorial), 22/6 *Environmental Law and Management* 279 (2011).

84 *See* Nanda, note 11 above at 551, 555 (2010).

85 United Nations Environment Programme Yearbook 2009, New Science and Developments in Our Changing Environment, 28 (2009) available at http://www.unep.org/yearbook/2009.

3.2 Strategic Priorities for Technology Transfer

One of the outcomes of the COP in Cancun in 2010 was the decision by the Ad Hoc Working Group on long-term Co-operative Action under the Convention on a mechanism for the progression of technology development and transfer.[86] The decision sets out a framework for the formation of both a Technology Executive Committee[87] and a Climate Technology Centre and Network[88] and sets out priority areas to be considered by these entities under the Convention.[89] Priority areas include such generic aspirations as the 'Development and diffusion of environmentally sound technologies and know-how in developing country parties'.[90] This activity is critical to the achievement of effective mitigation and adaptation but although simply expressed, it represents a massive endeavour, and therefore requires a strategic view on prioritisation of the activities needed to achieve it. The reality is simple, but harsh – the time, money and human resource needed to achieve this goal are all limited. Over and above the need for the strategic decision on the balance of expenditure of resources between mitigation and adaptation technologies, decisions need to be made as to which recipient countries should be prioritised and which technologies are most important to implement first?

The preceding section of this paper made a case for the prioritisation of transfers of mitigation technologies to a sub-category of developing countries on the basis that it will address both immediate and long term impacts on emission levels from the developing countries most effectively. Whilst this proposal may be lacking in political sensitivity, the logic of the approach is borne out to some degree by the observed nature of the early CDM pipeline of projects. The vast majority of the projects over recent years have operated in just two countries – India and China, with these two countries alone accounting for approximately 75 per cent of the projects in the CDM pipeline at the start of 2010.[91] They are attractive targets for those seeking to implement CDM projects precisely because, amongst other things, the scale of emissions resulting from their growing economic activity, represents a scale of opportunity in terms of achieving significant emissions reduction and associated credits. It is to be hoped that a similar level of pragmatism and expediency will operate within the new technology transfer bodies. Their resources will inevitably be limited, and if there is an unprioritised attempt to be all things to all nations in terms of technology transfer, then their chances of achieving the necessary outcomes in terms of climate stabilisation are poor.

In terms of technology prioritisation, the lack of a definition within the UNFCCC for what actually constitutes an EST makes it difficult to specify key GHG reducing technologies,[92] let alone to prioritise them for implementation purposes. However, once again on the basis of limited time and money, a strong case for such prioritisation exists. The technology needs synthesis report offers an excellent starting point, in particular the collation of regional analysis of technology needs,[93] but further structuring of implementation priorities will still be required. At a very simplistic level, a case for prioritising mitigation technologies offering the lowest marginal abatement costs would seem reasonable, on the basis that it would deliver the greatest reduction of GHG for the available funding.[94] Once again, this proposal has some evidential support from the unforeseen category of abatement projects previously described, where industry identified projects aimed at HFC-23 GHG reductions on the basis that they represented the cheapest way of generating the largest certified reductions.[95] However, despite the underlying logic of this approach in terms of environmental return on investment, in reality, the potential downside is that such technologies may have little or no potential to support development in the recipient countries,[96] or they may not, in some instances be implementable in certain

86 *See* Cancun Agreement, note 26 above, Part IV, Section B, p.16.
87 *Id.*, at 17, para. 117(a).
88 *Id.*, para. 117(b).
89 *Id.,* para. 120.
90 *Id.*, para. 120(b).
91 *See* Clean Development Mechanism projects in the pipeline, available at http://cdmpipeline.org/cdm-projects-region.htm#1.
92 *Id.,* Section 2.4.
93 *See* Second Synthesis Report, note 38 above, Annex IV.
94 *See* Wara, note 66 above at 1801.
95 This arises because HFC-23 is very long lived GHG, and under the rules of the CDM, when HFC-23 is converted to a CO2 abatement equivalent, 1 ton of HFC-23 destroyed is considered equivalent to 11700 tons of CO2 captured and destroyed. *See* Wara, note 65 above at 1782.
96 *See* De Sepibus, note 61 above.

territories due to lack of skills to introduce or maintain them. The counter argument that technology transfers should be country driven, and compatible with the Technology Needs Assessments of that territory,[97] runs the converse risk, that development aspirations rather than immediate abatement capacity steers the selection of technologies required.

