CLIMATE CHANGE, TECHNOLOGY TRANSFER, AND INTELLECTUAL PROPERTY: A 'MODEST PROPOSAL' FOR AN IP ENFORCEMENT MORATORIUM

DALINDYEBO BAFANA SHABALALA*

INTRODUCTION

The Earth continues to experience record-breaking temperatures caused by increased atmospheric concentrations of carbon dioxide ("CO2") and other greenhouse gases ("GHGs").[1] The impacts of this unprecedented warming include increased floods and drought, rising sea levels, the spread of deadly diseases such as malaria and dengue fever, and increasing numbers of violent storms and weather-related catastrophes.[2] Climate change presents a challenge to almost all areas of human economic activity because of our reliance on GHG-emitting fossil fuels and fossil fuel products.

The current global emissions trajectory has a high probability of 4.5 degrees of warming above pre-industrial levels with catastrophic effects.[3] Factoring in planned actions under the Paris Agreement[4] still leaves a high probability of reaching 2.7 degrees of increased warmth.[5] To keep warming well below 2 degrees and maintain the possibility of

* Assistant Professor of Law, University of Dayton, School of Law.

[1] U.N. ENV'T PROGRAMME AND WORLD METEOROLOGICAL ORGANIZATION, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014 SYNTHESIS REPORT 40 (R.K. Pachauri et al. eds.) (2014) [hereinafter IPCC].

[2] *Id.* at 50–53.

[3] *See* CLIMATE ACTION TRACKER, http://climateactiontracker.org/ (last visited February 6, 2020) (Analyzing and tracking government climate action measured against the Paris Agreement).

[4] The Paris Agreement was adopted as a Decision of the UNFCCC parties rather than a protocol or a treaty so as to avoid the domestic ratification obligations of some countries regarding formal international agreements. *See* United Nations Framework Convention on Climate Change Dec. 1/CP.21, U.N. Doc. FCCC/CP/2015/10/Add.1 (January 29, 2016) (adopting Paris Agreement).

[5] *See* U.N ENV'T PROGRAMME, THE EMISSIONS GAP REPORT 2016 (2016) (analyzing outcomes of planned actions under Paris Agreement).

stabilizing at the safe level of 1.5 degrees above pre-industrial levels, it may be necessary for global emissions to peak by 2020.[6] Projections suggest that, based on past emissions, the Earth is already locked into a baseline increase in temperature that makes some impacts unavoidable by 2100.[7] None of the associated costs of climate change between now and 2050 are likely to be avoided because this is lock-in.[8]

For climate change adaptation, the first thing to note are these locked-in impacts. Necessary adaption entails increasing adaptive capacity[9] in the near term, and thereafter focusing on specific systems and tools to address region-specific climate impacts. The Intergovernmental Panel on Climate Change ("IPCC")[10] analysis of timing of impacts and mitigation-peaking dates suggests that much of the initial work for addressing vulnerability[11] and resilience,[12] even under the most optimistic scenarios, will have to be carried out almost immediately in order to be prepared to respond to impacts caused by the inevitable 1-degree temperature increase that will occur by 2050.[13]

The urgency of mitigation technology development and diffusion is determined by when, generally at some point before 2025, the country will need to peak emissions. This will necessitate major technological and sector shifts including in vehicular fuel efficiency,

---

[6] IPCC, *supra* note 1, at 82.

[7] *Id.* at 78-79.

[8] *Id.*

[9] Adaptive capacity is the potential or capability of a system to adapt to climatic stimuli or their effects or impacts. *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2001: IMPACTS, ADAPTATION AND VULNERABILITY. CONTRIBUTION OF WORKING GROUP II TO THE THIRD ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 894 (2001).

[10] The Intergovernmental Panel on Climate Change (IPCC) is the international body for assessing the science related to climate change. *See About*, IPCC, https://www.ipcc.ch/about/.

[11] Vulnerability is the degree to which a system is susceptible to injury, damage, or harm (one part—the problematic or detrimental part—of sensitivity). *See* CLIMATE CHANGE 2001, *supra* note 9.

[12] *Id.* at 894.

[13] INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: SYNTHESIS REPORT. CONTRIBUTION OF WORKING GROUPS I, II AND III TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 51, 60 (2014).

end-use electric efficiency, coal production efficiency, carbon capture, and storage, renewable energy, and nuclear energy.[14] A cursory glance at the technologies encompassed by these sectors yield an unwieldy and large list of specific technologies.[15] For example, end-use electric efficiency encompasses the entirety of the domestic and industrial appliance sector encompassed by a well-off middle class home in the globalized economy. Most such appliances, whether televisions, washing machines or refrigerators, have motors, lighting and sensors which could be made more efficient, expend heat which can be reduced or captured, run on software which can be made smarter and faster; and batteries whose efficiency and storage capacity needs to be improved by orders of magnitude.[16] The scope of necessary action implies that reform of no single technology or technological subset will be sufficient; all the identified technology sectors will require adaptation to achieve the goals.[17] These technologies are integral to the reduction of poverty and the expansion of the middle-class and developed countries must allow access to all of that technology at low or free cost if climate change mitigation is to occur at any reasonable pace, scale and cost.

The adaptation challenge, from sea-level rise to changes in the hydrological cycle, is quite clear.[18] This implies increased fragility and volatility in ecosystems and habitat niches[19] affecting food production, water access and related health problems as well as increased disaster recovery costs from climate-related extreme weather events.[20] The majority of people in developing countries live in climate-vulnerable environments and ecosystems.[21] Technology and innovative capacity

---

[14] INT'L ENERGY AGENCY, ENERGY TECHNOLOGY PERSPECTIVES 2010: SCENARIOS AND STRATEGIES TO 2050 76 (2010).

[15] For a full list of technologies, see Dalindyebo Shabalala, CLIMATE CHANGE, TECHNOLOGY TRANSFER AND INTELLECTUAL PROPERTY: OPTIONS FOR ACTION AT THE UNFCCC 59-70 (2014).

[16] *See id*.

[17] INT'L ENERGY AGENCY, ENERGY TECHNOLOGY PERSPECTIVES 2012: PATHWAYS TO A CLEAN ENERGY SYSTEM 39 (2012).

[18] CLIMATE CHANGE 2014, *supra* note 14, at 51.

[19] *Id.* at 54.

[20] *Id.* at 51-53.

[21] *See* U.N. ENV'T. PROGRAMME (UNEP), TOWARDS A GREEN ECONOMY: PATHWAYS TO SUSTAINABLE DEVELOPMENT AND POVERTY ERADICATION 19 (2011). *See also* AHSAN UDDIN AHMED, ET AL., BRIDGE OVER TROUBLED WATERS: LINKING CLIMATE CHANGE AND DEVELOPMENT 1 (Shardul Agrawala ed., 2005).

are clearly co-extensive with adaptive capacity.[22] From an aggregate development approach, one of the most important interventions that can be made in these developing countries to reduce vulnerability, while laying the groundwork for increasing adaptive capacity, are ones that increase economic growth as quickly as possible in as sustainable and equitable a manner as possible.[23] Adaptation presents a complex challenge involving a network of existing capacity and vulnerability, with impacts and adaptations to impacts taking place within a network of co-factors such as poverty, population shifts and migration patterns, land use and land use changes.[24] The Stern report suggested that the key areas are: economic wealth generally; infrastructure and technology; information, knowledge and skills. [25] These are precisely those areas that can be best addressed by ensuring technology transfer. Developing countries are also significantly dependent (up to 64% participation in South Asia and sub-Saharan Africa) on agriculture for economic growth and thus more sensitive to climate variability.[26] A stable and sustainably growing framework for agricultural production and distribution is a necessity for reducing vulnerability and enabling adaptive capacity in developing countries.[27] Health interventions to deal with chronic diseases (both communicable and non-communicable) in developing countries are also a necessity to reduce vulnerability and enable adaptive capacity.[28] This implicates both general health infrastructure, and health management systems, but also as well as the opportunity costs associated with prices of medical products, devices and services. From this view, the adaptation

---

See also G. McGranahan et al., *The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones*, 19 ENVIRONMENT AND URBANIZATION 17, 17 (2007).

[22] INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007 –

IMPACTS, ADAPTATION AND VULNERABILITY 727 (2007).

