



# Beyond Technology Transfer

## Protecting Human Rights in a Climate-Constrained World

## International Council on Human Rights Policy

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**Beyond Technology Transfer:  
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## ACRONYMS

AGECC	UN Secretary-General's Advisory Group on Energy and Climate Change
BAU	Business-As-Usual (scenario)
BIT	Bilateral Investment Treaty
CCS	Carbon Capture and Storage
CDM	Clean Development Mechanism
CERs	Certified Emissions Reductions
CIEL	Centre for International Environmental Law
COP	Conference of the Parties
DCCIPR	Declaration on Climate Change and Intellectual Property Rights
EGTT	Expert Group on Technology Transfer
ESTs	Environmentally Sound Technologies
FAO	Food and Agriculture Organization
FIVIMS	Food insecurity and vulnerability information and mapping systems
GDP	gross domestic product
GDRs	Greenhouse Development Rights
GEF	Global Environment Facility
GHG	greenhouse gas
ICCPR	International Covenant on Civil and Political Rights
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICHRP	International Council on Human Rights Policy
IEA	International Energy Agency
IAs	International Investment Agreements

IP	intellectual property
IPCC	Intergovernmental Panel on Climate Change
LDCF	Least Developed Countries Fund
LDCs	least developed countries
MDG	Millennium Development Goal
NPS	New Policies Scenario
R&D	research and development
REDD	Reducing Emissions from Deforestation and Degradation
SCCF	Special Climate Change Fund
SEI	Stockholm Environment Institute
SRTT	Special Report on Methodological and Technological Issues in Technology Transfer
TNA	Technology Needs Assessment
TRIPS	Trade-Related Aspects of Intellectual Property and Services
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VCLT	Vienna Convention on the Law of Treaties
WEO	World Energy Outlook
WFP	World Food Programme
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

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- *Future Climate Technology Regimes: An Assessment of the Macro-Environmental Context from a Human Rights Perspective* – John Barton, Stanford University;
- *Climate Technology Transfer: A Derivation of Rights- and Duties-Bearers from Fundamental Human Rights* – Simon Caney, University of Oxford;
- *Technology transfer in the UNFCCC and Other International Legal Regimes: The Challenge of Systemic Integration* – CEIL (Marcos Orellana and Dalindyabo Shabalala);
- *Health: Human Rights, Climate Vulnerability and Access to Technology* – Sisule Musungu, IQSensato;
- *Promoting the Transfer of Technologies for Adaptation in Agriculture: A Role for the Right to Food?* – María Julia Oliva, Union for Ethical Biotrade;
- *Technology Policies to Support Adaptation in Developing Countries: Equity and Rights Considerations* – Stockholm Environmental Institute (Sivan Kartha, Clarisse Kehler Siebert and Richard Klein).

An advisory panel attended the meeting and gave feedback on the project: Stefanie Grant, M.J. Mace, Romina Picolotti, Dinah Shelton, Youba Sokona, Balakrishnan Rajagopal and Mohan Munasinghe were also members of the advisory panel. At the review meeting, Philippe Cullet, Mac Darrow, Caroline Dommen, Clare Mahon and Matthew Stillwell provided invaluable insight and commentary. Kasia Snyder and Angela Onikepe provided extensive research assistance at the ICHR. Shortly after his exemplary contribution to this project, Professor John H. Barton passed away. We extend our respects and deepest sympathy to his family.



## NOTE ON THE TEXT

In June 2008, the ICHRP published *Climate Change and Human Rights: A Rough Guide*, tracking the main human rights concerns raised by climate change and exploring possible areas of synergy in law and policy. As a first attempt to broach a topic of growing policy importance, the report met a broad need and has been well-received.

As a follow-up to this initial research, the ICHRP launched a second project, aiming to draw out in detail how human rights are relevant to a central and practical area of climate change policy. Following an extensive review period and the commission and delivery of a feasibility study by the CIEL, technology transfer was chosen as the theme for further research because of its evident and far-reaching human rights implications that have so far not been examined or fully articulated.

The theme was also chosen because it is a topic that other research institutions were less likely to pick up, unlike some of the other human rights issues identified in the original *Rough Guide*, such as threats to food, water, health or housing, the rights implications of Reducing Emissions from Deforestation and Degradation (REDD) programmes or biofuels, or the looming problem of climate-related migration and conflict.<sup>1</sup> Finally, technology policy is a cross-cutting issue in the climate change domain, touching on mitigation and adaptation as well as on substantive issues such as food and water security and health and housing infrastructure. The means by which technology moves between states takes us into the heart of international legal and commercial processes that are not, for the most part, constructed in a way conducive to reducing the impact of climate change.

Technology transfer has been consistently central to the climate change regime since the UNFCCC was signed in Rio, in 1992. Its centrality was robustly reaffirmed when the parties to the UNFCCC met in Bali in December 2007. There, technology was identified as one of four pillars of any future climate change settlement (alongside mitigation, adaptation and finance). Despite the relative lack of progress at Copenhagen in 2009,

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1 Indeed, many of these issues have since been subjected to extensive research. A number among the UN Human Rights Council's Special Procedures have examined the impacts of climate change on the areas of their mandate. Notably, the Special Rapporteur on Adequate Housing, the Special Rapporteur on the Right to Food and the Special Rapporteur on Extreme Poverty and Human Rights have looked into this question. For an excellent study, see the position paper of the Independent Expert on the Human Rights to Water and Adequate Sanitation, "Climate Change and the Human Rights to Water and Sanitation" (2010), available online at: [www2.ohchr.org/english/issues/water/lexpert/docs/Climate\\_Change\\_Right\\_Water\\_Sanitation.pdf](http://www2.ohchr.org/english/issues/water/lexpert/docs/Climate_Change_Right_Water_Sanitation.pdf).

technology remained at the heart of the Copenhagen arrangements and also featured in the Cancún Agreements of late 2010, at a time when human rights also formally entered the treaty language.

Technology transfer is needed both to help poorer and more vulnerable countries and communities adapt to the now inevitable consequences of climate change in the short term, and to assist them in moving on to low-carbon development pathways in the longer term. Human rights are relevant to the technology questions that arise in both these policy areas: adaptation policies in the short term and mitigation measures over the long term. Highlighting the human rights benefits of technological interventions may create a space for re-framing and circumventing the unsustainable dynamic that has largely characterised debate of this subject to date. In this regard, human rights offer a strong ethical and legal basis from which technology transfer might be approached.

The ICHRP project on climate technology policy and human rights, which launched in 2009, rested on three pillars of research, comprising core areas where human rights are relevant to technology transfer law and policy:

- (1) Examining how attention to the human rights implications of climate change can help identify where technologies are most urgently needed for adaptation, the project investigated rights to food and to health (the present report concentrates on food), as well as reviewing the context within which technology transfer for adaptation takes shape.
- (2) Researching, in the context of mitigation policies, the human rights implications of the long-term development constraints imposed by climate mitigation, particularly for LDCs, with a view to assessing the implications for technology transfer, both at the conceptual and policy levels.
- (3) Exploring the relevant international law architecture – reviewing intellectual property (IP) and international investment law alongside environmental and human rights obligations – to clarify how international law helps or hinders the fulfilment of human rights through technology transfer.

The ICHRP commissioned six papers from leading experts in climate change, human rights and ethics, international environmental, trade and IP law, and technology transfer. In July 2009, the ICHRP held a meeting in Geneva discussing draft papers with a broader group of key experts. Revised papers were received in 2010. The present report takes account of this process as a whole as well as Conferences of the Parties (COPs) to

the UNFCCC held in Copenhagen and Cancún.

In each case, the papers approached technology transfer through the lens of the original UNFCCC articulation of the problem (i.e., primarily in terms of an obligation on developed countries, who thus figure in the foreground of the report). The report does not, however, assume that technology transfer involves a “passive” transfer of technology or expertise from North to South. It is not clear that such a conception of technology transfer has, in fact, ever predominated, although it is frequently invoked as a barrier to action.

*Beyond Technology Transfer: Protecting Human Rights in a Climate-Constrained World*, addresses issues that are central to technology policy at a critical time and aims to explain the concerns of environmental activists and of human rights advocates so that common principles might be found and a common position forged. Technology transfer has generally been conceived of as a means to address a central injustice associated with climate change – that activities that have primarily benefited the people of the world’s richest states will disproportionately affect those living in the world’s poorest states. It has long been recognised as an indispensable element of a stable future and a global deal. The ICHRP report shows that it is more than that, however: it is also a principal means by which basic human rights standards might still be attainable for the world’s most vulnerable people in a climate-constrained future.

In December 2010, in Cancún, Parties to the UNFCCC formally agreed, for the first time, “in all climate change-related actions, [to] fully respect human rights.” This report shows the way forward with regard to one central pillar of the climate change regime: technology policy.



## EXECUTIVE SUMMARY

*Beyond Technology Transfer: Protecting Human Rights in a Climate-Constrained World* argues that international climate change technology policy can – and must – take human rights concerns into account if it is to function justly and effectively.

The report also suggests that the urgency of the threats climate change poses to human rights can play an important role in kickstarting technology policy, which has long been stalled at the international level.

The report starts from two premises, each of which is now widely shared. The first is that any solution to climate change depends upon robust technology policies.

There are no quick technological fixes to climate change, of course, but technology development and diffusion is an indispensable element in all available scenarios for addressing climate change. Still, although it has been a key principle of the climate change negotiations for almost two decades, there has been very little progress in implementing the technology provisions of the United Nations Framework Convention on Climate Change (UNFCCC).

The second premise is that climate change has profound human rights implications, and that solutions to climate change will only be effective if they integrate human rights concerns.

The report suggests that human rights can help move technology policy forward. Human rights can provide the minimal platform of agreement on policy steps regarding technology at the international level. They can do so in the context of both mitigation and adaptation policies.

Climate change **mitigation** requires a dramatic shift towards low-carbon technologies in every walk of life – a shift that must ultimately take place globally. Among other things, this means that countries that lack access to low-carbon technologies will find their development options increasingly limited. This in turn will have predictable deleterious effects on a host of human rights. To avoid this scenario, renewable energy technologies will need to be gradually universalised.

Climate change **adaptation** is of greatest urgency in the developing world, where the worst effects of climate change are already being felt. Here too, access to technologies is critical. In these cases, threats to human rights can function as a kind of early warning system, helping locate where technologies will be most useful and are needed most urgently. Examples include technologies relating to seawalls, desalination, seeds and agricultural techniques, vaccines, and so on.

## TECHNOLOGY IS ESSENTIAL TO ANY LONG-TERM CLIMATE SETTLEMENT

International efforts to address climate change have consistently framed technology policy through the key notion of “technology transfer”. This term was enshrined in the UNFCCC and has reappeared in every major document since. It signals that it is not enough to develop technologies to tackle climate change. The technologies must also be available where they are needed.

What is technology transfer? The UNFCCC says: “The developed country Parties ... shall take all practicable steps to promote, facilitate and finance ... the transfer of, or access to, environmentally sound technologies and know-how to ... developing countries, to enable them to implement the provisions of the Convention.”

This provision has an obvious **ethical** dimension. At the time of negotiation, wealthier countries recognised both their greater contribution to climate change and their greater capacity to deal with it, and agreed to make technologies available to poorer countries to help them manage the impacts of climate change and transit to low-carbon economies. Under the UNFCCC, until technology transfer is “effective”, poorer countries are not required to accept emission reduction targets.

Technology transfer in the UNFCCC also has a **practical** dimension – it is impossible to imagine dealing effectively with the global problem of climate change if advanced technologies are not made available where they are most needed.

But this provision also has a **political** dimension. From the beginning, technology transfer has been part of the deal by which poor countries too agree to pull their weight for a problem they did not cause. Technology is the *quid pro quo* of global solidarity on climate change.

Yet despite decades of debate, there has been very little practical movement on technology transfer. There are many reasons for this, but the main one has to do with the international protection of IP rights.

This is a polarised debate. In very brief, one side claims that strong IP rights are needed to support technological investment in developing countries. The other side claims that the international protection of IP rights poses an obstacle to public policy in this domain. Neither side has proved its case and the evidence remains inconclusive.

The full report tackles this complex debate in more detail. Here it is enough to point out that the long debate over IP rights has itself become an obstacle to technology policy. Indeed, the argument over IP rights is

largely a distraction from the main problem – which is simply *a failure to systematically pursue the technology provisions of the UNFCCC*. This ICHRP report concludes that it is time to move on – and indeed the Cancún Agreements provide an opportunity to do so by introducing a new “Technology Mechanism”.

That said, it is nevertheless useful to recall the main legal points of the UNFCCC provision on technology transfer:

- Technology transfer involves an obligation under the Convention;
- The obligation is on “developed” countries and owed to “developing” countries;
- The obligation is “to promote, facilitate and finance” technology transfer;
- Technology means hardware, but it also covers “know-how” and presumably training;
- *Transfer* indicates something more than “trade” or business as usual: it is proactive.

The precise nature of this legal obligation is not crystal clear, however, and it is probably unproductive today to approach technology transfer as a simple matter of rights and duties. Technology policy will only succeed if based on international cooperation.

There are a number of points upon which everyone is agreed:

- (1) The greater responsibility for climate change, both historical and current, of the world’s wealthiest countries provides the practical and moral basis for technology transfer.
- (2) Without concerted action to effect technology transfer, climate change will wreak havoc that might otherwise be avoided, particularly in the least developed countries (LDCs).
- (3) Technology transfer cannot be a “passive” process between North and South. Policy must reflect the priorities of both sending and receiving countries and private actors.
- (4) Technology transfer is not a coercive process. It involves channelling the power of private initiative into a shared and urgent public interest.

## **HUMAN RIGHTS CAN MOBILISE AND INFORM TECHNOLOGY POLICY**

At Cancún, for the first time, the working climate change text recognised the importance of “fully respect[ing] human rights” in “all climate change-related actions”. Technology, which is one of the four pillars

of the Bali Action Plan, is clearly one of the “climate change-related actions” to which human rights are relevant. But what does this mean?