An alternative means of prioritisation may be to focus on key sectors, such as sustainable forest conservation and management as highlighted in the Cancun Agreement,[98] or a combination of deforestation prevention and the energy sector, as supported by the report of the World Economic Forum task force on securing low-carbon prosperity,[99] or 'deforestation prevention plus four' – the power, transport, buildings and industry sectors – as advocated by the Climate Group.[100]

If prioritising whole sectors is unpalatable, one may look to other areas of environmental protection for inspiration on a standard for technology selection and prioritisation across sectors. The principle of Best Available Techniques Not Entailing Excessive Cost or 'BATNEEC', for example, may prove a useful starting point. This standard was introduced under the 1984 Air Framework Directive[101] and is now widely used under the simpler banner of 'Best Available Techniques' as applied under applicable regulations to the abatement of pollution discharges.[102] There would need to be a qualification regarding the ability of the recipient state to effectively implement the technology, and the definition of 'best' could prescribe the required balance between GHG reduction potential and capacity to support sustainable economic development. Such an approach could at least provide a mechanistic foundation upon which more strategic decisions on technology prioritisation could be made.

Regardless of the precise basis on which a prioritisation of technology transfer is made, and this article has hopefully provided at least a basis for thought on the many options available, it is imperative that such a strategic level programme of phased implementation is agreed. As inequitable as it may be, the reality is that if the available financial and infrastructural resources are not targeted to get the best technologies to where they can have the greatest and fastest impact on GHG reduction, then the opportunity to limit climate change to an acceptable level may be lost.

The Cancun Agreement however, advocates that the work programme of the Ad Hoc Working Group on long-term Cooperative Action investigates 'the potential links between the Technology Mechanism and the financial mechanism'.[103] This offers possibly the best opportunity to agree a coherent and integrated strategy on the prioritisation of investment in transferring technologies with the greatest potential to meet the most critical mitigation and adaptation needs, in such as way as to maximise the sustainable development potential, but without prejudicing the primary, climate control objective. I do not wish to underestimate both the complexity and political sensitivity of this critical task. It is to be hoped, however, that the combined bodies of the Financial and Technology Mechanisms provide an appropriate forum with the prerequisite expertise to make such a judgement and to defend its validity against the inevitable pressure from those states which will not derive short term benefits from its operation.

3.3 Considering the Role of Private Sector

Treaties such as the UNFCCC are instruments of the will of states, with limited opportunities for the private sector to participate in or contribute to their negotiation.[104] The UNFCCC, like many other MEAs, contains technology transfer provisions which are critical

97 *See* Cancun Agreement, note 26 above, Section IV, B, para. 114.

98 *Id.,* Section II, C.

99 Task Force on Low-Carbon Prosperity (2009), World Economic Forum, Summary of Recommendations, available from http://www.weforum.org/reports/taskforce-low-carbon-prosperity-recommendations?fo=1.

100 The Climate Group, Office of Tony Blair, Breaking the Climate Deadlock: Technology for a Low Carbon Future, Executive Summary, 2009, available at http://www.theclimategroup.org/_assets/files/Technology-for-a-Low-Carbon-Future-Exec-Summ.pdf.

101 This Directive was superseded by the Integrated Pollution Prevention and Control (IPCC) Directive 96/61/EC.

102 The IPCC Directive applies the BAT principle to the media of air, water and soil.

103 *See* Cancun Agreement, note 26 above, Section IV, B, para. 128(d).

104 S. Tully, 'Commercial Contributions to the Climate Change Regime: Who's Regulating Whom'?, 5 *Sustainable Development Law and Policy* 14 (2005).

to the achievement of the overall objectives of the treaty, but the paradox is that the delivery of these obligations rests not with the governments of the states parties, but substantially with the private sector. For example, the UN Sustainable Forest Management Report recognises the public sector role in transferring forest management know-how or technologies, but states that 'transfer in the [forestry] industry sector is largely a private sector activity'.[105] Anderson et al express this point even more strongly as follows: 'The private sector develops, owns and controls the vast majority of technology and technical innovations; consequently it plays the most important role in technology transfers'.[106]

In the context of the UNFCCC, the private sector domination as direct participants in technology transactions, either as stand alone deals or as part of the CDM,[107] raises strategic issues in relation to the operation of the Technology Mechanism and the measures it may undertake to support the wider technology transfer process. In relation to technology transfer provisions in MEAs, states have been historically reluctant to compel their private sectors to fulfil the relevant obligations that the governments have committed to under such treaties.[108] As a result, it is imperative that in conducting their activities, as mandated by the Cancun Agreement,[109] the Technology Mechanism takes cognisance of this fact, and addresses its implications in two ways.

Firstly, creating enabling environments for technology transfer is as applicable to the supply side of the transfer as it is to the demand side. The balance of risk and reward associated with a transaction must be sufficiently favourable for the company controlling a technology to convince its Board or shareholders that it is in the company's best financial interests to go ahead. This fact is recognised in the Tech Transfer Strategy where the issue of incentivisation is addressed,[110] but is less clearly articulated in the much briefer applicable section of the Cancun Agreement.