[23] WORLD BANK, WORLD DEVELOPMENT REPORT 2010: DEVELOPMENT AND CLIMATE CHANGE 12 (2010). *See also* UNEP, *supra* note 21, at 39. *See also* NICHOLAS STERN, THE ECONOMICS OF CLIMATE CHANGE: THE STERN REVIEW 12 (Nicholas Stern ed., 2007). *See* PAUL BAER, ET AL., THE RIGHT TO DEVELOPMENT IN A CLIMATE CONSTRAINED WORLD 26 (Barbara Unmubig et al. eds., 2008).

[24] AHMED ET AL., *supra* note 21, at 4.

[25] STERN, *supra* note 23, at 94.

[26] UNEP, *supra* note 21, at 38. *See also* STERN, *supra* note 23, at 95.

[27] UNEP, *supra* note 21, at 38-40.

[28] *Id.* at 208-09.

challenge is essentially a development challenge[29] and thus covers all sectors of technology relevant to ensuring rapid, non-fossil fuel dependent economic development. Again, the scope of technologies implied is economy wide.

In the face of these challenges, what should the policy response be? Putting political realities aside, what workable solutions are available to address the basic problem of technology development and diffusion? This article argues that we should focus on two things: favoring business and licensing models that take high volume/low cost approaches to technology by removing regulatory barriers and transaction costs to engaging in large scale licensing and diffusion of technology; and acknowledging the urgency of the climate deadline by providing a temporary moratorium within the international intellectual property enforcement framework to allow for some breathing space. The next section discusses some of the basic, necessary elements that any such proposed solutions should have.

I. NECESSARY ELEMENTS OF ANY PROPOSED SOLUTION

Purely fiscal transfers are unlikely to address the problem of climate change and technology transfer. Large scale monetary transfers to developing countries are out of the question both as a political and a practical matter. There are basic problems of governance endemic in many developing countries, related to a lack of capacity, rampant corruption and insufficient regulatory oversight.[30] While many of these problems may be susceptible to policy changes in the short term, others, such as lack of governance capacity, require long term solutions. This suggests that urgent near-term action should focus on simple interventions that provide clear rules and signals to private sector actors to carry out their activities instead of expecting developing country governments to develop sophisticated enabling environments or developed country actors to raise taxes and engage in direct financial transfers. This is especially crucial for opening up and increasing access to existing technologies in the 2025 timeframe.[31]

---

[29] *See* STERN, *supra* note 23, at 430. *See also* AHMED ET AL., *supra* note 21, at 1.

[30] STERN, *supra* note 23, at 438.

[31] LENNY BERNSTEIN ET AL., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 2007: SYNTHESIS REPORT 67 (2007).

The scale of financial support necessary to enable developing countries to address climate change is daunting and contributes to the failure of the basic bargain in climate negotiations. Under the basic bargain at the United Nations Framework Convention on Climate Change, developed countries are supposed to provide financial support so that developing countries can choose to take an alternative non-GHG emitting development path. The extent of public funding available, however, may not be anything close to what is actually required to address the full scope of action needed to develop, deploy and diffuse technologies. Looking at just one conservative mitigation scenario, the IEA projected that between 2010 and 2020, over USD 2.3 trillion annually would need to be invested, the majority of which would be private flows.[32] The share of developing countries is USD 1.3 trillion annually, of which China represented USD 500 billion. In contrast to the scale of the projected need, total investment flows in 2010 and 2011 were USD 247 billion and 260 billion, respectively.

Within the climate negotiations, developed countries in Copenhagen at COP 15 committed to provide USD 200 billion annually by 2020 in investment (from a wide variety of sources, including public funds).[33] A significant portion was meant to flow through the Green Climate Fund ("GCF"), which implies direct cash or other instruments under the control of the fund, rather than financial instruments operating outside of the remit of the GCF. The IEA estimated that climate mitigation related flows from developed to developing countries amounted to somewhere between USD 70 and USD 119 billion a year.[34] The majority of this was private flows (USD 37 – 72 billion), and the public funds (through bilateral and multilateral mechanisms) amounted to a potential maximum of USD 43 billion. Olbrisch et al. reviewed the range of estimates for incremental investment in the literature noting significant variations for 2030 projections for annual financing needs in developing countries: from

---

[32] *See* KEVIN BREEN, ET AL., ENERGY TECHNOLOGY PERSPECTIVES 2012: PATHWAYS TO A CLEAN ENERGY SYSTEM 139 tbl. 4.3 (Marilyn Smith et al. eds., IEA 2012).

[33] *See* Britt Childs Staley et al., Tick Tech Tick Tech: Coming to Agreement on Technology in the Countdown to Copenhagen 13 (World Resources Institute Working Paper), Washington DC, June 2009.

[34] INT'L ENERGY AGENCY, ENERGY TECHNOLOGY PERSPECTIVES 2012: PATHWAYS TO A CLEAN ENERGY SYSTEM 152 (IEA/OECD 2012).

USD 175 billion to USD 565 billion per annum.[35] They do not provide estimates of the portion that would be from private flows, but their estimate of current funding suggests that private flows are the largest proportion of funding amounting to at least USD 65 billion per year.

In terms of direct support, it is unlikely that existing and future public funds will suffice to meet the need in developing countries,[36] and, as the IEA notes, they will have to also mobilize a significant amount of finance domestically.[37] This is all before funding for adaptation is taken into account, which under the GCF should take up half of the planned disbursements. The IEA and others have had difficulty finding an argument that investment flows for climate will differ in any significant way from existing patterns of investment into developing countries.[38] The prescriptions for providing a proper enabling environment replicate the same tried and true axioms of: 1) reducing regulatory uncertainty; 2) enabling policies for competitive, open markets and greening infrastructure investment; 3) implementing market-based and regulatory policies to "put a price on carbon" and correct for environmental externalities; 4) incentivizing for innovation and investment; and 5) adopting financial policies and instruments to attract private sector participation. Other than a broader faith that these interventions will work, there is little analysis of how these recommendations will shift the risk and investment calculus in economies that are not already attractive investment destinations (for primarily foreign capital) as a broader matter.

While attractive regulatory and market environments are clearly necessary conditions, they may not be sufficient to mobilize foreign investment at the scale required in markets that simply do not present a sufficient rate of return and may present, even at their best, more risk than the potential worth of returns. The policy prescription

---

[35] *See* Susanne Olbrisch et al., *Estimates of incremental investment for and cost of mitigation measures in developing countries*, 11 CLIMATE POLICY 970, 974 (2011).

[36] *See* Alex Bowen, *Raising Climate Finance to Support Developing Country Action: Some Economic Considerations*, 11 CLIMATE POLICY 1020, 1033 (2011).

[37] INTERNATIONAL ENERGY AGENCY, ENERGY TECHNOLOGY PERSPECTIVES 2012: PATHWAYS TO A CLEAN ENERGY SYSTEM 152 (2012).

[38] *See* Norbert Nziramasanga, *Implementing NAMAs Under a New Climate Agreement that Supports Development in Southern Africa, in* ELEMENTS OF A NEW CLIMATE AGREEMENT BY 2015 93 (Karen A. Olsen et al. eds., 2013).

here essentially tells developing countries to transform their economies as a necessary condition for being able to transform their economies, without any of the necessary financial and technological support for doing so. These policy transformations are meant to substitute for direct financial support, and, hopefully, make it possible for private sector money to flow. How that presents a different, new or additional solution to the broader development challenge is not explained. In order to develop, developing countries must therefore 'develop' and where they do so, this will obviate the need for significant public money and support.

In the end, the vast majority of financing and transfer will have to come from private sector action. Developed countries hope that the financial shortfall will somehow be made up by private sector actors, as long as markets are created, and regulatory incentives are put in place. However, where there is insufficient public finance to provide support to developing country actors and firms in accessing technology hardware and knowledge, a reliance on private finance leaves the additional costs of accessing knowledge in the hands of developing country firms and institutions. The only way therefore for developing countries to respond is to take regulatory action to restructure the market in knowledge and knowledge products so that the costs of action are borne by developed country actors, which leads us back to interventions aimed at regulating prices of products, and regulations aimed at regulating prices for accessing knowledge. This is why intellectual property intervention continues to be a major structural issue at the core of the climate change negotiations: there is not enough money, even where there is political will, to provide all the financial support that developing countries need to take action to address climate change mitigation and action.