At first glance, it involves recognising the degree to which human rights are impacted by the failure to move on technology transfer. The delay on technology policy is itself a cause of human rights harm.

But beyond this, we are called to take account of human rights in constructing technology policy.

How might that work? At present, most developing countries have produced Technology Needs Assessments (TNAs), in which their critical technology needs for both mitigation and adaptation are listed. This has been an immensely valuable process and begins to set a compass for technology policy internationally.

TNAs have not, and cannot on their own, provide the impetus for a proactive technology policy that must ultimately be set in *technology exporting* countries, albeit with the active participation and agreement of technology importers.

The report proposes that human rights provide an appropriate way to organise and orient technology policy and to prioritise needs and objectives in both adaptation and mitigation. Among the many points raised by the report, six key issues bear mentioning:

### **1. A focus on human rights can help decide on which technologies to concentrate national policies**

The identification of particular human rights threats caused by climate change provides a sound basis for prioritising the technologies best suited to meeting those threats. For example, human rights standards could be mainstreamed into the TNAs, by focusing on the vulnerability of particular persons in certain sectors (such as health, food security, water availability, housing security, cultural integrity and so on).

### **2. Human rights can help international coordination of technology policy**

If properly coordinated, TNAs can identify common human rights concerns across many countries. The fact that human rights embody generally agreed standards is key here: persons vulnerable to human rights threats constitute, in principle, a priority for international as well as domestic law and policy.

The full report says more about what such policies might involve. They could include **multilateral mechanisms** to incentivise, subsidise

and mobilise technologies across borders. They may also involve the creation of **patent pools** and exemptions.

### **3. Making clean energy universally available is vital to protect human rights as climate change encroaches**

At present, 1.4 billion people live without access to electricity and at least 2.7 billion depend on biomass burning for their cooking and heating. A recent report by a special advisory group to the UN Secretary-General makes clear that universalising access to modern and clean energy technologies is affordable, manageable and urgent.

Such a policy is also indispensable if the world's LDCs are to adapt to climate change in the near-term and to contribute to global mitigation efforts over the longer term.

### **4. Least developed countries must constitute a priority for technology policy**

The countries most vulnerable to climate change harms and least well equipped to address them must be a starting point for international policy on both mitigation and adaptation technologies. These countries are vulnerable to more than the effects of climate change alone. Once global mitigation measures are even partly successful, carbon-based energy and transport will become increasingly expensive – whereas renewable equivalents will likely remain expensive through the mid-term.

LDCs will, rightly, not be required to take on emissions targets in the near term. As a result, they might find themselves stranded with high-carbon low-efficiency infrastructure, increasingly out of step with a low-carbon global market. This must be avoided, all the more so as these countries begin to experience human rights deterioration and resource pressures caused by climate change.

### **5. The human rights principles of participation, consultation, accountability and access to justice provide a key resource in the construction of international policy**

These principles are best articulated at the international level in the Aarhus Convention on public participation in decision-making on environmental matters, which, although it lacks universal ratification, is nevertheless signed by a majority of the Annex 2 states. Abiding by these principles will help avoid many of the pitfalls associated with technology transfer in the past, where in some cases technologies were delivered without attention to local capacity to absorb or use them, leading to disuse or misuse, and giving the principle itself a bad reputation.

## **6. A human rights focus can help the technology transfer debate transcend the old and worn-out arguments about intellectual property**

Technology transfer has been stalled on the issue of IP rights for too long. The debate is increasingly academic and abstract. It is time to move on.

There are a number of reasons to encourage a change of gears on this subject:

- (1) Policy on technology need not pivot entirely on IP rights – many of the technologies in question do not involve significant patent royalties.
- (2) The combination of climate change and human rights concerns are sufficiently pressing that they must encourage state-led coordination on technology development and diffusion, involving incentives and subsidies. In return, the inclusion of patent pooling or open licensing requirements will not only be appropriate, it will also be efficient and will fit well within existing IP protections.
- (3) There is scope within the UNFCCC negotiations to tackle this problem head on and to ensure the international legal context is prepared for IP rights reform. Should it be thought helpful to do so, human rights concerns provide an appropriate impetus.

## RECOMMENDATIONS

### 1. To All Governments

Despite almost 20 years of negotiation and accumulating evidence of climate harms, there is as yet no actionable international policy on technology transfer. Without access to a variety of technologies, the human rights of hundreds of millions are at risk from climate change. Mobilising technology transfer policy is therefore crucial to the future security of human rights and, more broadly, to global security generally. Agreement on an international technology regime is of fundamental importance to the success of climate change policy and must be prioritised. It need not wait for prior agreement on binding targets. Future rounds of negotiations must attend to the construction of a robust technology regime, drawing on the considerable work carried out by the EGTT and others.

- The decision at Cancún to create a Technology Mechanism, consisting of a technology executive committee and technology centre and network, is an important step in actualising technology policy. The Mechanism must build on the work of the EGTT, but it will nevertheless be uniquely positioned to bypass the long-running obstacles in this area and focus on a vision of technology transfer that will do justice to the longstanding hope invested in it.
- A working and coherent definition of “technology transfer” is vital. The definition must recognise that “technology” is not limited to hardware, but also involves know-how and IP, and that “transfer” is not limited to facilitation of trade and markets but involves proactive public policy measures to ensure technologies move between countries to those who need them most and are deployed in a manner that does not pose undue risks to human rights, security, the environment or livelihoods.
- Human rights standards can fulfil a number of roles in moving climate technology policy forward:
  - (i) They can serve as indicators for identifying technologies needed in specific locations.
  - (ii) They can provide a means of coordinating international policy on priority technologies, priority destinations and technological risks.
  - (iii) They can serve as a basis to guide and monitor the manner in which technologies are transferred and deployed in practice.
  - (iv) They can provide an effective moral, legal and rhetorical impetus for more clearly defining the rights and obligations with respect to technology transfer.

- IP rights have long posed a significant obstacle to progress in technology transfer. It is time to move on from this debate, as the increasingly pressing human rights concerns make clear:
  - (i) IP rights may not pose a practical obstacle for all relevant technologies. Policy can move forward swiftly, for example, on the transfer of energy-efficiency techniques, established adaptation measures, and some renewable energy technologies that do not incur prohibitive royalties.
  - (ii) Governments can move forward proactively with incentives and subsidies to promote patent pools and open licensing in the development of technologies for both adaptation and mitigation.
  - (iii) Multilateral agreements and programmes, including public–private partnerships and partnering between developed and developing countries, will be increasingly vital.
  - (iv) In extreme cases, where human rights emergencies arise due to climate change, states can lawfully turn to compulsory licensing to ensure that technologies reach those most in need, should IP rights pose an obstacle.

## **2. To Annex 2 Country Governments**

In its provisions on technology transfer, the UNFCCC speaks of “Annex 2 and other developed country parties”. Although this does not constitute a clearly defined duty-bearer, the specific countries named in Annex 2 nevertheless have legal obligations in this domain. The following recommendations are directed at Annex 2 and other “developed” countries, individually and collectively.

- Annex 2 countries are explicitly obliged under the UNFCCC to facilitate, finance and promote the transfer of environmentally sound technologies to non-Annex 1 and developing countries. Annex 2 country governments are also well-placed to mobilise technology transfer and generate economies of scale for technology developers and producers worldwide. To date, however, Annex 2 countries have done little to fulfil this obligation. It is now urgent that they take the lead.
- Given the threat climate change poses to human rights in vulnerable countries, Annex 2 country Governments must now take proactive steps to mobilise climate-relevant technologies between countries. A constructive approach will resist casting technology transfer solely in narrow terms of open markets, IP rights and enabling environments. It will recognise that without decisive action by and agreement among states, technology movements will be too few and too late.

- Annex 2 Governments are well-placed to contribute technological expertise and financial support, including through multilateral mechanisms for the effective transfer of technologies. The creation of mechanisms such as technology pools, including patent pools, will involve agreements on subsidies, investment incentives, R&D, IP rights, open licensing and technology dissemination.
- All Annex 2 measures must necessarily be responsive to the goals outlined in recipient country TNAs, National Adaptation Plans of Action and Nationally Appropriate Mitigation Activities, as well as to the instructions of the COPs to the UNFCCC and to the human rights obligations of all parties.
- Annex 2 countries should incorporate their UNFCCC technology obligations into their development policies and into those of the international financial institutions. Human rights provide a means of assessing and orienting development policy with regard to climate technologies for adaptation and mitigation. The Aarhus Convention is among the relevant treaties in this regard.

### **3. To Non-Annex 1 Country Governments**

Although named in the UNFCCC as the beneficiaries of its provisions on technology transfer, non-Annex 1 countries do not constitute a bloc or shared set of interests, economically, legally or politically. The following recommendations are thus aimed at the various groupings that comprise non-Annex 1 countries, and in particular the LDCs.

- Non-Annex 1 Governments would benefit from an assessment of the degree to which expected climate harms will have human rights impacts in their countries. These evaluations should inform the identification of technologies in country TNAs, NAPAs, NAMAs and NTPs, with a view to providing clear recommendations to the international community, and to donors and financial institutions, on the prioritisation of adaptation and mitigation technologies for addressing climate change.
- South–South technology transfer, as practiced notably by Brazil, is an invaluable resource and may have a demonstration effect in showing how best to construct successful models of technology transfer. It is not, however, a substitute for the technology transfer provisions of the UNFCCC.
- LDCs and other recipients of development aid are well-placed to negotiate the deployment of aid towards the fulfilment of human rights by virtue of Article 2.1 of the ICESCR. Climate change-related aid in particular will be well targeted where it is

oriented towards current or predicted human rights threats to food, water, health, housing and livelihoods, in particular, or to ward off forced migration.

- Non-Annex 1 countries that are not LDCs may be well placed to take the lead on demonstrating climate-constrained developmental paths that can successfully incorporate human rights obligations, in part through investment in, and R&D of, indigenous technologies.

#### **4. To Civil Society Organisations**

- Legal advocacy groups dealing with human rights or environmental law (or both) could explore the degree to which obligations undertaken through the UNFCCC, human rights treaties, or elsewhere may leave states or private entities liable for actions that have blocked or failed to facilitate technological transfer with human rights consequences.
- Environmental organisations and especially climate change groups may benefit from incorporating human rights goals and standards into their work on climate change technology.
- Human rights organisations must take seriously the threat of climate change and show an openness to public policy positions that might not fit easily within classical human rights discourse.
- Social science and research institutions must forge a road ahead for technology transfer, by demonstrating where technologies can most usefully be adapted to different contexts and how they can most efficiently contribute to the twin goals of furthering human rights and development in the face of climate change. Research must also be undertaken into the legal and practical obstacles to climate change technology transfer.

#### **5. To UN and Other International Agencies and Bodies**

- The UNFCCC Secretariat should consider the creation of a working group on human rights and climate change with a view to informing the construction of the Technology Mechanism and other relevant bodies. It should further empower the existing human rights liaison at the Secretariat.
- The UN Human Rights Council should continue to remain apprised of developments at the UNFCCC, to undertake its own investigations in this area, and to ensure that the human rights consequences of climate change are closely monitored and addressed. The Council should consider the appointment of a Special Procedure on climate change and human rights.

- As the principal formal locus of research into the human rights effects of climate change, it is vital that the Office of the High Commissioner of Human Rights retain a presence in this research domain and continue to influence policy.
- A number of UN Special Procedures have been following climate change developments, integrating it into their mandates and making valuable recommendations. These include the Special Rapporteurs on the Right to Adequate Food; on the Right to Housing; on the Right to Health; on Extreme Poverty and Human Rights; and the Independent Expert on the Right to Water and Sanitation. In each of these areas, and where other Special Procedures are touched by climate change, it would be valuable to undertake investigations into the role of technology in exacerbating or addressing the human rights harms of climate change and recommending policy orientations to governments.
- The Committee on Economic, Social and Cultural Rights is ideally placed to seek information from countries on the degree to which their technology policies meet their human rights obligations with regard to the impacts of climate change or the manner in which the inappropriate deployment of risky technologies might compromise human rights.
- Other UN bodies – principal among them UNEP, UNDP, UNCTAD and the WHO – will find it fruitful to integrate the technology–human rights nexus into their work. Studies might be undertaken within each agency with a view to making recommendations on the optimal mode of integrating climate technology exigencies in their particular mandates.
- Technologies relevant to disaster preparation and early warning systems will be vital to humanitarian agencies such as the ICRC, IFRC and UNHCR. In each case, human rights language may provide a useful motivator for mobilising funding and energy towards creating the technological infrastructure to manage climate harms before they become catastrophic.
- There is a role for agencies dealing with trade and IP, notably at the WTO and WIPO, to investigate the existing legal architecture in order to determine whether it helps or hinders the transfer of technologies necessary to mitigate the human rights impacts of climate change. Given its mandate, WIPO is particularly well-placed to explore multilateral approaches to options of patent pooling and open licensing in the climate technology domain.



## I. TECHNOLOGY TRANSFER TODAY: ADDRESSING THE IMPASSE

Technology transfer has been a fraught issue within the climate change negotiations over the years, and for good reason: all parties recognise the centrality of technology to any solution to climate change, but deep-seated differences exist over how the movement of technologies between states should be managed and allocated. Technology lies at the heart of climate change policy in part because progress in both mitigation and adaptation – the two key areas of urgent action to address climate change – necessarily relies on technological solutions. Technology transfer takes on special prominence given the imperative, both political and legal, of achieving long-standing development objectives in a world increasingly subject to the powerful constraints climate change imposes.<sup>2</sup>

It is, however, the very centrality of technology to each of these areas of policy that has complicated international agreement. It is not enough to ask *what* technologies are needed to address climate change: we also need to know *how* to ensure that the relevant technologies can in fact achieve the goals expected of them. For this to happen, the right technologies must reach the right people. To know *which* are the right technologies and *who* are the right people involves a series of value judgements about what, precisely, climate change policy should be doing beyond the consensus view that it must put a halt to the phenomenon itself and contain or reverse, insofar as possible, its effects.