Secondly, it is incumbent upon them that companies must act in their own best commercial interests, which will not necessarily be aligned with the objectives of the convention. As a result, care must be taken in the construction of financial mechanisms supporting technology transfers, to ensure that they cannot be manipulated by the private sector in ways which will subvert the goals of the treaty. For example, some commentators argue that the CDM as initially structured, provided a perverse commercial incentive to expand potentially polluting industries such as adipic acid production, for the sole purpose of generating emissions reduction credits, thereby undermining the purpose and efficacy of the CDM.[111]

The predominance of the private sector in effecting technology transfer under the UNFCCC begs a further question about the nature of the Technology Mechanism itself, namely whether the functions of this body may be more effectively undertaken, even in part, by the private sector? The argument has already been made that to generate wide scale private sector participation in climate related technology transfer, the enabling environment and funding must be commercially attractive. If this is the case, then the facilitation and management of that process should also, prima facie, be capable of commercial viability. The attractions of putting this activity on a private sector footing has some obvious potential appeal in that it would provide a more appropriate cultural interface for the companies engaging in technology transfer, it would have the potential for financial self-sustainability in the longer term, making a shorter term demand on the international public purse, and it could reasonably be expected to have a more results driven culture.[112]

105 *See* Transfer of ESTs for Sustainable Forest Management, note 2 above at 3.

106 *See* Anderson, Sarma and Taddonio, note 6 above at 12.

107 Recognising that current CDM projects will extend into the operating period of the Technology Mechanism, even if the CDM is not continued beyond 2012.

108 *See* Sullivan, note 1 above at 296.

109 *See* Cancun Agreement, note 26 above, Section IV, B, para.118-123.

110 *See* Technology Transfer Strategy, note 17 above, Section V, C, para. 63.

111 *See* Wara, note 66 above at 1783.

112 The Consultative Group on International Agricultural Research, a public body co-ordinating a large number of research institutions, announced a policy change to an operational approach known as 'managing for results', which is recognised as a business concept that it believes it can adopt to improve its delivery of development objectives. See "A Strategy and Results Framework for the CGIAR" at http://www.cgiar.org/changemanagement/pdf/cgiar_srf_june7_2010.pdf.

4 CONCLUDING REMARKS

The EGTT are to be commended on producing a clear and robust Tech Transfer Strategy for the UNFCCC. However, whilst the complexity of the topic makes it difficult to be exhaustive in any such document, the critical role of technology transfer in stabilising climate change at a sub-critical level, means that it is imperative that all relevant parameters be considered. It is in this spirit that I have suggested a number of additional tactical and strategic issues for consideration as the Technology Mechanism prescribed by the Cancun Agreement moves towards implementation of the Tech Transfer Strategy.

I would advocate a more detailed consideration of the merits of a procurement model of technology and IPR acquisition for developing states, along the lines suggested by Doi for more commercially advanced technologies,[113] or even at an earlier stage of development, and an assessment of the benefits offered by overcoming the hurdles of private sector IPR ownership and bringing the required associated know-how to the implementation process. This activity, as well as other aspects of technology transfer facilitation, including the operating model of the Technology Mechanism, need to be examined on a sector-by-sector basis, as successful models of technology transfer are not necessarily transferable to different technologies, let alone to different industrial sectors. This is of particular relevance when looking at the potential for transferability of learning from technology transfer experiences under other MEAs.

Over and above inter-sectoral variation, there needs to be a finer level of understanding applied to the impact of recipient country market size and growth potential in assessing the importance of various barriers to technology transfer, as well as commercial pragmatism in overcoming barriers which become less of a hurdle when the market opportunity is more sizeable. Greater examination of the potential to insure against risks, rather than waiting until the risks can be reduced would seem to be expedient.

The line between the tactical and the strategic starts of blur, with respect to the issue of prioritisation. In respect to supporting technology acquisition choices by developing countries, a 'database of everything' approach clearly has feasibility issues. Even a more generic supportive role for the Technology Executive in technology selection would require an immense bank of data in the absence of strategic prioritisation of territories, technologies or a combination of both, to be supported in a first phase of implementation.

Both the urgency of the need to control GHG emissions, and the fact that financial and human resource to be applied to the objective are limited, perhaps even more so by the current economic downturn, argue strongly for such prioritisation and for greater clarity about the balance that technology transfer under the UNFCCC should strike between supporting sustainable development and the most efficient achievement of the primary environmental objective.

Finally, the centrality of the private sector in transferring technology to address climate change or its impact must be recognised, and care taken both to actuate and incentivise their participation, but also to ensure that the potential for divergence of interests between the international community and individual companies acting within the Technology of Financial Mechanisms is recognised and appropriately guarded against. This may be achieved more effectively if some part of the Technology Mechanism itself were placed on a commercial footing. Whilst such an interface would undoubtedly be logistically and politically challenging, the potential benefits are possibly such as to merit its further investigation.

113 *See* Doi, note 36 above.

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