The recommendation for how developing countries need to transform their economies to become more open to investment, have better more predictable legal structures, be more open to trade, provide more room for the private sector, reflects the long running and ongoing debate on the ways in which developing countries should best ensure their broader economic development.[39] To a significant extent, these are exactly the same policy prescriptions that have been given to developing countries by multilateral financing and development

[39] *See generally* ETHAN HELPMAN, THE MYSTERY OF ECONOMIC GROWTH (2004).

institutions for much of the past 3 three decades. It is an ongoing debate about which economic model is best suited to ensure development and reflects the broader development challenge for developing countries. In that sense, it is only realistic to realize that climate change is indeed congruent with the broader development challenge. The paucity of direct public funding for climate change essentially throws developing countries back into the broader set of policy choices regarding how best to ensure economic development more broadly. Therefore we need a regulatory approach that creates markets and reduces transaction costs and uncertainty while NOT relying on developing countries themselves to do so. More importantly, we need to consider radical action that removes the basic friction that intellectual property places on the dissemination and distribution of technological products and know-how.

Most major emerging economies provide intellectual property protection that, for the moment, is sufficiently compliant with the Agreement on Trade-Related Aspects of Intellectual Property Rights ("TRIPS") and, in comparison to the pre-TRIPS era, provides a stable and relatively predictable environment for economic transactions to take place in the context of a broader enabling environment for investment. There remain concerns about sovereign risks, both policy and macro-economic,[40] related to sudden shifts in government policy or the extent to which government mandates require non-voluntary sharing of technologies, especially in China, but that risk appears to be largely mitigated by the broader attractiveness of doing business in China. Nevertheless, such risk perceptions may limit the quality and volume of technologies licensed or made available to enterprises in these countries. There is some evidence that what is made available under many licensing or joint venture agreements in these countries is not best available technology.[41]

India and China may also play a role as developers and adapters of technologies that may be better suited to demands in other developing countries. For example, in the area of modern heat access (e.g. switching from low efficiency biomass, to efficient gas and solar

---

[40] INT'L ENERGY AGENCY, ENERGY TECHNOLOGY PERSPECTIVES 2010: SCENARIOS AND STRATEGIES TO 2050 585 (2010).

[41] Kamal Saggis, *Trade, Foreign Direct Investment, and International Technology Transfer: A Survey*, WORLD BANK POLICY RESEARCH WORKING PAPER SERIES 1, 40 (2000).

cookers) rural and peri-urban populations in India and China provide ideal testing grounds for development and dissemination of such technologies and Indian and Chinese companies can themselves sell and transfer these technologies to other developing countries.[42] Private sector actors in OECD countries may not be interested in developing such products as there may be no significant domestic demand in their own countries, and technological solutions they propose may not be suited for deployment in difficult economic and institutional environments of many developing countries. In the electricity sector, another example is the growth in overall exports (13% – 45% from 2003 – 2009) from China's Shanghai Power Corporation of SC technologies for coal-powered electricity generation primarily due to exports to developing countries.[43]

India and China may be the clearest evidence of significant patenting of clean technologies.[44] However, they are also the developing countries that are most likely to pay reasonable market rates for licensing of technologies, which has been the case for a significant number of successful ventures, such as Goldwind and Suzlon.[45] The problem that these countries face involve accessing licenses for existing technologies from potential competitors in industrialized countries. They face issues, such as refusals to license, paying above market rates for technology or restrictive licensing practices, especially for best available technologies which present the cutting edge and may be a competitive advantage in industrialized country markets. They also urgently want to participate in new and innovative research on clean technology and generate leading companies that are IP holders themselves.

India and China can address these issues by using existing tools in the international IP system. Compulsory licensing, or the threat of

---

[42] DAVID ELZINGA, INTERNATIONAL ENERGY AGENCY ET. AL., ADVANTAGE ENERGY: EMERGING ECONOMIES, DEVELOPING COUNTRIES AND THE PRIVATE-PUBLIC SECTOR INTERFACE 25-26 (Int'l Energy Agency 2011).

[45] *Id.* at 38 (citing Tan & Gang, *An Emerging Revolution: Clean Technology Research, Development and Innovation in China*, World Resources Institute (WRI) Working Paper (2009)).

[44] Copenhagen Economics and The IPR Company, *Are IPR a Barrier to the Transfer of Climate Change Technology?*, at 18 (Jan. 19, 2009), available at http://trade.ec.europa.eu/doclib/docs/2009/february/tradoc_142371.pdf.

[45] INT'L ENERGY AGENCY, *supra* note 40, at 575.

it, may be available to address anti-competitive practices, such as refusals to license, unreasonable pricing or restrictive licenses. Additionally, easier and more transparent licensing platforms and markets may assist them. In terms of participating in new technologies, these countries would benefit from more joint research and development projects, both co-funded and multilaterally funded. Suggestions for: subsidies; joint R&D; insurance and loan guarantees for development, diffusion and transfer of climate technology; infrastructure for information sharing and licensing platforms, global patent pools, access to publicly funded research; as well as full use of TRIPS flexibilities reflect these concerns.[46] In a sense, it is the creation of a transparent and equal playing field for licensing of technologies that is their most urgent need as they generally have sufficient domestic production capacity. However, emerging economies are also the most likely to take on quantified emissions reductions obligations under the Paris Agreement framework and thus have a fundamental need for access to existing technologies to help them make the transition out of technologies in which they have significant sunk costs. This means that they are concerned with technologies that make existing energy-use less GHG intensive, such as 'clean-coal' technologies, and carbon capture and sequestration. In this sense, the issues they face bear some similarity to the needs of smaller developing countries, in terms of access to existing technologies. The least developed countries ("LDCs") and other developing countries face a calculus that has only some parallels to the access to medicines issue: there is an urgent need for access to existing products at low prices that will maintain and increase energy access. In general, these countries have little capacity for production and innovation of complex clean technology, and they do not have the funds to purchase goods in quantities necessary. They are also the ones in the least need of mitigation technologies, to the extent that they have no GHG emission reduction obligations, and they have comparatively low levels of fossil fuel energy consumption. Their mitigation

[46] *See, e.g.*, U.N. Framework Convention on Climate Change, Ad Hoc Working Group on Long-Term Coop. Action Under the Convention, Bonn, Ger., Mar. 29-Apr. 8, 2009, *China's Views on the Fulfillment of the Bali Action Plan and the Components of the Agreed Outcome to be Adopted by the Conference of the Parties at its 15th Session*, at 5 (Feb. 6, 2009), available at http://unfccc.int/files/kyoto_protocol/application/pdf/china060209.pdf.

technology need is largely related to access to existing technology products, and the adaptation of low-level technologies to local conditions.

The evidence suggests that most mitigation technologies are not patented or otherwise IP protected in these countries.[47] However, the countries from which LDCs and other developing countries tend to purchase low cost technology products, especially China and India, may be increasingly unable to provide these if they cannot access licenses for technologies that allow them to export. China, Brazil and India tend to be in the best position to provide low cost mitigation technologies to other developing countries because their companies are better placed and more willing to establish production centers and distribution systems in economies that are less interesting, or too risky for companies from industrialized countries. LDCs and other developing countries generally have too little purchasing power for most companies in industrialized economies to establish production centers or distribution networks. The emerging economies can fill this gap but only if they can become production and distribution centers themselves, and that will occur through access to licensing. Thus, LDCs and other developing countries have an interest in seeing further research and development ("R&D") and access to patent licensing for emerging economies, but only to the extent that the technologies licensed are relevant to their needs. South-South flows of renewable energy technology are at a very low level, the lowest among the four south-north vectors of flows.[48] However, these have been increasing since 2002 and are likely to grow as more developing countries put in place policies that create demand for such technologies. Any proposed solution to address technology transfer must consider a way for the least developed and developing countries to be able to lower tariffs for selected technological products coming from other developing countries without having to comply with MFN obligations under the WTO.

---

[49] Copenhagen Economics and the IPR Company, *supra* note 46; *see also* John Barton, *Intellectual Property and Access to Clean Energy Technologies in Developing Countries: An Analysis of Solar Photovoltaic, Biofuel and Wind Technologies* (ICTSD Trade and Sustainable Energy Series, Issue Paper No. 2, Dec. 2007).

[48] INT'L ENERGY AGENCY, *supra* note 40, at 573.

This need for emerging economies to provide technologies cheaply to other developing countries is even clearer when it comes to technologies for adaptation. LDCs and most developing countries are probably the most vulnerable to extreme weather events (droughts and floods) and shifts in disease bands that the IPCC Fourth Assessment report has found to be some of the near term effects of climate change.[49] This resonates in particular areas, such as agriculture and health. To become more climate-resilient, improving health systems and access to appropriate diagnostic and treatment options for diseases, such as malaria and dengue fever will be crucial. Dealing with droughts and floods will require appropriately engineered or hybridized plants and plant varieties. Health and agriculture are both sectors that are heavily reliant on intellectual property as a way of organizing investment, production and distribution. These technologies are more likely to be IP protected not only in emerging economies but also in a significant number of LDCs and developing countries. This would make it more difficult to export products from major emerging economies to LDCs and developing countries because licenses are likely available only for domestic production and distribution. Where these technologies are patented in LDCs and developing countries, importing them becomes even more difficult. Thus, a significant portion of LDCs and developing countries realize that the best way to ensure access to technologies for adaptation in areas, such as health and agriculture, is to reduce the number of patents protected technologies in all developing countries, including emerging economies.