Put another way, if we can identify the most pressing technological solutions for specific climate change problems, we still must figure out how to make these technologies available in response to the identified needs. It often seems as though this latter question of technological access or distribution has been the sticking point in international negotiations on technology transfer. Before the question of access can even be addressed, however, problems arise at the level of identifying the needs that require fixing. There are numerous possible climate change needs: how are they to be prioritised?

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<sup>2</sup> The best account of this relationship is Paul Baer, Tom Athanasiou, Sivan Kartha, and Eric Kemp-Benedict, *The Greenhouse Development Rights Framework*, Revised second edition, EcoEquity/SEI (November 2008).

None of these questions have so far been resolved in the international climate change negotiations. Although there has been plenty of exploration of “technology needs” and “barriers” to transfer, there has been precious little agreement over *which* needs are priorities, and what constitutes a “barrier”. A careful parsing of the existing definitions of climate change and of the history of textual agreement and compromise to date will demonstrate that it is not just that precise articulation of the problem has proven elusive: it is also that precise articulation has frequently been actively, and often artfully, avoided. Despite their evident value, the current UNFCCC texts do little to nail down the term “technology transfer”, not, at least, in such a way that it might acquire either legal definition or clear policy orientation.<sup>3</sup> Rather, they have settled for a somewhat compromised rhetorical stance that supports the notion in principle while evading clear definition in practice.

Underlying the difficulty of articulating policy in this area is the recognition that any course of action will entail costs. Developing technologies is costly. Producing them is costly. Making them available where they are most needed is costly.<sup>4</sup> The problem resides in part in the complex matter of figuring out what the costs will be and who should bear them, and this task is further complicated by the uncertainties and probabilities that underlie climate science. All of these difficulties are furthermore compounded by a long-running and fundamental disagreement as to the proper way in which costs of this kind should be assessed and allocated at all. For some, technological development and access are essentially market concerns: policy interference of any kind – insofar as it involves proactive government intervention – is likely to be counter-productive. For others, technology is a political and moral imperative too urgent (in terms both of time lost and damage) to be left to the vagaries of market forces.

Progress on technology transfer over the years has depended upon the development of a language that is amenable to both these positions, focusing on “capacity building”, the creation of “enabling

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3 The principal documents on technology transfer are available on the UNFCCC website at: [unfccc.int/documentation/documents/items/3595.php](http://unfccc.int/documentation/documents/items/3595.php).

4 Much of the technology transfer literature is devoted to the question of costs and who should bear them. For our purposes, the principal positions are neatly summed up in John Barton, “Future Climate Technology Regimes: An Assessment of the Macro-Environmental Context from a Human Rights Perspective”, Paper produced for the ICHRP Project on Climate Technology Policy, presented at Geneva, July 2009. See the discussion of Barton’s paper below.

environments” and the determination of “mechanisms” for transfer. Anyone following the debate closely will know that, despite apparent terminological harmonisation, neither position has shifted very much, if at all. In the main, debates have centred on IP, but as many decades of discussion have shown, this has not proven a valuable talking point in ensuring progress on technology transfer. While progress on IP will matter if transfer is to take place, the primary barrier is more fundamental: it appears to lie in opposing economic views that are frequently entrenched, dogmatic, and ultimately unsustainable, and that have shifted little over the decades. In short, technology transfer has fallen victim to an age-old debate over state intervention versus market forces.

The result is paralysis. Insofar as climate technology diffusion has taken place *in fact*, the contribution of the UNFCCC process has been modest in the extreme. For the most part, North-to-South movements of climate technologies, where they have happened, have taken place through ordinary market transactions, with a few such movements due to the Kyoto mechanisms, notably the Clean Development Mechanism (CDM) and the Global Environment Facility (GEF). They have been sporadic and uncoordinated and utterly inadequate to the unique challenges of climate change. They have rarely informed policy in developing countries and have had negligible impact in the LDCs, let alone for those individuals most vulnerable to climate change effects. Almost 20 years after the UNFCCC was signed at Rio in 1992, technology transfer remains, in effect, a contentious term and an unclear policy objective.

## **A. HUMAN RIGHTS AND TECHNOLOGY TRANSFER**

This report aims to respond to this challenge. Its purpose is to provide a basis for determining some minimal parameters for the obligation to transfer technology that can circumvent the tired opposition between state and market. The report starts from the premise, originally laid out in the ICHRP’s 2008 *Rough Guide*, that human rights provide a language on which broad agreement already exists over minimal standards for

action.<sup>5</sup> Human rights do not, of course, provide solutions for the various disputes that continue over technology transfer, but they can arguably help identify core areas of agreement: a basis for urgent, if minimal, actions in the face of climate imperatives that may help overcome the deadlock, pending broader agreement on larger aims. In short, the rationale for this claim is as follows:

- Many of the key areas identified by the Intergovernmental Panel on Climate Change (IPCC) as vulnerable to the effects of climate change are also able to be articulated in human rights terms, which therefore provide a means of prioritising essential areas of intervention and distinguishing these from less essential areas.
- Human rights provide a common language for basic justice claims, a language that is acceptable in all of the world's countries, developed and developing alike, and among most social groups. Moreover, the claims articulated as human rights comprise legal obligations in most of the world's states.
- Human rights put the person at the centre of policy analysis. When it comes to the groups most vulnerable to climate change, a human rights lens prompts the policy focus to begin with the persons that

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5 A burgeoning literature now exists on the relationship between human rights and climate change. Among many examples, the following stand out: Daniel Bodansky, "Climate Change and Human Rights: Unpacking the Issues", 38 *Georgia Journal of International and Comparative Law* 511 (2010); Elisabeth Caesans et al., "Climate Change And The Right To Food: A Comprehensive Study", Columbia Law School Human Rights Institute and the Special Rapporteur on the Right to Food (2009); Edward Cameron, *The Human Dimension of Global Climate Change*, 5 *Hastings West-Northwest Journal of Environmental Law and Policy* 1 (2009); Mac Darrow, Siobhan McInerney-Lankford, Lavanya Rajamani, *Human Rights and Climate Change: A Review of the International Legal Dimensions*, World Bank (2011); Jessie Hohmann, "Igloo as Icon: A Human Rights Approach to Climate Change for the Inuit?" 18 *Transnational Law and Contemporary Problems* 295 (2009); John H. Knox, "Climate Change and Human Rights Law", 50 *Virginia Journal of International Law* 163 (2009); John H. Knox, "Linking Human Rights and Climate Change at the United Nations", 33 *Harvard Environmental Law Review* 477 (2009); Svitlana Kravchenko, "Right to Carbon or Right to Life: Human Rights Approaches to Climate Change", 9 *Vanderbilt Journal of Environmental Law* 513 (2008); Marc Limon, "Human Rights and Climate Change: Constructing a Case for Political Action", 33 *Harvard Environmental Law Review* 439 (2009); Siobhan McInerney-Lankford, "Climate Change and Human Rights: An Introduction to Legal Issues", 33 *Harvard Environmental Law Review* 437 (2009); Anne Parsons, "Human Rights and Climate Change: Shifting the Burden to the State?" 9 *Sustainable Development Law and Policy* 22 (2009). See also the contributions to Stephen Humphreys (ed.), *Human Rights and Climate Change*, Cambridge University Press (2009).

are themselves likely to be affected and to build policy around the goal of reaching these individuals, thus connecting the local, national and international.

- Human rights provide a complementary framework of international law to the climate change regime. The aims of both regimes overlap substantively, and it is helpful, therefore, to read international obligations in the light of both regimes.
- Human rights provide a *minimal* area of policy intervention, one that is not in itself overly onerous, but below which policy should not fall. This means that they provide a floor on which policy must rest, but do not impose a ceiling. In the *Rough Guide*, we referred to human rights as providing thresholds in setting policy.<sup>6</sup>
- Human rights principles of participation and accountability, articulated in, for example, the Aarhus Convention on public participation in environmental matters, can be critical to ensuring that basic errors are avoided in the construction of climate change policies.

In short, human rights can provide an effective means of focusing and prioritising areas for climate change intervention. Moreover they provide a means that rests on a widely accepted consensus regarding appropriate standards. A human rights focus would suggest that it is the most vulnerable *individuals in the most vulnerable countries* that ought to be prioritised. Following the same logic, vulnerable groups in LDCs would be prioritised, as a matter of international policy, over those in the richer developing countries. This focus on vulnerability – long recognised as a priority category in successive IPCC reports – is also indicated in the burgeoning work on climate change emerging

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6 ICHRP (2008), 7: "If an effect of climate change is to cause the living conditions of specific individuals to sink below these understood thresholds, it might be considered unacceptable (or even unlawful)." A similar assessment applies to climate policy choices – no policy option would be acceptable if it entailed deterioration in human rights protections below a certain threshold. The notion of thresholds is attributable to Simon Caney. See Caney, "Climate Change, Human Rights and Moral Thresholds" in Stephen Humphreys (ed.), *Human Rights and Climate Change*, Cambridge University Press (2009).

from the UN Human Rights system.<sup>7</sup>

In this report, we will examine these claims in more detail; however, the report looks more closely at the obligations and actions of the apparent duty-bearers under the UNFCCC (Annex 2 countries) than the measures available to developing countries themselves. In the remainder of Chapter 1, we lay out the key terms of the technology debate in climate change: technology transfer, mitigation and adaptation, touching on their human rights implications. Chapter 2 provides a broader case for technology transfer based on the ethics of human rights. Chapter 3 teases out the underlying causes for disagreement regarding the technology requirements of the UNFCCC and, without taking sides, identifies a core minimum obligation that must necessarily underlie any interpretation of the treaty text and negotiating positions. Chapter 4 addresses the various barriers to technology transfer while Chapters 5 and 6 put human rights to work with regard to the subject, asking how human rights can contribute to technology policy. This is done specifically within the domains of adaptation, with particular reference to the right to food, (Chapter 5) and mitigation (Chapter 6).

## **B. THE NEED FOR TECHNOLOGY TRANSFER**

The impacts of climate change call for access to technologies, in particular in places where these impacts will wreak havoc with current livelihoods, dwelling places, food and water sources, and economic systems. These

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7 See in particular, UN Doc. A/HRC/10/61, Report of the OHCHR on the relationship between climate change and human rights (15 January 2009). The full extent of engagement of the UN Human Rights Council with climate change can be found on the OHCHR website at: [www2.ohchr.org/english/issues/climatechange/index.htm](http://www2.ohchr.org/english/issues/climatechange/index.htm). The main points are provided as follows:

On 28 March 2008, the Human Rights Council adopted its first resolution on “human rights and climate change” (res. 7/23). In implementation of that resolution, the OHCHR prepared and submitted a study on the relationship between climate change and human rights (A/HRC/10/61) to the tenth session of the Council held in March 2009. On 25 March 2009, the Council adopted resolution 10/4 “Human rights and climate change” in which it, *inter alia*, notes that “climate change-related impacts have a range of implications, both direct and indirect, for the effective enjoyment of human rights ...”; recognizes that the effects of climate change “will be felt most acutely by those segments of the population who are already in a vulnerable situation ...”, recognizes that “effective international cooperation to enable the full, effective and sustained implementation of the United Nations Framework Convention on Climate Change ... is important in order to support national efforts for the realization of human rights implicated by climate change-related impacts”, and affirms that “human rights obligations and commitments have the potential to inform and strengthen international and national policy-making in the area of climate change”.

technological needs, broadly speaking, involve “adaptation” to climate change. However, climate change also involves another urgent set of technology needs to mitigate its effects. Countries everywhere must ultimately progress towards carbon-neutral economies, and in many cases they must do so while simultaneously improving conditions of “development” for expanding populations. Technological needs also exist for energy generation and transport (and so on) in places whose inhabitants did not themselves cause the climate problem but who also do not have the wherewithal to take the steps necessary to address it.

Determinations of technological needs must be based on solid predictions about climate change effects. Mitigation needs seem more straightforward from this perspective, as any switch to carbon-neutral technologies in any domain (energy, land-use, transport, and so on) stands unequivocally to improve upon a business-as-usual (BAU) scenario. Technologies for climate change adaptation, on the other hand, appear a little more complicated. Specific information about climate change impacts on particular people in particular places is needed in order to make informed policy decisions about the viability of technological choices.

This distinction, however, should not be overdrawn. Technology choices regarding mitigation take place against a larger backdrop of allocation of access to greenhouse gas (GHG) emissions in what is increasingly going to become a zero-sum game. Climate change mitigation is a global affair: ultimately, each choice to allow GHG emissions to take place in a certain location or for a particular activity also involves a decision not to permit emissions to be used elsewhere for other activities. Choices about how this increasingly unavoidable trade-off is to be made must shape technology decisions in the area of climate change mitigation. The same choices will also shape the development options available to the world’s countries in a future climate-constrained world.

Adaptation technologies, for their part, are generally dual-function: they are not merely means of adapting to climate-wrought changes; they are also (generally) a means of supporting certain kinds of lifestyles, cultures, or basic needs or standards in areas where these come under pressure due to climate change. The latter goals frequently overlap with or restate development goals. Since adaptation technologies may frequently (if not always) have a developmental component, many such technologies will retain a significant utility in addressing the larger climate change problem (that is, the pressure it places on development) even in cases where the climate science itself remains uncertain. We will now examine both mitigation and adaptation in further detail.

## 1. Mitigation

Mitigation choices do not merely involve the replacement of existing carbon-based technologies with new renewable or carbon-neutral technologies. As we discuss in Chapter 6, in much of the world, energy levels are grossly inadequate to the present needs of populations, and the priority is to extend energy availability from a very low base. Calculations about the appropriate kinds of technology on which to focus global investment policies must take into account that some low-carbon energy sources (nuclear power, for example) have an inherently limited reach (they are unlikely ever to reach beyond their current usage patterns),<sup>8</sup> whereas the effectiveness of others (solar, wind or hydropower) is highly sensitive to local geo-climatic factors.

At the same time, the locus of technological development and the locus of its optimal deployment need not be one and the same. Viewed as a global issue, significant economies of scale will emerge for the export of technology systems to those places where they are most useful.<sup>9</sup> In short, climate change significantly alters the rationale for investment in “green” and “clean” technologies, particularly when the global developmental context is also taken into account. This intuition underpins the standard market approach to technology “development and diffusion” and continues to inform much thinking on technology transfer. The difficulty with this approach is, however, that the actual context in which technology transfer must take place does not fulfil the ordinary conditions for broad market diffusion.

On one hand, local and national investment decisions must be informed by and be responsive to *global priorities*. Among those priorities is the urgency of getting technologies to people who do not constitute “markets” in the ordinary sense (i.e., their demand for certain technologies is not driven primarily by economic factors) but in a sense that takes into account climatic factors that are (1) beyond their control; (2) causing a deterioration in quality of life; and (3) immediate and pressing. These needs are not necessarily identifiable at the local level in the first instance. As they derive from global processes they can, in many cases, be identified in advance primarily through a global, rather than a local, lens.

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8 See, in this regard, COM 781 final, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Second Strategic Energy Review: An EU Energy Security and Solidarity Action Plan* (13 November 2008).

9 For example, the potential global market for low-cost solar power technologies is well documented.

By corollary, investment decisions taken at the local, national or firm level will also have impacts on a global context in which access to carbon is necessarily interdependent. That is to say, any decision to emit GHG in one area implicitly requires reducing GHG somewhere else. In such a situation there is no alternative to *global coordination*, and even if market mechanisms are deployed to help achieve such coordination, the policy challenge remains to construct national- and firm-level investment and distribution decisions in the light of *global objectives*.

Climate change mitigation must be viewed in *global* terms because the broader objectives of GHG mitigation are only meaningful at global level. Whereas a global target must unavoidably be broken down into national targets (a notoriously complex exercise) it is nevertheless universally recognised and repeatedly affirmed in the climate change texts that global GHG mitigation cannot come at the expense of the development goals of the world's developing countries. This injunctive might be viewed as a "strong constraint" on any attempt to articulate a global mitigation policy. It is restated in paragraph 6 of the "shared vision for cooperative action" in the Cancún Agreements:

*Parties should cooperate in achieving the peaking of global and national greenhouse gas emissions as soon as possible, recognizing that **the time frame for peaking will be longer in developing countries**, and bearing in mind that **social and economic development and poverty eradication are the first and overriding priorities of developing countries** and that a low-carbon development strategy is indispensable to sustainable development.*<sup>10</sup>

This imperative of *increasing* development in some parts of the world while at the same time achieving overarching GHG *cuts* requires that a number of basic assumptions be fulfilled:

- (1) **Vulnerable countries (in particular) are assumed to have continuing access to "developmental space" in the near term.** Given that rising living standards are bound to lead to increases in GHG emissions, the poorest countries must not be penalised for near-term increases.

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<sup>10</sup> UN Doc. GE.10-70914, Draft decision [-/CP.16], Outcome of the work of the Ad Hoc Working Group on Longterm Cooperative Action under the Convention [hereafter LCA COP 16], para. 6. Emphasis added.

- (2) **Steep reductions in emissions of developed countries must take account of this extra “developmental space” in developing countries.** Given that a number of developing countries will continue to increase emissions for some time, cuts in developed countries must be comparatively steeper than they would otherwise be, to take the increases elsewhere into account.<sup>11</sup>
- (3) **Wealthier countries can help poorer countries to develop while at the same time contributing to reduced global GHGs over the longer term.** This is not quite the same as offsetting. Developed countries cannot effectively (solely or even substantially) meet their own targets by contributing to reduced emissions elsewhere (from a BAU baseline), as this would lead to significant GHG accounting inconsistencies. Only a tiny percentage of the GHG reductions required by developed countries will ever be feasibly available in developing countries.<sup>12</sup> Nevertheless, targeted efforts to contribute to low-emission development in poorer countries must presumably be made to count towards the emissions budgets of both countries (where achieved reductions are quantifiable, monitored, and verifiable).

The third assumption is where technology transfer may be expected eventually to come to the fore as more than simply an obligation under the international law of climate change. There, technology transfer can be seen as an indispensable element of any practical solution that might stand a chance of fulfilling the basic parameters of a global deal and achieving the enormous global GHG cuts necessary to stave off climate change. Once GHGs are viewed as a scarce global good (i.e., once it is clear that the uses to which they are put are limited and ultimately exclusive) any choice involving the reduction of GHGs or their limited increase in some (developing) contexts, will also involve having to prioritise some uses over others. How then should such priorities be set?

Human rights fulfilment must figure among the basic criteria for allocating GHG emissions priorities. There are legal, practical, political, and ultimately ethical grounds for bringing human rights to bear in this way, and human rights provide an optimal means of making fraught decisions of this sort as they provide minimal thresholds for the acceptable distribution of public goods, and do so in a language that is near universally accepted.

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11 Both of these assumptions are made in the IPCC's reports and fleshed out in detail and usefully discussed in Baer et al. (2008), *supra*.

12 The arithmetic is laid out in George Monbiot, "The rich can relax. We just need the poor world to cut emissions. By 125%", *The Guardian*, July 13, 2009.

## **2. Adaptation**

Adaptation to climate change until recently played a secondary role at climate negotiations, viewed by many as a potential distraction from the more urgent work of setting mitigation policy. However, with the growing recognition that a certain amount of climate-induced change is now inevitable, adaptation has moved to the heart of discussion.<sup>13</sup> At the same time, technology policy too was initially considered largely in the context of climate change mitigation only. Today, by contrast, States party to the UNFCCC have clearly asserted their view “that the objective of enhanced action on technology development and transfer is to support action on mitigation and adaptation in order to achieve the full implementation of the Convention”.<sup>14</sup>

These are nevertheless very different goals involving diverse technologies existing in different policy contexts. The key sectors for adaptation technologies include (citing the most recently agreed text) “the areas of water resources; health; agriculture and food security; infrastructure; socioeconomic activities; terrestrial, freshwater and marine ecosystems; and coastal zones”.<sup>15</sup> This list is clearly non-exhaustive although it is broad.

Three obvious implications for technology policy jump out from the above description. First, a broad spectrum of technological apparatuses potentially falls within the scope of this objective. Second, the requirement that such technologies be “environmentally sound” is necessarily of a different kind than the same requirement with regard to mitigation technologies.<sup>16</sup> Whereas mitigation technologies must necessarily aim at an ideal horizon of carbon neutrality, environmentally sound technologies (ESTs) for adaptation must aim at global benchmarks recognising local variations. These technologies must reflect best available environmental standards in current use, given costs, resources, and the urgency of adaptation imperatives (see Chapter 3, below). Third, the list is largely coextensive, or at least consonant, with the principal objectives of development policy, as found, for example, in the Millennium Development Goals.

The consonance of climate change adaptation objectives and

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13 LCA COP 16, para. 2(b): “Adaptation must be addressed with the same priority as mitigation and requires appropriate institutional arrangements to enhance adaptation action and support”.

14 LCA COP 16, para. 113.

15 LCA COP 16, para. 14(a) at note 1.

16 See, for example, LCA COP 16, paras. 120 and 123.

developmental goals has long been recognised and debated. In general, the trend has been to keep the two separate despite their congruence, for two main reasons:

- (1) **Financial** – Insofar as there has long been a quasi-formal global economic arrangement in which developed countries lend or donate funds to developing countries to further development, a fundamental element of the climate change regime has been to regard funding for climate change adaptation as “new and additional” to that funding.<sup>17</sup>
- (2) **Philosophical** – Perhaps a stronger reason to keep adaptation and development goals apart is that the fundamental impetus for their fulfilment differs, at both national and global level.<sup>18</sup>

To flesh out the latter point, bilateral development aid has generally retained a more or less explicit link to the national interests of donors, and multilateral aid has prioritised growth *per se*, with relatively little regard to the distribution of the benefits of such growth at *local* level.<sup>19</sup> By contrast, adaptation policy must necessarily focus firmly on particular *local* problems needing fixes. The local is the driving priority; the *national* provides the legislative and policy context for reaching it; the *global* provides only the means and overarching context. By contrast with international developmental policy, there is no reason that adaptation policy should benefit non-locals, such as foreign investors (a key stakeholder in development policy).

To put it another way: adaptation policy is about the survival of individuals or communities and the maintenance of basic public standards. Unlike development policy, adaptation is not primarily about fuelling growth *per se*.

The particular complexity of adaptation policy lies precisely in the imperative to reach those most vulnerable to the ravages of climate change. Adaptation interventions must be grounded on a reasonably reliable understanding of expected climate change effects, taking account of socioeconomic and political factors as well as physical and climatic probabilities at local level. Compiling information to the degree of sophistication necessary to provide a basis for action and to enable prioritisation between different actions is an immense challenge. There

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17 See UNFCCC, Art. 4.3; also LCA COP 16, paras. 18 and 97. See ICHRP (2008), 21–22.

18 See Stephen Humphreys, “Climate Change and International Human Rights Law” in Rosemary Rayfuse and Shirley Scott (eds), *Climate Change and International Law*, Edward Elgar (forthcoming 2011).

19 See, Robert Hunter Wade, “Is globalization reducing poverty and inequality?”, 3 *World Development* 567–589 (2004).

is, however, already a good informational basis for identifying some communities likely to be highly vulnerable to certain climatic effects, and this provides a basis for preliminary action.

### **C. DEFINING THE TERMS**

In a 2000 report, an IPCC Working Group produced a working definition of technology transfer, describing it as:<sup>20</sup>

*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, non-governmental organizations (NGOs) and research/education institutions ... the broad and inclusive term "transfer" encompasses diffusion of technologies and technology cooperation across and within countries. It covers technology transfer processes between developed countries, developing countries, and countries with economies in transition. It comprises the process of learning to understand, utilize and replicate the technology, including the capacity to choose and adapt to local conditions and integrate it with indigenous technologies.*

The group conceded that their "treatment of technology transfer ... is much broader than that in the UNFCCC or of any particular Article of that Convention", yet it is a definition that has been widely repeated, presumably, because a broad definition suits most speakers.

We will not use this broad definition here; rather, we will aim to stick with a much narrower definition taken directly from the Convention texts. We will examine this terminology in greater detail in Chapter 3. For now, it is sufficient to lay out a few basic principles. In keeping with the accepted international law practice that treaty terms be interpreted in accordance with their "ordinary meaning", "in their context" and in light of the treaty's "object and purpose", the term "technology transfer" would appear to have a number of basic significations.<sup>21</sup>

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20 Stephen O. Andersen et al. "Technical Summary" in Bert Metz, Ogunlade R Davidson, Jan-Willem Martens, Sascha N.M. van Rooijen and Laura Van Wie McGrory, *Methodological and Technological Issues in Technology Transfer: A Special Report of IPCC Working Group III*, Cambridge University Press (2000), 15–16.

21 Vienna Convention on the Law of Treaties (VCLT), Art. 31.1 states: "A treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose." Chapter 5 looks in more detail at the potential application of the VCLT to this set of issues.

## **1. Technology: hardware, know-how, training**

“Technology” is a broad term that can, in the climate change context, be reduced to “mitigation” and “adaptation” technologies. There are cases where one technology can contribute both to mitigation and adaptation (e.g., some agricultural techniques<sup>22</sup>), but in general the distinction holds. Mitigation technologies reduce the amount of GHGs from a given baseline in, for example, energy production, transport, waste management, urban planning and housing design. Adaptation technologies involve interventions into the specific sectors to deal with climate-related stresses in agriculture, land reclamation or water purification, for example.

Two further questions arise in the climate context. First, by “technology” do we mean hardware (actual machinery), or do we mean something softer like “know-how”, the capacity to construct, wield, maintain, or adapt technologies? Do we mean design? The right to reproduce certain technologies (i.e., information of a kind often guarded in patents)? As we shall see in Chapter 4, a fixation on IP in the debate is unsurprising insofar as the term “technology transfer” itself has historically been conceived in relation to IP, but it is not necessarily helpful. Sticking with a narrow construction according to the ordinary meaning of the terms of the text, “technology” covers each of these three concerns: hardware, know-how and design.

## **2. Transfer: something more than “trade”**

What about “transfer”? On one hand, the term involves the recognition that the optimal locus of development is not necessarily identical to its optimal locus of deployment. “Transfer” in this sense need not mean crossing national borders, but it is clear from the context of these admonitions in the climate change treaty texts that it does, in fact, have that connotation.<sup>23</sup> Transfer in this cross-border sense has a trade element, as it is also the central premise of international trade relations that production and consumption need not be collocated. Free-trade agreements consistently lead to increasing production of commodities far from their point of consumption.

“Transfer” must also necessarily mean something *more* than “trade”. The very fact that this terminology is supplementary to the trade regime denotes that “something more” is at issue in dealing with climate change. Although the text does not specify what precisely this “something more” consists of, it does describe the particular functions that transfer is to fulfil. UNFCCC Article 4(5) tells us that the purpose of technology transfer

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22 See Frances Seymour in Humphreys (ed.), *Human Rights and Climate Change*, CUP (2008).

23 See note 21, above, on the VCLT, advising attention to “context” in interpreting terms.

to developing countries is “to enable them to implement the provisions of the Convention.” That is, to allow developing countries to contribute to the global goal of climate mitigation and the local goal of climate adaptation while dealing with “economic and social development and poverty eradication [as their] first and overriding priorities” (UNFCCC, Art. 4.7). The unavoidable implication is that “technology transfer” is needed because the ordinary functioning of the international trade regime will not be adequate to the technological needs of the climate change regime.