Any proposed solutions must address this issue of generating markets in developing countries, creating capacity and interest in LDCs specifically, as well as enabling major emerging economies to export technological products to developing countries, if not to major developed economies. This may require some regulatory mechanisms for segmenting international technology markets and increasing the participation of private sector actors in major developing economies, such as India and China.

Solutions must also address the issue of the scale and scope of existing market measures and the need for enabling industrial policy

---

[49] INT'L GOV. PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 2007: SYNTHESIS REPORT 48 (2008), available at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf.

measures related to intellectual property. This requires the UNFCCC or some other relevant body to take a significant role in facilitating transactions, reducing transaction costs and expanding markets. Such policy interventions should be addressed at decreasing transaction costs of developing country buyers in accessing the international knowledge market, as well as international rightsholders when making their knowledge and technologies available to developing country actors, especially in emerging economies. By reducing the cost of acquiring technological knowledge or absorbing existing technologies, these interventions will, in turn, increase capacity and incentives for domestic innovation,[50] and encourage and enabling trade in products and knowledge between emerging economies and other developing countries, especially LDCs.

Finally, all of the above suggests that the near-term emergency focuses primarily on rapidly increasing the distribution of existing and near-commerce ready technologies. In the traditional intellectual property sense, we need to focus on static efficiency i.e. distribution of existing technology rather than dynamic efficiency, the generation of new technologies. Any proposed solution to the intellectual property issue needs to address both but we may have to delink dynamic efficiency from static efficiency in the near term, but especially in the 2025-timeframe. From a global welfare perspective, deployment and diffusion of technology to developing countries may also be the cheapest and most effective way of ensuring GHG reductions, especially in the 2015 – 2050 period. Some forecasting models conclude that the learning process and speed of adoption and deployment would be faster and cheaper in developing countries than in OECD countries, suggesting that developing countries should be preferred targets for investments in clean energy deployment and diffusion.[51] However, the attractiveness and success of such deployments is complicated by the role of institutional frameworks that may affect the certainty of investments such as the existence, enforcement and predictability of intellectual property protection.[52]

---

[50] *See* Bernard M. Hoekman et al., *Transfer of Technology to Developing Countries: Unilateral and Multilateral Policy Options* 16 (World Bank Policy Research, Working Paper No. 3332, 2004).

[51] NICOLAS LEFEVRE, DEPLOYING CLIMATE-FRIENDLY TECHNOLOGIES THROUGH COLLABORATION WITH DEVELOPING COUNTRIES 24 (2005). This is especially true for solar PV. *Id.* at 25.

[52] *Id.* at 32.

Thus any approach that seeks to encourage such deployment using market based incentives will have to find a way to address such potential risk premiums in technology deployment while providing incentives and mechanisms for industrialized country private actors to deploy their technologies in developing countries.

There remains some debate about whether the technology mix needed to address the scale of the climate challenge can be met with already existing, deployed and demonstration-ready technologies or whether new breakthrough technologies will be required. This is a key issue as it will determine the extent to which the balance of resources is directed toward R&D versus demonstration, deployment and diffusion. However, the IPCC Third Assessment Report (2001) argued that existing and demonstration-ready technology would be sufficient. The Fourth Assessment report confirmed that conclusion with high confidence from an overview of the range of scenarios for stabilization.[53] The Stern Report suggested that it was possible to meet the climate change challenge using existing technologies,[54] although the report does state that achieving stabilization at 450 ppm, which is consistent with a 1.5 – 2 degree Celsius goal is not likely to be achievable with current and foreseeable technologies.[55] Pacala and Sokolow have argued with more confidence that, generally speaking existing technologies would be sufficient.[56] Arguing the contrary, Hoffman et al. suggested in 2002 that existing technologies would be insufficient and that new breakthroughs would be required.[57] As the assessments suggest that faster and greater reduction will be needed to meet the challenge of reducing GHG emissions by 80% by 2050, the arguments of those suggesting that new breakthroughs will be necessary begin to seem increasingly persuasive. Taking into account that the necessary reductions suggest that a peak of emissions will have to take place between 2015 and 2025,[58] the rapid deployment of

---

[53] CLIMATE CHANGE 2007, *supra* note 51, at 56.

[54] STERN, *supra* note 23, at 193.

[55] *Id*.

[56] S. Pacala & R. Socolow, *Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies*, 305 SCIENCE 968, 968-70 (2004).

[57] Martin I. Hoffert et al., *Advanced Technology Paths to Global Climate Stability: Energy for a Greenhouse Planet*, 298 SCIENCE 981, 981-87 (2002).

[58] CLIMATE CHANGE 2007, *supra* note 51, at 67.

existing technologies will be a prerequisite for longer term action. In the longer term, technological breakthroughs may be required.

From an intellectual property perspective and the continual argument between ensuring static efficiency (access to and distribution of technology in the present) and dynamic efficiency (incentives for the generation and diffusion of technologies in the future), static efficiency must be the paramount concern with respect to existing technologies in order to peak between 2015 and 2025. However, to ensure that new technological breakthroughs are encouraged in the 2018 – 2050 period, dynamic efficiency must be paramount to ensure the highest possible incentives for the creation of new technologies that will contribute to GHG reduction. A consequence of this is that it may be necessary to differentiate between providing little or no IP protection for existing technologies, while ensuring sufficiently high levels for those technologies already in the R&D pipeline.

Finally, any solution must address the elephant in the room, which is how to get market actors in developed countries to engage in transactions in developing countries given the uncertainties around governance, legal recourse, and intellectual property protection. This is at the core of the argument by developed countries that developing countries need to create environments that enable technology transfer. However, few developing countries are likely to be able to accomplish such policy measures on their own and such measures are unlikely to actually encourage technology transfer at the necessary scale. Any solution must produce structures to achieve the goals of increasing technology transfer while providing developed countries private sector actors with reassurance. This means creating supranational mechanisms that generate legal certainty. The next two sections provide proposals that meet all of these criteria and which work in the aggregate. Section III focuses on market-based facilitation of transactions and Section IV proposes an IP moratorium that emphasizes static efficiency in the near term while maintaining incentives for innovation in the post-2025 period.

II. REDUCING TRANSACTIONS COSTS AND CREATING MARKETS IN DEVELOPING COUNTRIES[59]

[59] Some of these proposals have been included in a submission to the Technology Executive Committee by the Climate Action Network's Working

A significant part of the problem for technology transfer for climate change relates to the nature and scale of transactions for both product and knowledge. One of the contributions that the UNFCCC or other international climate institutions can make is to provide standardized, centralized and trustworthy mechanisms for negotiating and carrying out such transactions. A crucial part of this will be providing transparency, certainty, predictability, and conflict resolution.

A. Mechanisms for Reducing Transaction costs

1. INTELLECTUAL PROPERTY EXCHANGE AND PLATFORM

The UNFCCC should authorize and create an intellectual property exchange specifically for climate change mitigation and adaptation technologies. Such an exchange would enable secure, efficient and transparent arms-length transactions for intellectual property licensing at a one-stop shop, with the weight and authority of the UNFCCC behind it. It may be appropriate to select one or more existing exchanges in an open and competitive process provided that the selected exchange meets basic criteria. Such baseline attributes include providing a low flat nominal fee for those posting assets or seeking to access licenses and enabling special licensing arrangements for LDCs in addition to security and predictable dispute resolution features.