As we have already seen above, there appear to be good reasons for the introduction of this proactive language in response to the specific exigencies of climate change. Essentially, there are two such reasons:

- (1) **Widespread acknowledgement that market uncertainties limit the availability of both mitigation and adaptation technologies where they are most needed** – The demand for these technologies in this context is not market-driven; it derives from climate vulnerability whose effects are exogenous and essentially independent of prevailing market conditions. There seems little reason to believe – and every reason to doubt – that the market will effectively channel and diffuse vitally needed technologies to the most vulnerable persons and countries.
- (2) **The profound sense that the harms caused by climate change are unjust, and that those who caused them must proactively contribute to the well-being of those who are affected.**

### **3. Public and private goods and actors**

If “technology transfer” is not simply synonymous with “international trade in technologies”, to what then does it refer? The point is clearly not a mere technology “exchange” between two parties; it is a “transfer” from one party to another. A reading of the ordinary meaning of the terms themselves implies such proactive agency. But from whom to whom? As discussed in Chapter 3, the texts are clear that “transfer” involves, at a minimum, movement from developed to developing country state parties, or rather, from Annex 2 to non-Annex 1 Parties. Transfer involves the agency of states; it is a public policy intervention, but this formulation alone is imprecise and problematic and must be supplemented.

It is imprecise because most technologies are not “public” goods in any simple sense. They can be held in either public or private hands and are today most frequently held in private hands even when they clearly serve a public interest (such as energy production). This matters because were all relevant technologies publicly owned, the implications of “transfer” would be relatively straightforward: it would presumably mean from one

government or set of governments to another. The fact that technologies are held in private hands complicates any such notion of transfer. Private parties are ordinarily not directly obligated under international law. How are the public parties to climate treaties to fulfil an obligation that involves material objects they do not themselves own or control?

The same problem is found at the recipient end of the transfer equation. Are technologies to be transferred *into* public or private hands? Again, the language of the texts would appear to imply public-to-public transfers, whereas a common approach to technological movement would rather assume private-to-private transfers. At a minimum, if the transfer of climate adaptation technologies are to fulfil their purpose, they might be expected ultimately to wind up in private hands. Indeed, one can imagine at least four possible permutations for “technology transfer”:

- (1) Annex 2 *public* to non-Annex 1 *private*;
- (2) Annex 2 *private* to non-Annex 1 *private*;
- (3) Annex 2 *public* to non-Annex 1 *public*;
- (4) Annex 2 *private* to non-Annex 1 *public*.

John Barton, in a paper commissioned by the ICHRP, identified two principal means by which technology transfer can take place:<sup>24</sup>

*One is for direct transfer by the public sector, as exemplified by global plant breeding under the auspices of the Consultative Group on International Agricultural Research (CGIAR), which has traditionally made new plant varieties directly available to the farmers or agricultural research organizations of developing nations.<sup>25</sup> The other is through private sector transfer – this pattern typically involves a license from a developed world licensor who has IP rights to a developing world licensee who then uses the technology and pays a royalty in return ... And, as will be seen, there are methods of combining public and private sector roles, some of which are likely to be especially important in the climate change sector.<sup>26</sup>*

These two existing modes of transfer comprise roughly the first and second

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24 John Barton, “Future Climate Technology Regimes: An Assessment of the Macro-Environmental Context from a Human Rights Perspective” (2009), unpublished paper on file with the ICHRP. References preserved.

25 See [www.cgiar.org](http://www.cgiar.org).

26 See, e.g., John Barton, “New Trends in Technology Transfer”, International Centre for Trade and Sustainable Development, Intellectual Property and Sustainable Development Series, Issue Paper 18 (February 2007).

of the four possible permutations located above. It is worth bearing in mind that they do not exhaust the possibilities: transfer may also take place to non-Annex 1 governments, who might then deploy them directly (as the second two modes, above, appear to suggest) or pass them on to the private sector as might be expected. In fact, as transfers may be either bilateral or multilateral, there are many more permutations even than these four. There are also long imaginable chains between private actors, with public actors playing a mediating role, for example:

*Annex 2 private to Annex 2 public to non-Annex 1 public to non-Annex 1 private.*

This need not be too complicated: there are numerous available means to systematise multilateral and bilateral transfers of technology between public and private actors alike. Indeed, the recent strategic thinking within the UNFCCC envisages just such measures.<sup>27</sup> Nevertheless, the fact that the UNFCCC is not clearer on these issues has arguably permitted the implementation of the technology provisions to languish thus far.

#### **4. “Developed” and “developing” countries**

That “transfer” takes place between developed and developing country parties, although uncontroversial in principle is also problematic in practice. This is because the distinction itself is increasingly fraught. Certain countries (e.g., China and Brazil) no longer seem to fit neatly into this framework.

The UNFCCC is precise on this question, distinguishing between “Annex 1”, “Annex 2” and “non-Annex 1” Parties, referring to lists of specific countries laid out in the Annexes to the treaty. Non-Annex 1 countries qualify as developing and thus appear as potential claimants under the UNFCCC technology provisions. The group includes not only all 47 LDCs, but also relatively large economies such as Brazil, China and India. It covers essentially the whole of Latin America; Central and East Asia other than Japan; the entire African continent, both North and South; and the Middle East (including Israel and oil-rich states such as Saudi Arabia). It not only seems unjust that all of these countries might be treated as though they were equal (from the perspective of technological access), but their great divergence has also complicated agreement on unified positions on this topic, again contributing to delays in this domain.

The present report is not the place to weigh in on these difficult issues,

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<sup>27</sup> See FCCC/SB/2009/3, “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. Report by the Chair of the Expert Group on Technology Transfer” (May 2009).

other than noting the danger of continuing a general paralysis on technology transfer that not resolving these difficult issues creates (and has created). It is perhaps understandable that Annex 2 countries are reticent to put in place structural transfers to large emerging economies with whom they are in some respects competing. However, no such caveat applies to transfers to the most vulnerable poor countries, where the human cost of inaction is likely to be very great, and options for local response are much fewer.<sup>28</sup>

The human rights perspective suggests the following focus of attention: (1) Individuals and local communities (wherever they may be) and (2) LDCs.

In the context of adaptation, there has also been much focus on “South–South Transfer” within the climate domain, meaning transfers of local technological solutions that are adaptable to comparable (from the perspective of local economies and weather patterns) contexts elsewhere. Indeed, there has been some real progress in transfer of this kind, with Brazil in particular taking a proactive approach.<sup>29</sup> While this development is of immense importance in treating climate change and is worthy of further study, it does not take a central place in the present report as it does not exhaust “technology transfer” in the UNFCCC meaning (if indeed it amounts to transfer in this sense at all).

#### **D. CONCLUSION**

The case for technology transfer as something “more” than trade is overwhelming, both as a matter of ethics (Chapter 2) and law (Chapters 3 and 4). Once it is accepted that some form of technology transfer is required both ethically and legally in dealing with climate change, it also becomes clear that the ensuing costs must be borne in some form by developed countries, although clearly there must be limits. Developed countries need not pay for the transfer of any and every climate mitigation and adaptation technology to developing countries as a whole. The UNFCCC (and subsequent texts) does not provide clear parameters or impose upper or lower limits on the kinds and extent of technologies implied in the obligation to transfer technology. Human rights, however, provide an appropriate guide as to the relevant level of contribution that meets the UNFCCC’s minimal criteria and as to the appropriate recipients of technology transfer.

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28 In Chapter 6, we propose ways in which recipient countries might be distinguished and prioritised for the purposes of technology policy.

29 Cabral Lidia et al, “Brazilian Technical Cooperation for Development: Drivers, Mechanics and Future Prospects”, ODI, (September 2010); UNCTAD, “Economic Development in Africa Report 2010. South–South Cooperation: Africa and the New Forms of Development Partnership”, (2010).

## II. HUMAN RIGHTS AND TECHNOLOGY TRANSFER: THE ETHICAL CASE

The relationship between climate change and human rights was laid out in some detail in the 2008 ICHRP report *Climate Change and Human Rights: A Rough Guide* (“*Rough Guide*”). The report noted that “as a matter of simple fact, climate change is already undermining the realisation of a broad range of internationally protected human rights: rights to health and even life; rights to food, water, shelter and property; rights associated with livelihood and culture; with migration and resettlement; and with personal security in the event of conflict”.<sup>30</sup> Leading plausible predictions, then as now, strongly support the claim that climate change-induced harms will cause vastly increased hunger, water-stress, losses of livelihoods and dwellings, and in some extreme cases, loss of the entire territorial base of certain states.<sup>31</sup>

At the time, there was very little material available on the relationship between these harms and the existing body of human rights law and practice, but since the report’s publication there has been a flurry of activity in a number of different fora and a great deal of scholarship and research devoted to the topic.<sup>32</sup> At the formal level, perhaps most relevant for present purposes, human rights language has recently entered the climate change negotiating text. This follows a strong push from a coalition of non-governmental organisations and a number of Resolutions of the Human Rights Council.<sup>33</sup> The preamble of the current text on Long-Term Cooperative Action references the Human Rights Council Resolution of March 2009:<sup>34</sup>

*Noting resolution 10/4 of the UN Human Rights Council on human rights and climate change, which recognizes that the adverse effects of climate change have a range of direct and indirect implications for the effective enjoyment of human rights and that the effects of climate change will be felt most acutely by those segments of the population*

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30 ICHRP, *Climate Change and Human Rights: A Rough Guide*, (2008), 1.

31 The ICHRP records a range of predictions from leading sources in two Annexes. See ICHRP (2008), 85–100. See also IPCC AR4 WGII, Summary for Policymakers, 13–15, 59–63; IPCC AR4 WGII Technical Summary, 44–47; Stern Review, 62–76; 103–105.

32 See the list of articles and publications in note 5, above.

33 See note 7, above.

34 Draft decision -/CP.16 “Outcome of the work of the Ad Hoc Working Group on long-term Cooperative Action under the Convention”, preamble.

*that are already vulnerable owing to geography, gender, age, indigenous or minority status and disability.*

More starkly, the text of the tone-setting “shared vision” “[E]mphasizes that Parties should, in all climate change-related actions, fully respect human rights.”<sup>35</sup> What might this mean in practice?

Part of the purpose of the present report is to provide an example of how human rights might be respected in the execution of one of the key areas of climate change policy: technology. The report also aims to show how doing so can be a significant help to policy-making and policy execution. It is worth noting, however, that since countries’ obligations to respect human rights derive from their ratification of human rights treaties, they remain regardless of any wording in the climate change texts.

At a deeper level, however, it may also be argued that human rights considerations are relevant to climate change as a matter of principled justice. The *Rough Guide* laid out a series of justice questions raised by climate change and offered suggestions as to how human rights law and practice might provide a vehicle for pursuing these claims in the international arena.<sup>36</sup> The *Rough Guide* drew attention to the degree to which poor rights protections tend to coincide with vulnerability to climate change, and noted that the human rights of many individuals stand to be affected both by the phenomenon of climate change itself and by the steps taken to address it.<sup>37</sup>

The *Rough Guide* proposed, among other things, that human rights standards provide basic threshold levels that can be used as a compass for orienting policy: were climate change itself (or the steps taken to address it) to cause standards to fall below these basic minimum thresholds, such an outcome would be unacceptable. In short, to ensure that human rights fulfilment does not deteriorate significantly due to climate change and related activities would figure among the priorities of climate change policy. Human rights would thus enter into the construction of climate change policy as an aid to setting priorities and a means of evaluating success. Before turning to the pragmatic elements of such a move, we will first set out the case for treating technology transfer in the context of climate change as a human rights affair.

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35 Ibid., para. 8 (italics in the original).

36 ICHRP (2008), 4–7; 21–40; 55–72.

37 ICHRP (2008), 1–3; 18–21.

## A. HUMAN RIGHTS ARGUMENTS FOR TECHNOLOGY TRANSFER

As a first step, and to provide solid grounding for later steps, we lay out the ethical principles underlying a human rights basis for the exercise of technology transfer. The following normative argument, summarising a paper by Simon Caney, provides ethical grounds for agreeing to the existence of a certain set of obligations and duties between people (which should not be confused with grounds based on legal agreements or practices):

- There are three different kinds of normative argument for the claim that an obligation to transfer technology in the context of climate change is entailed by human rights.<sup>38</sup>
- All three arguments call for technology transfer from developed countries to the least privileged in the world, as well as also justifying intra-country transfer.
- The three arguments will not necessarily converge in the amount of technology transfer they justify.
- The most compelling account of the ascription of responsibilities to uphold these human rights combines a (poverty-sensitive) “polluter pays” principle and a (history-sensitive) “ability to pay” principle.

Caney notes that human rights instruments do not make direct reference to technology transfer, so the link between them requires “first, mak[ing] a case for a human right (or a number of human rights) and then, second, show[ing] that upholding that human right requires technology transfer”. He identifies a number of ways in which such a link could be shown, ultimately focusing on the following three types of arguments:

- **Adaptation-based arguments** – the transfer of technology is required for adaptation in order to allow individuals to enjoy their human rights despite experiencing climate harms.
- **Mitigation-based arguments** – the transfer of technology is required to allow people to continue to enjoy their human rights without thereby contributing to climate change.

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38 Caney uses the somewhat stronger language of a “right to technology transfer”, which he speaks about as potentially derived from other human rights. In the report, while we fully endorse the thrust of Caney’s argument, we do not follow this language of a “right to technology transfer”, preferring to reserve the term “right” for internationally recognised human rights.

- **Restitution-based arguments** – the transfer of technologies is necessary as a form of compensation by those who have overused a public good (i.e., the atmosphere's absorptive capacity) to those who have as a result been unfairly deprived of this public good. The argument assumes people are entitled to a fair share of the atmosphere.

In each case, Caney claims, the relationship between climate change and human rights, were it accepted, entails an *entitlement* to technology transfer and that the entitlement is specifically grounded in the realities of climate change.<sup>39</sup>

To flesh out each of these arguments, Caney focuses on three core human rights: the right to life, the right to health, and the right to basic means of subsistence. In order to avoid the controversies associated with “positive rights”, however, Caney chooses to use narrow interpretations of each of these rights, defining them in a more minimal fashion than those used in the treaty texts.<sup>40</sup> He defines them as follows:

- **The right to life** – All persons have a human right that others do not arbitrarily deprive them of their life.<sup>41</sup>
- **The right to health** – All persons have a human right that others do not act in ways which threaten their health.<sup>42</sup>
- **The right to basic means of subsistence** – All persons have a human right that others do not act in ways which harm their ability

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39 Caney notes two further kinds of arguments that might be made, one on pragmatic grounds that technology transfer is a good way to fulfil human rights in conditions of climate change but does not derive from an obligation as such; a second, by contrast, posits that there is entitlement to the transfer of technologies based on the existing human rights regardless of the existence of climate change. The right to water, for example, might be thought to entail a right to the transfer of technologies needed to fulfil it.

40 In this he follows Thomas Pogge. See for example Thomas Pogge, *World Poverty and Human Rights: Cosmopolitan Responsibilities and Reforms*, Polity (2008).

41 Compare Article 6, International Covenant on Civil and Political Rights (ICCPR): “Every human being has the inherent right to life. This right shall be protected by law. No one shall be arbitrarily deprived of his life”.

42 Compare Article 12 of the ICESCR, which affirms “the right of everyone to the enjoyment of the highest attainable standard of physical and mental health”. Caney calls this a “maximalist” wording of the right, entailing positive commitments from states to achieve the right for its citizens, and which he contrasts with his “minimalist” wording.

to have access to the means of subsistence.<sup>43</sup>

The key point to note about Caney's definitions of these rights is how little they demand beyond the basic ("negative") "no harm" principle. Governments are not expected, on these wordings, to act positively to fulfil human rights. There are lengthy defences of much more extensive articulations of these rights available, but the present argument does not take a position on these. The point here is simply to strengthen the general argument by choosing relatively uncontroversial premises from which to begin.

## **1. Adaptation**

Caney examines the degree to which these rights are threatened by climate change and the degree to which technology transfer provides a means of protecting against potential rights violations by providing for adaptation to the new or anticipated context. In each case, he finds that there are near incontestable grounds (assuming current science to be broadly correct) for concluding that these rights are in fact at risk of being undermined for certain persons due to anthropogenic climate change. In the case of the right to life, climate change is expected to cause increasingly "severe weather events – such as storm surges, hurricanes, and flooding resulting from heavy rainfall".<sup>44</sup> Climate change is also "projected to lead to death from heat stress and cardio-respiratory problems". As to the potential for technology transfer to address these outcomes, Caney writes:

*Technology transfer is, for example, necessary to design cooler housing and accommodation and thereby minimise*

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43 See Article 1(2) common to both the ICCPR and the ICESCR: "All peoples may, for their own ends, freely dispose of their natural wealth and resources without prejudice to any obligations arising out of international economic co-operation, based upon the principle of mutual benefit, and international law. In no case may a people be deprived of its own means of subsistence." See also, ICESCR Article 11, recognising "the right of everyone to an adequate standard of living for himself and his family, including adequate food, clothing and housing, and to the continuous improvement of living conditions".

44 Caney, 11, citing Ulisses Confalonieri and Bettina Menne "Human Health" in Martin Parry, Osvaldo Canziani, Jean Palutikof, Paul van der Linden and Clair Hanson (eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press (2007), 396–397. See generally Paul Hunt and Rajat Khosla in Humphreys (2008); A. J. McMichael et al. (eds.) *Climate Change and Human Health: Risks and Responses*, WHO (2003) and Anthony J. McMichael et al. "Chapter 20: Global Climate Change" in Majid Ezzati, Alan D. Lopez, Anthony Rodgers, Christopher J. L. Murray (eds.), *Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attribution to Selected Major Risk Factors*, WHO (2004).

*loss of life from heat stress. It can also be employed to build stronger buildings and infrastructure and thereby uphold the human right to life. It can be used to build sea walls that offer more protection against storm-surges. In addition to this, technology can be employed to improve drainage systems so that local environments can cope better with extreme precipitation and flooding. Without this, people will be at increased vulnerability to the effects of dangerous climate change. Technology transfer is thus required to assist the adaptation required for human rights protection.*

As to the right to health, there is again broadly accepted evidence that climate change will lead to increased instances of vector-borne diseases, such as dengue fever, water-borne diseases, increased cardio-respiratory problems and diarrhoea. Again Caney cites available means by which existing technologies can help to ward off these likelihoods:<sup>45</sup>

*First, through enhanced technology vulnerable groups may be better able to monitor and detect imminent outbreaks of diseases. In addition to this, it can assist greater immunisation against infectious diseases. Over and above this, it can assist in the construction of better systems for waste disposal and hence reduce the incidence of diarrhea and water-borne diseases. Furthermore, improved building design is essential to provide better protection against severe weather events.*

Finally, on the right to the means of subsistence, Caney notes the expected threats to food security and the importance of irrigation and coastal protections among the responses.<sup>46</sup>

Summing up, Caney also asks about the *extent* of technology transfer that such an argument would expect. He finds that adaptation-based arguments, assuming a minimalist understanding of human rights, would require technology transfer to the degree to which the rights in question are actually affected by climate change, that is, given

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45 Caney, 12, citing Anthony McMichael "Human Health" in Metz et al (2000), 339–340 (on "monitoring and surveillance"), 340 (on "immunisation campaigns"), and 342 (on "urban infrastructure" and "water supply").

46 Citing Anthony Nyong and Isabelle Niang-Diop "Impacts of Climate Change in the Tropics: the African Experience" in Hans Joachim Schellnhuber, Wolfgang Cramer, Nebojsa Nakicenovic, Tom Wigley and Gary Yohe (eds), *Avoiding Dangerous Climate Change*, Cambridge University Press (2006), 237–238.

that a certain rise in global average temperatures is unavoidable, the obligation to transfer technologies will rise to the level necessary to address the *actual* harms that result or to ward off harms that can be fairly predicted. Caney notes, however, that, on these arguments, the obligation is only owed to those whose lives are actually jeopardised by climate change and that the technologies in question cannot be used for non-adaptation related ends.

## **2. Mitigation**

Turning to mitigation, Caney begins by noting the general consensus that to tackle climate change involves mitigating GHGs. He also registers the desirability in principle that measures to mitigate GHGs take place *everywhere*, at least in the medium to long term. In these circumstances, he states that his “central claim is that without technology transfer some will not be able to engage in the mitigation that is necessary without jeopardizing their own or other people’s rights. They will face the choice of either mitigating but in so doing sacrificing human rights or not sacrificing human rights but also not mitigating.” That is “[u]nless there is technology transfer some people will be unable to make a serious contribution to mitigation without compromising (their own or other people’s) fundamental human rights.”<sup>47</sup>

The starting point to this set of arguments is that the fulfilment of basic human rights of the kind referred to above – e.g., rights to health, food and water (subsistence) – requires energy. In much of the world, these rights remain poorly fulfilled, but even keeping them at current levels is energy intensive. As Caney puts it, “respecting the right requires energy and because of this it may run contrary to the commitment to lower greenhouse gas emissions.”<sup>48</sup> Energy is required for cooking, refrigerating, and transporting food, much of which currently relies on dirty technologies in much of the world. There would appear to be a “tension” or even incompatibility between keeping such systems operative, or extending them, and mitigating GHGs at the same time.

This tension can, however, be resolved if there is a transfer of technology which facilitates more efficient energy systems and which can enable the use of clean energy sources. Technology transfer is thus needed to achieve a state of affairs in which there is both mitigation and the protection of the right to subsistence.

A similar argument might be made about the availability of sinks. As

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47 Caney, 14–15.

48 Ibid.

land use change is a major cause of GHG emissions, it is important to maximise the yield output from existing land and to mitigate the deleterious effects of land-use changes when they take place. Again, these needs can be met through access to technologies. Caney also pursues similar arguments through the various other rights he identifies (rights to health and to life).

Some objections might be raised, as Caney acknowledges. For example, presumably if poorer countries were not required to mitigate at all, the basis for technology transfer in these cases disappears. Caney reckons, however, that there is no real scope, certainly not in the mid to long term, for countries to opt out of mitigation: such are the pressures on the climate that it is doubtful the planet can sustain any non-participants indefinitely. On any scenario, developing countries benefit from a longer time period prior to peaking, but there is no scope for total non-participation.<sup>49</sup> Similarly, as a matter of politics, it is plain from current negotiations that any global deal will require that all countries take mitigation actions in the mid to long term, rendering the case for technology transfer very much stronger in the present.

Caney would better address these objections by broadening his definition of the relevant rights in line with their articulation under international law. The International Covenant on Economic, Social and Cultural Rights (ICESCR) treaty text, for example, imposes an obligation on states to ensure “the highest attainable standard of physical and mental health” for citizens as well as “the continuous improvement of living conditions”, and it has been consistently interpreted in this way.<sup>50</sup> Even though the requirement on states is to achieve “progressive” rather than immediate realisation of these rights, it is clear on any scenario that to fulfil these rights will require increasing energy use. Indeed, given the sizes of the populations involved and their growth rates, energy consumption must be vastly increased in the developing world in a way that contrasts sharply with the rich world. In this scenario, the problem of GHG mitigation becomes much sharper. Caney’s central claim – that absent technology transfer, to mitigate GHG emissions will tend to harm human rights – appears robust in this case.<sup>51</sup>

For this set of arguments, Caney notes that the degree to which there is an

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49 See generally Baer et al. (2008).

50 ICESCR, Arts. 12 and 11, respectively.

51 On this point, Caney makes the case that any requirement to mitigate without technology transfer would in fact prevent further fulfillment of those rights, thus violating them even in the negative sense. Caney, 18.

obligation to transfer technology would be coextensive with the degree to which recipient countries are expected to mitigate GHG emissions. The corollary condition would be that the technologies in question are put to the purpose of achieving mitigation and not to other uses.

### **3. Restitution**

Caney provides a third set of rights-based arguments to underpin technology transfer. Although these are not “human rights” claims in the traditional sense, they are nevertheless worth attending to, as they are relevant to the general context in which human rights are mobilised in the climate change debate. Technology transfer as restitution concerns the notion that certain persons have used more than their fair share of the atmosphere’s “absorptive capacity”<sup>52</sup> and should thus be required to make up the difference to those persons who, as a result, do not have access to a “fair share” of that capacity. Technology transfer provides the means to make good the shortfall.

As Caney notes, if it is accepted that there is such a thing as a right to a fair share of the earth’s carbon capacity, the rest of the argument seems difficult to refute. As he points out, on any account, the industrialised nations have used up a far greater proportion of the atmosphere’s absorptive capacity than other parts of the world:<sup>53</sup>

The Pew Center on Global Climate Change reports, for example, that “[f]rom 1850 to 2000, the United States and the European Union were responsible for about 60% of energy-related CO<sub>2</sub> emissions, while China contributed 7% and India 2%.” Furthermore, according to a recent report by Michael Raupach and his co-authors published in 2007, “[t]ogether, the developing and least-developed economies (forming 80% of the world’s population) accounted for ... only 23% of global cumulative emissions since the mid-18th century”.

With that development space no longer available (i.e., with new entrants effectively prohibited from the use of fossil fuels for development) it seems only just that the “gluttonous” states should be required to make up the loss in other ways – hence, technology transfer. Caney notes that the extent of such transfer must depend on what constitutes a “fair

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52 Caney cites Henry Shue, “Climate” in *A Companion to Environmental Philosophy*, Blackwell (1991), 449–459.

53 Caney cites the Pew Center on Global Climate Change. Cumulative CO<sub>2</sub> Emissions ([www.pewclimate.org/facts-and-figures/international/cumulative](http://www.pewclimate.org/facts-and-figures/international/cumulative)); Michael R. Raupach et al. “Global and Regional Drivers of Accelerating CO<sub>2</sub> Emissions” at 10288.

share”. Here, there are three main views:

- (1) Each person is entitled to “survival” or “subsistence” emissions (the minimum amount needed to survive)<sup>54</sup>;
- (2) Each person might be entitled to sufficient emissions to ensure a decent standard of living;
- (3) Each person might be entitled to equal emissions.

Caney notes that the third of these, while it may seem intuitively correct, is problematic, insofar as people actually have widely divergent needs in fact and also have differing access to alternative forms of energy. Rejecting the first as overly minimalist, he settles for the second view of the “fair share” individuals may be entitled to – sufficient for a decent standard of living.

An entitlement of sufficient emissions to ensure a decent standard of living is also readable into the provisions of the ICESCR, notably Articles 11 and 12, cited above. If there is already a right to subsistence, it would appear to assume that anything *necessary* to the fulfilment of that right must also *necessarily* be comprehended within it or derivable from it. This, indeed, is the basis of the “right to water” (like carbon emissions, water is not explicitly referenced in the ICESCR.) If it were the case that the water or food of the world had been exported from poor countries to the point that individuals there were dying as a result, that would presumably be an infraction of those rights.<sup>55</sup> Something similar must be true of the carbon emissions that are and have been, in effect, confiscated from developing countries.

Similarly if the world’s development space has been used to the point of denying many people the *capacity* to develop sufficiently to lift certain populations to decent standards of living, there would appear to be a *de facto* violation of these substantive rights. An obligation to transfer technology, on those who had overused the necessary capacity, would appear to be the appropriate (restitutive) response.<sup>56</sup> From this perspective, Caney’s restitution argument appears to stand on more traditional human rights grounds too (although it does not fit

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54 On this paragraph, see ICHRP (2008), 9–12. On “subsistence” and “survival” emissions, see Anil Agarwal and Sunita Narain, *Global Warming in an Unequal World: A Case of Environmental Colonialism*, Centre for Science and Environment (1991); Henry Shue, “Subsistence Emissions and Luxury Emissions” 15 *Law & Policy* 39 (1993).