Such exchanges make the process of identifying licensees, technologies on offer and carrying out negotiations and pricing much easier and simpler, including standard licensing. They are particularly useful for those institutions and firms that are primarily engaged in manufacturing their activities and for whom licensing is not a central activity. The opportunity costs related to negotiating and licensing out are much reduced in such an exchange for such actors who may not be willing to put significant resources into licensing activity. The exchanges may also be very useful for weakly resourced institutions and actors, such as university technology transfer offices. A pilot version of such an exchange for environmentally sound technologies was Green Xchange, which was established in 2009 as a collaboration

---

Group on Technology available at:
https://unfccc.int/ttclear/pdf/Call%20for%20Inputs/EE/**CAN**_EE.pdf.

of Creative Commons and several firms, to implement a patent commons approach first pioneered by Creative Commons in the copyright arena and extended now to the field of patents. Green Xchange offered four kinds of standard licenses: *Intellectual capital* which provided free and open access to all for any purposes; *Research Non-exempt* which is limited to free access for non-profits for non-commercial research purposes only (patenting for non-commercial purposes is also allowed); *Standard* which provided a royalty free license for exploitation for commercial purposes; and *Standard PLUS* which required some payments and could contain other term restrictions. Assessment of the project suggests that it never expanded much beyond the primary provider of the initial patents, Nike, and that the business model was never able to overcome issues related to existing IP management practices in firms who primarily viewed IP as a strategic blocking tool.[60] The Xchange was never able to build up a critical mass of patents; it also found that users were primarily interested not just in the patent, but in the associated know-how requiring further building up of relationships and value-added service that the exchange was not in a position to provide.[61] In addition, while the focus on open innovation was laudable, it made it difficult to make a business case to firms that they should place their patents into the Xchange. This may have made the Xchange more of a CSR exercise for many companies rather than a new business opportunity. In this case of this proposal, the presence of the CTC&N in combination with the exchange, as well as access to financing and a critical mass due to the worldwide scale of the exchange would go a long way to addressing some of the challenges encountered by the Green Xchange approach.

2. A B2B PLATFORM FOR COMMERCIAL TRANSACTIONS

In parallel, The UNFCCC should also designate a B2B platform for commercial transactions related to climate change mitigation and adaptation products and goods**,** specifically targeted at projects and

---

[60] *See* ROYA GHAFELE & ROBERT D. O'BRIEN, OPEN INNOVATION FOR SUSTAINABILITY: LESSONS FROM THE GREENXCHANGE EXPERIENCE, INTERNATIONAL CENTRE FOR TRADE AND SUSTAINABLE DEVELOPMENT POLICY BRIEF NO. 13 (June 2012), at 5.

[61] *Id.* at 1-8.

programs funded by UNFCCC financial mechanisms that leverages the information and categorization achieved by the Climate Technology Center & Network ("CTC&N") and its affiliated databases to allow easy access to publicly available technologies in particular. Such a platform would enable global, transparent offers for sale and offers for purchasing of technological goods and services on a web-based platform and enable secure, efficient arms-length transactions without long protracted negotiation processes. Registration requirements and placing of financial bonds for participation would reduce transaction risks for sellers and buyers, as would processes for reputational ranking. It may be appropriate for the UNFCCC to select, through an open tender process for the development, implementation and running of such a platform that would be funded by a basic fee for participation charged to private stakeholders. The CTC&N may be an appropriate host for the B2B platform.

3. AN INTERNATIONAL IP ARBITRATION MECHANISM

Finally, the UNFCCC should authorize, designate or create an Arbitration Mechanism to address contractual or intellectual property licensing problems that arise in the context of any legal dispute related to projects or programs funded by any UNFCCC Financial Mechanism. Receipt of funds from any UNFCCC financial mechanism and use of such in any contract using, accepting or in any way transferring intellectual property, should be contingent on acceptance of a mandatory arbitration clause in the funding contract and in the contract between the funding recipient and the technology provider (subject to the participants' choice of law in each contract and the designated countries' system for recognition of mandatory arbitration terms). All UNFCCC countries would have to agree to implement such decisions, subject only to the Constitutional requirements of domestic law either by joining and committing to apply principles of the New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards.[62] Decisions of the

[62] NEW YORK ARBITRATION CONVENTION, NEW YORK ARBITRATION CONVENTION ON THE RECOGNITION AND ENFORCEMENT OF FOREIGN ARBITRAL AWARDS, (June 10, 1958), http://www.newyorkconvention.org/new+york+convention+texts.

Arbitration mechanism would be appealable to the Advisory Board of the Technology Mechanism (which is composed of member state representatives, which will review and only reverse such decisions by a two-thirds majority of the voting members). Existing mechanisms, such as the WIPO Arbitration and Mediation Center, may be appropriate designees as such a mechanism.

4. ENABLING JOINT RESEARCH & DEVELOPMENT, DEMONSTRATION AND DEPLOYMENT

Collaborative R&D is seen by many as a way to circumvent IP-related issues by engaging in joint research in structures that provide for the sharing of IP.[63] Thus joint cross-border R&D will ensure that all involved parties have ownership. Studies have shown that investment in R&D has a significant impact on technology productivity and capacity building and can be a powerful tool in enabling not just deployment but capacity to adopt and adapt technologies to local needs.[64] This may be based on the CGIAR model of sector-specific directed research groups. This can allow pooling of resources by governments rather than creating competing research programs. Joint Demonstration R&D platforms have been suggested by others as a way to address especially problems related to the commercialization, and uptake of climate technologies.[65]

Providing equal access to R&D subsidies and funds to firms from developing countries is a crucial way to encourage technology transfer. Since the expiration of the provisions in the Agreement on Subsidies and Countervailing Measures[66] on non-actionable subsidies

---

[63] BERNICE LEE ET AL., WHO OWNS OUR LOW CARBON FUTURE? INTELLECTUAL PROPERTY AND ENERGY TECHNOLOGIES 59 (Chatham House ed., 2009). *See also*, DAVID OCKWELL ET AL., UK-INDIA COLLABORATION TO IDENTIFY THE BARRIERS TO THE TRANSFER OF LOW CARBON TECHNOLOGY, FINAL REPORT 110 (Department of Environment, Food and Rural Affairs, ed., 2007).

[64] *See* BERNARD M. HOEKMAN ET AL., TRANSFER OF TECHNOLOGY TO DEVELOPING COUNTRIES: UNILATERAL AND MULTILATERAL POLICY OPTIONS 8 (World Bank Policy Research, Working Paper No. 3332, 2004).

[65] *See* LEE ET AL., *supra* note 66, at 61.

[66] Agreement on Subsidies and Countervailing Measures, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1A, 1869 U.N.T.S. 14.

on 31 December 1999, environmental subsidies generally, and research and development subsidies specifically fall within the category of 'actionable' subsidies. Thus, discriminatory R&D subsidy regimes by industrialized countries may be subject to WTO dispute settlement if they do not meet the standards in Articles 1, 2 and 5 of the SCM Agreement. However, it may be better to address such issues with prior commitments to provide access negotiated at the UNFCCC. The use of tax benefits for R&D could be extended to R&D carried out in developing countries, especially for LDCs.

The IEA Technology Implementing Agreements may be an appropriate way in which to address the need for increasing international R&D collaboration. These implementing agreements serve as vehicles for directed collaboration with defined roadmaps and research and development goals in which countries participate voluntarily, and which may include both IEA member and non-member countries as well as associated parties from industry and academia.[67] The IEA has established a cross-cutting TIA called the Climate Technology Initiative. However, unlike some of the TIAs it has no explicit research component primarily focusing on information sharing and description of best practices.

A key component of many of these TIAs is that they envision either a cost-sharing framework, with a contribution from each participating party or a task-sharing framework, in which each party takes on a task and pays the costs of that itself within its own national framework.[68] It is not clear whether this is the main cause for the limited participation of developing country parties or private sector actors from developing countries in these TIAs, but a survey of the membership of all forty current TIAs shows low participation of developing countries.[69] In addition, the issue of intellectual property is structured in such as fashion as to assure right holders that any IP that they make available as part of the project will not be disclosed or transferred to others.[70] What is done with the information and possibly patentable improvements that may occur as a result of the

---

[67] INT'L ENERGY AGENCY, ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, IEA IMPLEMENTING AGREEMENTS: BACKGROUND AND FRAMEWORK AS OF 2003 3 (2003), https://www.solarpaces.org/wp-content/uploads/IA_Framework_ia-brochure2003.pdf.

[68] *Id.* at 5, 11.

[69] *Id.*

[70] *Id.* at 6.

collaborations is also unclear. The major problem is that the TIAs focus almost exclusively on information-sharing arrangements such as workshops and platforms or collecting and describing best practices but rarely involve carrying out proof of concept or demonstration projects.[71]

If the IEA aims to become a useful venue for reducing IP issues while enhancing R&D collaboration it will need to take three critical steps. These include finding a financing structure that appeals to the participation of developing countries, by perhaps applying for GCF funds to enable participation, clarifying IP sharing of technologies developed under the TIAs, and focusing on tangible cooperation regarding proof of concept, demonstration and adaptation of technologies to specific conditions and markets.