55 Something along these lines did, in fact, take place in the great famines of the nineteenth century. See Mike Davis, *Late Victorian Holocausts*, Verso (2001).

56 *Mutatis mutandis*.

with the current regime of human rights implementation, which does not recognise strong extraterritorial obligations of the kind envisaged here).

Caney also notes that, unlike the adaptation- and mitigation-based arguments, there is *no* condition attached to the use of any technologies transferred under the restitution-based scenario. Recipients may use it as they see fit.

## **B. RESPONSIBILITIES AND DUTY-BEARERS**

To finish, Caney devotes some time to consideration of how the responsibility to transfer should be allocated and who the relevant duty-bearers are.

As to the normative bases for determining responsibility, Caney examines two well known ethical positions, the “polluter-pays” principle (which he refers to as the “responsibility principle”<sup>57</sup>) and the “ability to pay” principle. According to the former, those who have caused a problem should be liable to pay for the consequences of cleaning it up. As Caney notes, such a notion fits both our intuitive notions of justice (i.e., polluters ought to pay for past pollution) and with our general conceptions of efficiency (i.e., polluters will be discouraged from future pollution if they know they will have to pay). It also aligns with classic liberal notions of agency: the agent responsible for a certain situation is also the appropriate source of rectification, where necessary.

Caney goes on to note that the principle fits well with each of the three arguments for an obligation to transfer technology set out above. In each case, identifiable agents have contributed directly to the problems experienced by third parties (the direct harms of climate change; the inability to mitigate without harming human rights; and the shortfall in development capacity), so those agents would appear to be the appropriate locus for the obligation to transfer technology.

There are a number of standard objections to the “polluter pays” principle in this formulation. One is that it is unjust to hold present generations responsible for the acts of past generations. In response, Caney notes that even if it were the case that the emissions of present generations were not in themselves excessive to the point that they already meet the polluter pays principle (in fact, of course, they are), it would still hold true that present generations are the beneficiaries of the excessive emissions of their forebears. Since that gain has

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57 Caney adopts the term “Responsibility Principle” in order to avoid confusion on the question of whether the polluter pays principle is primarily oriented towards future, rather than past, pollution, as some commentators have suggested. See Caney, 24, at note 57.

been achieved at a cost to others (also in the present generation), the principle still holds (albeit in a modified form).<sup>58</sup>

A second objection to holding individuals responsible for the harm of their excess emissions is to claim that they were “excusably ignorant” of the harms their actions were causing to others. In response to this objection, Caney points out first that there cannot be a case for excusable emissions since at least the mid-1990s, by which time knowledge of climate change was widespread. Even if it were arguable that the science was uncertain at the time, he adds, it would still be plausible to expect entities to have assumed their acts might be harmful and to have exerted a “precautionary principle” with regard to those acts. A third response would simply be to impose strict liability for the resulting harms. Caney argues that the potential unfairness of strict liability in cases of potential ignorance is mitigated by the fact that those responsible have also benefitted from their acts, and so can be required to compensate for the harms at least up to the point to which they benefitted, without risk of unfairness.

A third objection is to note that, since the benefits of GHG overuse have not been equally distributed among the “beneficiary population” (i.e., there are many poor people in rich countries), it cannot be just to hold individuals responsible at least until they themselves have attained to the level of a “decent standard of living”. Caney essentially agrees to this objection, arguing that it merely modifies the polluter pays principle: individuals who have not benefitted cannot be themselves regarded as “polluters” and should not be penalised. The implication would appear to be that among the means available for technology transfer, a tax targeting poorer individuals in richer countries (for example) would be an unjust option.

The “ability to pay” principle says that the obligation to transfer technology should be borne by the most advantaged: Caney provides three available grounds for such a claim. First, it may be made on grounds of efficiency (the wealthy are best positioned to bear the burden). Second it may be made on grounds of equality (since to require the wealthy to carry the burden is redistributive). Rather than relying on these positions, which he describes as “contentious”, Caney offers a third ground: that dealing with the problem of climate change requires an “equal sacrifice” of each according to his ability. Whereas the ability to pay principle is naturally forward-looking (i.e., it does not assign responsibility for past emissions), Caney notes that the principle

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58 A different response to this objection is to hold collective entities responsible rather than individuals: thus if “Britain” was responsible for excess emissions in the nineteenth century, it is still “Britain” that is responsible for the consequences today.

may be revised slightly in the climate change case to account for the fact that the “ability” in question has in fact come about due to climate-endangering activities, and that this recognition should play a part in determining the amount to be paid.<sup>59</sup>

Finally, Caney discusses the question of duty-bearers, which breaks down into two constitutive questions. First, which actors should bring about the policies and practices to fulfil the obligation to transfer technology. Second, who should bear the costs of these actions. The answer to the first question seems clear enough: states should set the policies in question; they can “provide an infrastructure which incentivizes technological development, innovation and transfer”.

This seems correct. We will also treat states as the relevant locus for policy decisions in this domain. Of course, states are rarely the direct bearers of costs, which are passed onto taxpayers or private companies (through, for examples, regulations limiting the kinds of profit-making activity they may undertake). Caney makes the point, following his principal arguments up to this point, that the costs should be sensitive to the degree that individuals have actually benefitted from overuse of the climate: those who do not benefit from a basic decent standard of living – or for whom to pay towards technology transfer would push their standard of living below such a point – should in no circumstances be required to pay. By corollary, presumably individuals and companies that have benefitted greatly from overuse of the carbon dump should have to pay proportionally more towards technology transfer.

Caney’s argument relies on ethical rather than legal grounds, but there are international legal obligations that complement his case. These are not found in international human rights documents alone, which Caney relies on for the articulation of the relevant grounds for technology transfer. Although human rights law has been read to engage obligations of the kind outlined here, it is not an easy case to make: human rights obligations are owed primarily by states to their citizens, rather than to the citizens of other states.<sup>60</sup>

However, there are other bodies of international law that support various elements of Caney’s claims. One such is the international law

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59 Caney terms this the “History Sensitive Ability to Pay Principle”. To it he adds the supplementary point that those with the ability to pay can do so without compromising their own autonomy. Caney, 28–29.

60 For discussion see ICHRP, 3–5; Stephen Humphreys, “Climate Change and International Human Rights Law” in Rosemary Rayfuse and Shirley Scott (eds), *Climate Change and International Law*, Edward Elgar (2011).

of state responsibility, by which states must repair acts affecting other states that amount to breaches of their international obligations.<sup>61</sup> The other principal body of relevant law is the UNFCCC itself, which does entrench an obligation to transfer technology in its Article 4.5 (see Chapters 1 and 3 for more detail). Whereas that provision asserts the existence of such an obligation, and states the duty-bearers (Annex 2 countries) and rights-bearers (non-Annex 1 countries), it says little about the purposes for which technology should be used or the extent of transfer required. Caney's work provides crucial fleshing out in both of these areas, drawing on normative grounds contained in international agreements signed up by many of the same states elsewhere.

Once that obligation is assumed, human rights law is again relevant, as it provides developing countries with a strong basis to require that any technologies received are used primarily to address the relevant rights threatened by climate change. This, essentially, is required of states by Article 2.1 of the ICESCR (more on this in Chapter 5, below). Activating this obligation would also require that donor countries factor developing country obligations to fulfil human rights into their own technology transfer planning.

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61 Crawford Commentary on Draft Articles on State Responsibility.

### III. TECHNOLOGY TRANSFER IN CLIMATE CHANGE LAW AND POLICY

In Chapter 5 we will delve into the ways in which human rights law can buttress technology policy. Before doing so, however, it would seem sensible to outline the obligation to transfer technology as it appears in climate change law, as well as the ways in which the term is used and understood. In the present chapter, we explore the following questions: What is understood by the term “technology transfer”; what is its legal status; what is the current state of progress of policy discussion on technology transfer in the UNFCCC process; what current mechanisms exist for the transfer of ESTs and are they adequate. In Chapter 4 we will then ask, what are the generally perceived barriers to technology transfer?

#### A. TECHNOLOGY TRANSFER IN CLIMATE CHANGE LAW

In Chapter 1, we discussed the meaning of “technology transfer” in an intuitive manner, placing it in the context of broader debates on trade and international law. We avoided discussing existing controversies over the definition of technology transfer within the climate change regime, in part because these do not present much clarity with regard to the term and nor do they – from a legal or policy perspective – provide much guidance on what it might mean as a policy objective.

In the two decades since the signature of the UNFCCC in Rio, there has been relatively little movement on technology transfer under its terms. It is clearly useful to revisit the relevant set of legal admonitions and their definitional elaboration in order to fully appreciate the policy context that has shaped and excused this immobility.<sup>62</sup> In what follows we look first at the legal obligation, as stated in the UNFCCC text, and then at the way in which the theme has since been discussed beneath the UNFCCC rubric – which, perhaps surprisingly, appears to bear only a fleeting resemblance to the initial text itself.

The first point to note is that *technology transfer is required under the international climate change regime*. The key provision is Article 4.5 of the UNFCCC, which commits developed countries to engage in technology transfer with developing countries:

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62 Aside from direct citations from legal and policy texts, much of the text that follows is taken from papers commissioned by the ICHRP from the Stockholm Environment Institute (SEI), CIEL and the late Professor John Barton of Stanford University.

### **Box 1. Article 4.5 of the UNFCCC**

The developed country Parties and other developed Parties included in Annex 2 shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly to developing countries, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties.

It is worth taking a moment to examine what this provision, which occurs under a section of the Convention entitled “Commitments”, entails.

#### **1. An obligation on Annex 2 Parties owed to non-Annex 1 Parties**

To begin, the term “shall” indicates an obligation. Who is the bearer of the obligation? “Developed country Parties and other Parties included in Annex 2”. The UNFCCC lists two sets of countries in Annexes. Annex 2 amounts to the industrial west including the European Union and Japan but not (since 2002) Turkey. Annex 1 is a longer list including also the countries of Central and Eastern Europe “that are undergoing the process of transition to a market economy”. The UNFCCC text generally uses two formulae: “developed country Parties and other Parties included in Annex 1 [or 2]” and “non-Annex 1 Parties”, meaning developing countries.<sup>63</sup> Although the wording in UNFCCC Article 4.5 is somewhat ambiguous, it would appear to indicate that the Parties listed in the shorter Annex 2 – at a *minimum* – owe the obligation to transfer technology.<sup>64</sup> By the same token, the obligation is clearly on the *governments* of these states: international law does not impose direct obligations on private actors in the first instance.

To whom is the obligation owed? The text says, “other Parties, in particular developing countries”. As a legal matter, the Article 4 technology transfer obligations are phrased in terms of duties, implying

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63 For a list of non-Annex 1 parties to the UNFCCC, see here: [unfccc.int/parties\\_and\\_observers/parties/non\\_annex\\_1/items/2833.php](http://unfccc.int/parties_and_observers/parties/non_annex_1/items/2833.php).

64 The 24 Parties listed in Annex 1 are Australia, Austria, Belgium, Canada, Denmark, European Economic Community, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland, and United States of America.

that the beneficiaries of these duties have *rights* under the UNFCCC.<sup>65</sup> This would appear to indicate that all Parties to the UNFCCC not included in Annex 1 are potentially rights-bearers under Article 4.5, although the Article provides little guidance on how this might work. It is not clear, for example, whether these countries bear rights as individual states or as a collective of “non-Annex 1 Parties”. It is also unclear whether the right is held against specific Annex 2 parties individually, or rather, again, collectively as a group. It is also unclear how any such rights might be asserted in the breach. Presumably, at a minimum, there may be recourse to the International Court of Justice for breach of an international obligation. Article 4 is silent on each of these issues.

It is clear, however, that developing countries do not bear any *obligation* under the provisions relevant to technology transfer. On the contrary, Article 4.7 of the Convention states that:

*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.*

The latter wording matters from a human rights perspective: the implication is not only that the set of substantive outcomes referred to in human rights treaties as “economic and social rights” (here formulated as “economic and social development and poverty eradication”) are relevant to climate change policy, but also that they may play a role in the transfer of technology. Developing countries, as beneficiaries of technology from developed countries, must prioritise poverty eradication at least on a par with emission mitigation, including, presumably, in their deployment of acquired technologies.

It may be, on the UNFCCC wording, that if a country ceases to be a “developing country”, its effective rights under Articles 4.5 and 4.7 are thereby diminished or extinguished. Likewise it may be that if a country attains to “developed” country status, it may attract obligations under these provisions: the wording of the text does not preclude non-Annex 2 Parties from having obligations if they are “developed”. Very much,

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<sup>65</sup> In Hohfeldian terms, duties and rights are “jural correlatives”: a duty implies a right and vice versa. See Wesley Hohfeld, *Fundamental Legal Conceptions as Applied in Judicial Reasoning and Other Legal Essays* (1919).

therefore, depends on whether a country is credibly categorised as “developed” or “developing”. Curiously, however, there is no agreed international means of making such a determination.

There is, however, agreement on the related category of LDCs, a term of art in the UN, referring to very low-income countries. There are currently 49 LDCs – their status is determined within the UN system.<sup>66</sup> LDCs are indubitably rights bearers under Article 4, just as Annex 2 countries are indubitably duty-bearers. For other states, there is less clarity.<sup>67</sup>

For all that, it does not appear that many countries, developing or developed, have treated Article 4.5 as obligatory under international law (which is not to say that they might not yet do so). In a 2010 summary of progress in implementing Article 4.5, the Expert Group on Technology Transfer (EGTT) noted that only three Annex 2 parties reported undertaking bilateral measures to transfer technologies, although none of the three appeared to have done so in a manner attentive to the full parameters of Article 4.5 or to the exigencies of climate change vulnerability.<sup>68</sup>

## **2. An obligation to promote, facilitate and finance technology transfer**

What does the obligation consist of? Three distinct obligations are declared in the provision: to promote technology transfer, to *facilitate* it and to *finance* it. Each of these terms is open to interpretation, but none is especially complex, and the appearance of the three together tends

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66 See the UN website: [www.un.org/special-rep/ohrls/lcd/lcd%20criteria.htm](http://www.un.org/special-rep/ohrls/lcd/lcd%20criteria.htm).