If we take to heart the argument that the primary need in developing countries is for technologies that are either new to the domestic industry or new to the domestic firm, but not necessarily inventive[72], then the focus should be on dissemination of existing technologies in the near term. Collaborative R&D will be useful for avoiding IP problems once developing countries have built up sufficient domestic capacity to compete on the global market in these sectors and this may already be true in some sectors such as wind and solar PV. Thus R&D per se is best suited for the post-2030 technological landscape and not a panacea for the short-term problems of access to advanced but already commercialized products and processes. What is needed is the demonstration and adaptation of commercialized or near commercialization technologies to market and environmental factors in developing countries. The TIAs may be better suited to creating the breakthrough technologies of the future post-2030, but less well-suited to enabling work directed at near-term demonstration and deployment of already commercialized or near commercialized technologies.

The establishment of global voluntary patent pools is another conflict avoidance strategy that has been proposed.[73] Global voluntary

---

[71] OCKWELL ET AL., *supra* note 66, at 113.

[72] David Ockwell et al., Organisation for Economic Co-operation and Development, OECD Environment Working Papers 12, Enhancing Developing Country Access to Eco-Innovation: The Case of Technology Transfer and Climate Change in a Post-2012 Policy Framework 16 (2010).

[73] LEE ET AL., *supra* note 66, at 59.

patent pools consist of right holders placing technologies in exchange pools where right holders are able to access other's technologies, the know-how, and the capacity building to make the most effective use of these other technologies. To further avoid conflict, parties could place technologies and know-how in the public domain to make them readily accessible. There are several weaknesses to global patent pools, and I am more skeptical of these than authors such as Maskus.[74] Pools are only as effective as their memberships, their content and the licensing structure that they create. The first concern would be to ensure that the pool was open to all relevant actors and did not unduly exclude firms from developing countries. Where the establishment of these is voluntary, it may be possible to rely on market forces to best identify the stakeholders. Where it is government structured or mandated, the difficulty lies in designing a system that would be seen as fair by both insiders and outsiders. In both cases, significant concerns arise about anti-competitive effects. A patent pool is most efficient where it brings together sets of different, complementary technologies that in the aggregate provide a package that allows the manufacture of a product. One example could be the smartphone market.[75] Many patents from so many different partners on different aspects of the technology are necessary for the product to be created. It is more efficient to allow all participants to pool their patents, allowing easy or cheap access for all participants to the package. However, where the pool charges higher prices for accessing the technology than to its own members, this creates a barrier to entry in the product market. Thus incumbents may be unduly protected. Where the pool consists not just of complementary technology which may be linked in some network but of companies with similar technologies and patents, the anti-competitive concerns are that much larger, as this allows the firms to only prevent entry into the product market, but also allows them to collude to charge a joint higher price in the licensing market. Thus where these licensors might have competed on price and terms, they can now present the same, likely higher costs and terms to non-pool members. What is problematic is that much of what people envision pools achieving in the realm of climate technology is the

---

[74] *See* Keith Maskus, *Differentiated Intellectual Property Regimes for Environmental and Climate Technologies* 27 (OECD Environment Working Papers, Working Paper No. 17, 2010).

[75] *See, e.g.,* SISVEL LTE PATENT POOL, http://www.sisvel.com/index.php/lte.

pooling of similar technologies, allowing firms to more efficiently research and improve each other's technologies.[76] Such patent pools seem to be viewed as tools for accessing technologies for firms in developing countries, but where these firms are not able to provide sufficiently valuable patents to the pool, there will be no market incentive to include them in the pool. In either case, voluntary pools pose too much of a danger in competitive terms in that they are likely to exclude developing country firms, and that they are unlikely to allow competitors to share technologies. Where the package of patents offered by the pool contains non-essential patents, but the pool uses the leverage to require purchase of these as part of the package, this also creates significant problems for the market.

It is important to consider the kind of problems that pools are meant to solve. If the issue is one where production of a technological good is blocked because of patent thickets and high transaction costs, voluntary or even publicly backed pools can be useful tools. They can provide a one stop shop for all participants in the product market. If the issue is to try to solve the issue of such things as refusals to license, or reluctance to share technology and knowledge, voluntary pools are not likely to change the behavior of those firms who see the patent primarily as a tool for creating room to operate and prevent market entry, unless they can use the pool to exclude new market entrants. As noted, given the gaps in ownership in patenting between firms in developed and developing countries, cross-licensing within a pool creates little inactive for the inclusion of firms in developing countries without valuable IP. They would most likely end up as outsiders to the pool. In designing around this, what is actually being created is the concept of a repository, from which stakeholders can pick and choose which technologies they wish to license at a flat rate. Given the variation in the utility and value of different patents, such a repository is unlikely to be able to provide a flat rate and each patent will have to be priced differently. This effectively then becomes a publicly run IP licensing platform rather than a pool per se. Thus, while the idea of aggregation is correct, both the "patent pool" label and a understanding of the limits of aggregation are sometimes lacking from

[76] *See* LEE ET AL., *supra* note 66, at 59.

recommendations to pool patents, enable cross-licensing, and provide low-cost access.

The limits of joint R&D unaccompanied by deliberate and structured training, education and capacity building for the majority of developing countries are clear. The UNFCCC needs to leverage its institutional and financial power to retain some power of how and what it licenses and focus its work on demonstration and deployment, allowing the bulk of breakthrough research to take place in the IEA and other fora.

With that in mind, I propose that the UNFCCC should require that all R&D projects funded by any UNFCCC financial mechanism establish joint intellectual property rights for the UNFCCC, through the TEC and/or CTCN as its authorized representative. The TEC and/or CTCN should not require permission from other joint right holders to license the technology, at grant or concessional rates and terms, with proceeds shared jointly with other right holders, to enterprises and institutions located in LDCs or other countries with insufficient technological and manufacturing capacity if it meets certain criteria. The enterprise or institution must be located within the territory of an LDC or other countries with insufficient technological and manufacturing capacity and committed to carrying out activities related to adaptation, demonstration, and deployment of commercialized, or near commercialized technologies in the country for at least 5 years as well as capacity building, education, information transfer, and training of local personnel relating to the licensed technology.

As a condition of receiving funds, all R&D demonstration and deployment projects with a funding component from any UNFCCC Financial Mechanism, must involve at least one public research institution from an LDC and, at the very least, intellectual property rights in technologies and knowledge developed under the research project or program so funded must be vested jointly in that public institution. Industrialized country parties should commit to giving preference for any publicly funded research collaborations on climate technology to those that include participation by public and/or academic institutions from developing countries. This would have, for example, required that the EU Horizon 2020 research funding framework program currently in force, give preference to projects in the climate mitigation and adaptation sector, to those that include public institutions from developing countries.

5. ENABLING ACCESS TO PUBLICLY FUNDED TECHNOLOGIES

There is a need in industrialized countries for a clear policy focus on ensuring that publicly funded technologies are made available at grant or concessional rates on a non-exclusive basis to firms and institutions in developing countries. This needs to go beyond the non-profit Model licenses made available by, for example, the US National Institutes of Health ("NIH").[77] This would require that funding agencies maintain ownership or retain non-exclusive licenses, with the option of sub-licensing on a non-exclusive basis and geographically limited to developing countries, on a grant or concessional basis.

With that in mind I propose that UNFCCC industrialized country parties commit to retaining the IP right or full non-exclusive licensing rights to publicly funded technologies and commit to license or sub-license technologies developed using public funds to firms and institutions in developing countries, or to the CTC&N and related joint R&D platforms, on non-exclusive grant or concessional terms. It may be appropriate to limit these licenses to domestic use and for export of products, or products produced by protected processes, only to other developing countries.

The majority of these licenses are likely to consist of pre-commercialization technologies closer to basic science and research. In such situations, firms in developing countries may not be likely to take these technologies up on their own but may be in a position to do so where they are carried out in sectoral-based public-private partnerships[78] or in the context of broader international R&D programs. These will require funding for proof of concept and demonstration. The ability to provide geographical limitations may make it more likely that developed country agencies will engage in such licensing, given an appropriate licensing partner or platform.

---

[77] *See* MODEL NON-PROFIT LICENSE AGREEMENT FOR NTDS, HIV, TB AND MALARIA TECHNOLOGIES, https://www.ott.nih.gov/licensing/non-profit-license-agreement-summary (last visited March 24, 2013).

[78] Dominique Foray, *Technology Transfer in the TRIPS Age: The Need for New Types of Partnerships between the Least Developed and Most Advanced Economies*, 23 ICTSD PROGRAMME ON IPRS AND SUSTAINABLE DEVELOPMENT (2009) (Switz).

B. Market Access and Creation Mechanisms

A key set of needs relate to market access for products produced by specific processes. This market access can be envisioned as a two-way flow: moving technological products into LDCs and other countries with little or no manufacturing capacity, and encouraging location of manufacturing and other activities such as R&D in LDCs to encourage skills training and transfer of know-how to institutions and firms in developing countries. The aim would be to use the leverage of financing by the UNFCCC, largely through the Green Climate Fund and with the assistance of the CTC&N, to provide an incentive for developing country and industrialized country firms to participate.

Industrialized countries can use the proposed mechanism as a lever to enable and encourage technological development in developing and least developed countries. They could specifically and unilaterally open their markets, by lowering their tariffs on environmentally sound technologies produced by developing countries, especially by low and middle income countries.[79] While this could be done unilaterally, the aim would be to leverage the funding capacity of the UNFCCC to encourage and model the behavior. The proposal is to have a COP decision or set of decisions that would create a standard model license to be used by firms and institutions in developing country UNFCCC parties to produce technologies primarily for their domestic markets and for export to LDC markets or other countries with insufficient technological and manufacturing capacity. The license would explicitly exclude the export of patented products or products produced by a patented process into other non-LDC or non-developing country markets. Recipients of funds from any UNFCCC financial mechanism who used such a license would be prioritized for receipt of funds and would be guaranteed 100% support of licensing costs, even at full commercial rates. Funds for licensing of technologies covered by such a license would have to meet one or more of the following criteria: (1)the technology would be effective at increasing energy access for the most vulnerable; (2)the technology would be effective at enabling specific adaptation to a climate change risk or effect to which LDCs are particularly vulnerable; or (3) the

[79] Hoekman et al., *supra* note 53, at 16.

technology would be effective at increasing the adaptive capacity of vulnerable populations in all developing countries.

Additionally COP should create a standard model license to allow enterprises from any UNFCCC party to export technological goods produced in any LDC into any other UNFCCC party where the products or process producing such products is IP protected if production of the technology and/or application of the process for production is carried out in facilities located within the territory of an LDC and is committed to do so for at least 10 years. Additionally, at least 30% of personnel involved each year in production shall be local citizens; production shall include capacity building, and at least one sub-license shall be granted, at grant or concessional rates, for use of the technology for production and/or adaptation primarily for the domestic market of the LDC.

For those LDCs where a specific technology product or process is not IP protected, UNFCCC parties should commit to allow import at 0% tariff into other UNFCCC countries of that technological product, or products produced by that process, made in LDCs capacity), provided that production of the technology or application of the process for production is carried out in facilities located within the territory of an LDC and is committed to do so for at least 5 years. Recipients of any UNFCCC Financial mechanism who carried out such production would be prioritized for receipt of funds.

The model licenses are targeted at two groups. The first is at emerging economy firms who may need incentives to take on such licenses with such restrictions and to encourage them to focus on LDCs and other developing countries as prime markets and launch pads for their products. It also removes the LDCs and smaller developing countries from the arena of competition between emerging economy firms and industrialized country firms. To the extent that emerging economy firms wish to have access to industrialized country markets they can compete on the international global field directly, or they can go through LDCs. This allows for LDCs to benefit both from the employment and technology transfer from emerging economies but to also benefit from the market access into industrialized economies. While many already enjoy significant tariff free access for their goods into industrialized economies under various preferential regimes (e.g.

the Everything But Arms initiative of the European Union)[80] these do not extend to IP protected goods or goods produced by an IP protected process, and many are bound by restrictive standards on rules of origin that limit the ability of firms from other countries to use their location in LDCs to also benefit from such access. This proposed system piggybacks on this existing framework but requires some more flexibility in terms of rules of origin but strict standards in terms of technology transfer and benefit to the LDC.

III. A PRAGMATICALLY RADICAL PROPOSAL – MORATORIUM TO PEAK DATE

The data and scenarios tend to agree that peaking somewhere between 2015 and 2025 will be required if we are to stand a reasonable chance of reducing emissions by 80% by 2050 (relative to 2007 levels) and to stabilize at an increase of only 1.5-2 degrees Celsius.[81] There is significant evidence and consensus that peaking can be achieved with existing or near commercialization technologies.[82] Peaking however, can only be achieved with a rapid uptake of existing technology at a rate unprecedented in human history. The need for rapid distribution of technological products is clearly paramount and economies of scale have to be achieved in a very short period of time. The immediate availability of more efficient and low emission processes in all fields is crucial to shifting industries away from GHG-reliant paths, and to preventing lock-in. Existing methods of ensuring deployment and diffusion of technology are likely to be insufficient.[83] The process of licensing negotiations or other bilateral exchanges between rightholders and users of their technologies are too slow. While the facilitative mechanisms outlined above present serious attempts to reduce transaction costs, what we need is an almost frictionless system. However, we may also need to address the issue of certainty by not making unduly permanent changes in the innovation system, especially if we wish to maintain the dynamic

---

[80] Council Regulation 978/2012, Applying a Scheme of Generalized Tariff Preferences and Repealing Council Regulation, 2012 O.J. (L 303). (E.U.).

[81] IPCC, *supra* note 1, at 67.

[82] *Id*. at 68.

[83] LEE ET AL., *supra* note 66.

efficiencies and production of new technologies in the post-2025 period after peaking. As noted, adaptive capacity must also be built up as quickly as possible in the near term to ensure increased survivability in the post-peak period, when changes of at least 1 degree Celsius appear to be already locked-in.[84]

It is also important in a world in which complex technologies consist of multiple patents that the focus in on increasing the capacity to access, use, and adapt products rather than specific patented components. The solutions proposed must operate at the level of the product, not just at the one or more technological inventions contained within a product. With respect to processes, the need is to address products produced by such processes and to the specific technologies that enable process change or efficiency, which are more likely embedded in the single patent or technology. What this means is that actions aimed at these technologies are not likely to have 100% congruence with specific patent classifications. The scope and effect of action will therefore be limited only to those situations wherein a patent (product or process) is being used for a particular designated climate technological purpose. This is an important distinction for the proposal I make below, so that patent holders will still remain free to address those activities that are not associated with the specific sectors or products identified below.

With these conditions in mind I propose the following two elements for a UNFCCC Agreement.

A. A 2015 - 2025 Moratorium On IP Enforcement

A moratorium on IP Enforcement in all UNFCCC members of patents, plant breeders' rights, copyright and trade secrets rights embedded, contained in, or consisting of technological products and processes for climate change mitigation and adaptation and which were applied for, or came into existence, prior to January 1, 2020. All actors in all UNFCCC member countries would be allowed to exercise all activities in respect of the protected right, for the period of the moratorium.

This would also entail a suspension of the term on the right, which would not run during the moratorium. After the end of the moratorium, the rightholder and the state could resume enforcement

[84] STERN, *supra* note 23, at 12.

and the term would begin to run again but the right would only exist against those who began to make use of the protected technology after the end of the moratorium. All prior users could continue to rely on the use that they had made of the protected technology during the moratorium.

Under the agreement, the patent holder could also elect to establish a liability regime[85] for the technology in which ALL prior and new users of the protected technology would continue to be allowed to exercise activities with respect to the sectors defined below but would be required to pay a flat fee or percentage of reported profits. Thus there would be no right of refusal but a right of remuneration. In each jurisdiction where the IP protection remained in force, the country would designate a state agency which would be obligated to enforce and collect the fee on behalf of, and in partnership with, the patent holder. The fee would be set up by a negotiated agreement between the rightholder, the agency and representatives of user stakeholders. If no agreement was reached within a year of the moratorium ending, the fee would be subjected to binding arbitration[86], which would take into account: the need to ensure reasonable;[87]the national domestic market; and the need to not deter continued use of the technologies.

Such a moratorium would apply in a large variety of fields.[88] In the area of health, it would encompass medical products, processes and services related to managing health needs during extreme weather events, increasing general immune-capacity and resistance to vector borne and temperature sensitive diseases, creating hygienic and sanitary living and working conditions and WHO essential medicines, [89] and associated medical devices and diagnostic tools such as anti-

---

[85] J.H. Reichman, *Legal Hybrids Between the Patent and Copyright Paradigms*, 94 COLUM. L. REV. 2432 (1994). While first suggested by Reichman, in a later iteration he focuses on the use of such a regime for sub-patentable innovation in contrast to and as a critique of utility model and petty patent systems. *See* J.H. Reichman, *Of Green Tulips and Legal Kudzu: Repackaging Rights in Subpatentable Innovation*, 53 VAND. L. REV. 1743 (2000).

[86] Reichman, *supra* note 89, at 1743.

[87] Reichman, *supra* note 89, at 1784.

[88] Shabalala, *supra* note 15.

[89] WHO, WHO MODEL LIST OF ESSENTIAL MEDICINES 17TH LIST (Mar. 2011), http://www.who.int/medicines/publications/essentialmedicines/en/index.html.

protozoals,[90] disinfectants and antiseptics,[91] gastrointestinal medicines,[92] immunicologicals,[93] and antibacterials. [94]

New plant and animal varieties or adaptations and wider use of existing plant and animal varieties may be required in areas where hydrological and seasonal variations go beyond those under which existing seed and animal germplasm input strategies were developed. Biotechnology and animal and plant breeding will play significant roles in adaptation responses, especially where shifts in management practices and behavior are insufficient to achieve the full scale of adaptation needed.[95] Working from several sources[96] such as the CGIAR and the ITPGRFA, and focus on those technologies related to core staple foods, as well as, we can already identify a limited list including seeds of plant varieties, especially wheat, soya, maize, rice, sorghum, sugar cane, with resistance to drought, flood, salt-water or pest and disease resistance, response to fertilizer or long and short harvest cycles,[97]animal germplasm and animal varieties with shorter reproductive cycles capable of surviving drought, flood or disease or less likely to produce methane during digestion;[98] biotechnological and other methods for producing such plants or varieties; low cost and low GHG-emissions fertilizers or pest management chemicals and systems for the management of animal waste, including recycling into biogas and other biomass for energy generation.

Efficient water use or monitoring, storage, capture, treatment and reclamation technologies for desalination[99] or the treatment of high

---

[90] *Id.* at 13 (Section 6.5).

[91] *Id.* at 23 (Section 15).

[92] *Id.* at 24 (Section 17).

[93] *Id.* at 27 (Section 19).

[94] *Id.* at 5 (Section 6.2).

[95] W.E. EASTERLING ET AL., *Food, fibre, and forest products*, *in* CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY. CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, 273, 296 (M.L. Parry et al. eds., 2007), https://www.ipcc.ch/site/assets/uploads/2018/03/ar4_wg2_full_report.pdf.

[96] The CGIAR is formerly known as the Consultative Group for International Agricultural Research; ITPGRFA is the International Treaty on Plant Genetic Resources for Food and Agriculture.

[97] EASTERLING ET AL., *supra* note 100, at 294.

[98] *Id.*

[99] *Id.*

levels of toxicity and microbial growth;[100] extreme weather event capacity and response systems including early warning systems, stockpiling and distribution systems, disaster mitigation systems and weather resistant materials; renewable energy generation and end use fuel or electrical efficiency systems, industry process efficiencies including in the production of iron and steel,[101] cement,[102] chemicals and petrochemicals,[103] paper,[104] and aluminum;[105] as well as vehicular[106] and structural power and heating sources[107] and fuel efficiency all will require similar assessment and treatment.

B. Phase to Zero Tariff 2025

On the goods and services identified above, including those that are protected by intellectual property rights, or produced by processes that are protected by intellectual property rights (other than trademarks), industrialized countries (Annex 1 countries) agree to immediately lower their effective (not WTO bound) tariffs to zero, beginning in 2015. They also agree to allow importation of technologies into their economies. Emerging economies, in particular Brazil, India, and China (but above a defined GDP per capita threshold), all agree to lower their effective tariffs to zero, phasing in 20% reductions per annum from existing levels by 2020. All other countries agree to lower their effective tariffs on goods by 2025.

While the agreement in the UNFCCC involves tariffs, the agreement to reduce tariffs will not be in violation of the WTO Agreement because it does not violate the national treatment (Article III GATT 1947) or the MFN requirement (Article I GATT 1947). It

---

[100] ZBIGNIEW W. KUNDZEWICZ ET AL., *Freshwater resources and their Management, in* CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY. CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 196 (Martin L. Parry et al. eds., 2007).

[101] INT'L ENERGY AGENCY, ENERGY TECHNOLOGY PERSPECTIVES 2012: PATHWAYS TO A CLEAN ENERGY SYSTEM 401 (2012).

[102] *Id*. at 406.

[103] *Id*. at 411.

[104] *Id*. at 415.

[105] *Id*. at 420.

[106] ELZINGA ET AL., *supra* note 44, at 25.

[107] *Id*. at 18.

does not raise tariffs, nor does it give preferential treatment to any party.

The combination of these two elements is aimed at removing primary barriers related to regulations and tariffs to access and adoption of technologies. This does not, of course, fully address the capacity and financing issues, but the aim is that the proposal will function as a shock to the system pushing adoption of climate technologies for adaptation and mitigation to the fore. The time limit will accomplish two things: create an incentive for those who wish to adopt such technologies to do so as quickly as possible within the moratorium window; allow rightholders to maintain ownership and still have a mechanism for recouping investments and making money from their IP after the moratorium is ended. Specifically, it shifts the business model for rightholders to one where they can expect to receive many smaller payments but from a hugely expanded population of users. The length of the term of their right is not diminished by this proposal but it is simply suspended for the period necessary to ensure maximum dissemination of all technologies during the period to peaking. This will ensure that the best available technologies will be adopted in that period rather than the cheapest available, but second-best options. The proposal takes what has been one of the more radical proposals on the table, the proposal from the G77 to remove patent protection for all environmentally sound technologies in developing countries[108] and modifies it to actually achieve a very specific time limited goal that takes into account both static and dynamic efficiency in the production and dissemination of climate related technological public goods. The proposal for a moratorium on IP enforcement makes no distinction between industrialized and developing countries given the urgent need for global deployment and for addressing transaction friction in industrialized countries as well. However, one can imagine several options that could differentiate and be more specifically targeted. One

---

[108] U.N. Framework Convention on Climate Change, Negotiating Text, (August 13, 2010), https://unfccc.int/resource/docs/2010/awglca12/eng/14.pdf; U.N. Framework Convention on Climate Change, In-session draft texts and notes by the facilitators prepared at the twelfth session of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, (October 29, 2010) https://unfccc.int/sites/default/files/resource/docs/2010/awglca13/eng/inf01.pdf.

possibility would be that the moratorium in full would only apply to developing countries, while industrialized countries would only apply the moratorium on the right of importation. This would privilege those products and products produced by such processes that came from developing countries. Those in industrialized countries would still have to receive permission from the rightholder. This would provide a significant incentive for firms to relocate R&D, and production facilities to developing countries for the period of the moratorium. Another possibility would be to apply the phased approach in the phased tariff part but in reverse. Thus industrialized countries would have a moratorium for the period from 2020 to 2025, while developing countries would have the moratorium from 2020 – 2030, thus having a head start but not such an advantage that firms would relocate entire lines of production and R&D. Clearly the core details of such an agreement would have to be negotiated but the essential principle may present a workable middle ground between existing negotiating positions and the need to address climate change.

CONCLUSION

Climate change presents a radical challenge to existing structures of production and consumption, and in particular to our existing modes of decision-making and legal implementation. The uncertainty does not just lie in the extent to which we must act to mitigate and adapt to climate change but also in whether or not existing regulations pose a barrier or create too much friction to enable action to address climate change. In implementing solutions, there is always the fear of doing more damage and creating new problems while trying to solve another problem. There is also, however, the sense that delayed action may make effective action at a later date extremely costly or not possible at all. These uncertainties are complicated by deep divisions between industrialized and developing countries on burden sharing, on the scale and sources of financing, on the scale and sources of technology transfer. Pragmatism requires that any workable solution must balance between all of the competing demands and uncertainties. The scale of the climate change problem however, requires radical solutions that have broad impact. The proposal is a demonstration proof that pragmatic radicalism in addressing climate change is possible if, but only if, driven by a full assessment of the scale of the problem, the time remaining to address it, the mechanisms

best suited to enabling a solution (in the case of technology transfer specifically), and the limits of existing regulatory rules. This understanding is what tells us how far outside the existing framework we may need to go and whether or not such changes need to be permanent or time limited. There is clearly much more work to be done to provide better information on which to base solutions, especially in the arena of empirical evidence relating to the scale and scope of technology transfer and the role of intellectual property. What I have tried to show is that the response to this need not be to rip the system up root and branch, but to target very specific mechanisms which can be adjusted and made to work *for* rather than *against* technology transfer through facilitation of transactions, elaboration of existing obligations and judicious norm-setting.