67 See generally Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLS), *The Impact of Climate Change on the Development Prospects of the Least Developed Countries and Small Island Developing States*, Washington (2009).

68 FCCC/SBI/2010/INF.4, “Report on the review and assessment of the effectiveness of the implementation of Article 4, paragraphs 1(c) and 5, of the Convention” (May 10, 2010), para. 29. The full relevant text is as follows:

“Japan reported on actions to exchange information on policies through bilateral dialogue with developing countries, with a view to improving energy efficiency by sharing energy-conservation policies and supporting effective systems. Canada reported steps taken to assist developing countries directly with their technology needs, including technology transfer projects for climate change development of which capacity-building is a component. The European Union also reported in its submission a range of bilateral activities that either directly or indirectly involve the provision of support for the enhancement of institutional systems and regulatory and legislative frameworks needed to scale up the development and transfer of technologies.”

to sharpen their differences. On a plain reading, “facilitate” presumably refers to regulatory policies, legislative frameworks, incentives such as subsidies and tax breaks, and proactive steps, such as pooling and compulsory licensing. It is worth noting that, on this definition at least, few Annex 2 parties would appear to have fulfilled their obligation to “facilitate” technology transfer. The regulatory frameworks at home and in their relations with non-Annex 1 countries are for the most part neutral or even hostile to the task of ensuring relevant technologies reach those most in need in countries vulnerable to climate change impacts.

By contrast, “promote” has the presumably broader implication of actively taking steps to ensure that the objectives of technology transfer are broadly understood and accepted by relevant parties. This would doubtless include information campaigns and “awareness raising” – that is, convening spaces for consensus-building around the content and appropriateness of the obligation itself and mobilising public institutions towards its fulfilment. Again, on this reading, Annex 2 parties would also not appear to have fulfilled their obligation to “promote” technology transfer. In the main, the term remains unknown both among the general public of Annex 2 countries and even among those industries most relevant to climate change technology transfer.

The third obligation, to “finance” technology transfer, is perhaps more ambiguous (even though it may appear more concrete). On its face, this obligation appears to indicate that Annex 2 countries are obliged to pay for the transfer of technologies into developing countries, presumably from their national budgets. It is not clear that the *primary* duty-bearers of technology transfer need be the ordinary taxpayers of wealthy countries: arguably, it would be strictly more just for major carbon emitters to carry proportionally more of the cost.<sup>69</sup> But Article 4.5 does not specify the appropriate source of financing, apparently leaving that as a matter to the relevant state. Precisely what is to be financed is also unspecified. Might it be enough if technological research and development (R&D) at home may eventually have applications abroad? Or to subsidise national technology producers? This seems unlikely, as it is the “transfer” itself that is specified in the text. Also unspecified, however – and this is most problematic – is the *extent* of financing. There is a degree to which some Annex 2 countries have, nevertheless, financed technology transfer, albeit at a small scale, through CDM projects, which we will investigate in more detail below.

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69 See Simon Caney, *Climate Technology Transfer: A Derivation of Rights- and Duties-Bearers from Fundamental Human Rights* (2010), commissioned by the ICHRP.

### **3. “To take all practicable steps”**

The obligation is to “take all practicable steps” to these ends. This appears broad: for any state, a “practicable step” is presumably any step that falls within ordinary sovereign powers and actual state capacity, which is to say, any step a state can *actually* take that is not unconstitutional and does not fall foul of its international legal obligations. Presumably the principal limit on available steps is to be found in the term “practicable” (which might be contrasted with “lawful” or “available”). With regard to financing, for example, at what point does further financing cease to be “practicable”? Does this refer to budgetary constraints? To the legitimacy of various tax options? What is the relationship of this kind of financing to development aid commitments?

While these questions are clearly contestable, it nevertheless seems correct to view “all practicable steps” as a maximal admonishment, with the burden to show why lawful steps that remain untaken are not practicable (to “finance”, “promote” or “facilitate” technology transfer) falling to states.

### **4. “Environmentally sound technologies”**

Finally, very much depends on the key clause “transfer of environmentally sound technologies”. This term is potentially problematic. Clearly, technology transfer for mitigation depends upon technologies that are more “environmentally sound” than those they are replacing. The term would thus appear to be *comparative*: the degree to which a technology is “environmentally sound” is to be understood by comparing one existing technology to other existing technologies.<sup>70</sup> This qualification matters, as there is presumably no absolute criterion of “environmental soundness”: it is always possible that one “environmentally sound” technology will be superseded by another in future. To read a “possible future” qualification into the term “environmentally sound technologies” would, however, undermine the provision altogether. Given that the essential premise of technology is constant improvement, technology transfer would never take place if existing technologies could be disqualified if they were thought liable to supersession in future by a more “environmentally sound” technology.<sup>71</sup>

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70 It is debatable whether the term “environmentally sound” refers only to climate change criteria – that is, technologies that emit comparatively fewer GHGs than other comparable technologies – or whether it also refers to pollution more broadly or other harmful effects, such as harming animal life.

71 Such a reading would also debilitate technology transfer as newer generation technologies are also generally more expensive than existing technologies, with the extra cost certain to put a drag on transfer.

Notably, from this perspective, the text of Article 4.5 (and other relevant provisions in the UNFCCC) speak nowhere of “research and development” or “innovation”.<sup>72</sup> The obligation to “transfer” does not depend on a prior obligation to develop new technologies: existing technologies fall beneath its rubric as long as they are, by current comparative standards, “environmentally sound”.

The text of the Convention would appear to apply the same stricture of “environmental soundness” to technologies for adaptation. This may appear troubling at first sight, since it is not the purpose of adaptation technologies to mitigate GHG emissions and it would not seem appropriate to fail to take steps to adapt to climate change (particularly where there would be human rights consequences), simply because the available technologies were not zero-carbon or in case they might have other environmental consequences.<sup>73</sup> However, as in the case of mitigation technologies, the requirement is presumably comparative and present-tense: where multiple technologies are available for the same adaptation purpose, the requirement is to transfer that which is most “environmentally sound”. Indeed no other reading would appear to align with the “object and purpose” of the Convention.

Presumably too, the “environmentally sound” constraint is also subject to the “practicable steps” constraint: if the *most* environmentally sound (latest, most sophisticated) technology is not practicable (because it is, for example, too expensive or too difficult to produce *en masse* or to transport), the obligation presumably is to introduce the (next) most environmentally sound technology, one that is, in fact, practicable, and so on. Again, this is an important qualification. ESTs are costly: it would make a nonsense of technology transfer if the best technologies were too costly to transfer and others were disqualified because they were less “environmentally sound”.

## **5. Other relevant obligations**

In addition to Articles 4.5 and 4.7 laid out above, the UNFCCC contains other commitments under Article 4 relevant to technology transfer.

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72 A reference to “research and development” comes under Article 9 which founds the SBSTA. Art 9.2(d) says that the SBSTA shall “Provide advice on scientific programmes, international cooperation in research and development related to climate change”. However, this clause does not appear to conjoin “research” with “development” in the usual sense.

73 In general, the introduction of new technologies where they successfully lead to positive economic outcomes will tend to increase net carbon emissions, simply through the increase in economic activity they entail. This phenomenon, known as “leakage”, complicates the verification of emissions reduction schemes in every domain.

## **Box 2. Other Commitments to Technology Transfer under Article 4 of the UNFCCC**

Article 4.1(e): All Parties shall cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods.

Article 4.1(f): All Parties shall take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions, and employ appropriate methods, for example impact assessments, formulated and determined nationally, with a view to minimising adverse effects on the economy, on public health and on the quality of the environment, of projects or measures undertaken by them to mitigate or adapt to climate change.

Article 4.3: The developed country Parties [...] shall provide new and additional financial resources [...] for the transfer of technology, needed by the developing country Parties to meet the agreed full incremental costs of implementing measures that are covered by [Article 4.1] and that are agreed between a developing country Party and the international entity or entities [entrusted with the operation of the financial mechanism of the Convention].<sup>1</sup> The implementation of these commitments shall take into account the need for adequacy and predictability in the flow of funds and the importance of appropriate burden sharing among the developed country Parties.

Article 4.4: The developed country Parties and other developed Parties included in Annex 2 shall also assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects.

Article 4.8: In the implementation of the commitments in [Article 4], the Parties shall give full consideration to what actions are necessary under the Convention, including actions related to funding, insurance and the transfer of technology, to meet the specific needs and concerns of developing country Parties arising from the adverse effects of climate change [...].

Article 4.9: The Parties shall take full account of the specific needs and special situations of the least developed countries in their actions with regard to funding and transfer of technology.

Unlike Articles 4.5 and 4.7, few of these provisions lend to a clear delineation of obligations and rights- and duty-bearers. A number of notions are worth drawing attention to nevertheless. For one, the language of adaptation, involving all parties, is clearly consonant with that on the transfer of technologies – the measures in question call for technological solutions as well as international cooperation in achieving them (Article 4.3 makes the connection explicit). Moreover, two subgroups of countries are given priority as beneficiaries or rights-holders under Article 4: developing countries that are “particularly vulnerable to the adverse effects of climate change” (Art. 4.4) and the “special needs ... of the least developed countries” (Art. 4.9).

The obligation to transfer technology was reiterated and, to a degree, expanded in Article 10 of the Kyoto Protocol, where the Parties agreed to:

*Cooperate in the promotion of effective modalities for the development, application and diffusion of, and take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries, including the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain and the creation of an enabling environment for the private sector, to promote and enhance the transfer of, and access to, environmentally sound technologies ...*

The Protocol distinguishes between publicly- and privately-held technology in a way that may yet prove helpful – we will get back to this later. Otherwise, although hedged around with some new language, not all of which evidently clarifies the obligation, the core wording from UNFCCC Art. 4.5 remains in place in the Kyoto text which at time writing is still, significantly, the only other binding international accord in the climate change regime. Technology transfer has been further expanded in a series of recent soft law accords, notably the Bali Action Plan (2007) and the Cancún Agreements (2010). The former called for “[e]nhanced action on technology development and transfer to support action on mitigation and adaptation,” to include:<sup>74</sup>

- (1) Effective mechanisms and enhanced means for the removal of obstacles to, and provision of financial and other incentives for, scaling up of the development and transfer of technology to developing country parties in order to promote access to affordable ESTs;
- (2) Ways to accelerate deployment, diffusion and transfer of affordable ESTs;
- (3) Cooperation on R&D of current, new and innovative technology, including win-win solutions;
- (4) The effectiveness of mechanisms and tools for technology cooperation in specific sectors.

The provision that follows calls for similar “enhanced action on the provision of financial resources and investment,” including “consideration of: [i]mproved access to ... technical support.”

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74 FCCC/CP/2007/6/Add.1, Decision 1/CP.13., para. 1(d).

## **B. TECHNOLOGY TRANSFER IN THE UNFCCC PROCESS**

Given the number of terms in the textual obligation to transfer technology that would usefully benefit from increasing precision – “all practicable steps”, “promote”, “facilitate”, “finance”, “environmentally sound” and, not least, “transfer” and “technology” – it is perhaps surprising that, within the UNFCCC process itself, there has been relatively little work of clarification done on these terms. Far more attention has been devoted to elaborating a framework that, while relevant and useful, does little to clarify the core obligation regarding technology transfer. Before 2001, when the Parties to the UNFCCC agreed to the “framework for meaningful and effective actions to enhance the implementation of Article 4.5” there had been little progress of any sort.

The framework, which has shaped subsequent discussion of technology transfer, breaks the theme down into five constituent parts as follows:

- Technology needs and needs assessments;
- Technology information;
- Enabling environments;
- Capacity building;
- Mechanisms for technology transfer.

Also in 2001, the Parties established the EGTT to monitor the framework, advance technology transfer under the UNFCCC, and make recommendations to this end.<sup>75</sup> In 2006, the EGTT produced a set of recommendations together with a synthesis report on technology needs. The synthesis report is still the principal available document listing technologies relevant to transfer. In 2007, the EGTT was reconstituted and issued new terms of reference (its 19 members were nominated by State Parties according to regional quotas). The EGTT has since produced a strategic plan “beyond 2012”, recommendations on financing and a set of 40 performance indicators for assessing progress on the technology transfer framework. The EGTT was, however, dissolved in 2010 and replaced at the Cancún COP with a new “Technology Mechanism” consisting of a “Technology Executive Committee” and a “Climate Technology Centre and Network”. At the time of writing, these newer entities have not yet been constituted.

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75 See Decision 4/CP.7. For the final recommendation of the EGTT in its initial composition, see FCCC/SBSTA/2006/INF.4, “Recommendations of the Expert Group on Technology Transfer for enhancing the implementation of the framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention. Note by the Chair of the Expert Group on Technology Transfer.”

## 1. The “framework” for technology transfer within the UNFCCC

Whatever its benefits, it seems clear that the “framework”, which has thoroughly shaped subsequent debate on technology transfer within the UNFCCC process, has contributed little or nothing to clarifying the roles and priorities for technology transfer. Counter-intuitively, the framework has transferred the principal burden of “promoting and facilitating” transfer from developed to developing countries and has achieved almost nothing on “financing” transfer. Below, we briefly examine the impact of the framework on thinking on technology transfer.

### **Placing the burden on developing countries**

First, the general move is to shift the focus of attention in the consideration of technology transfer from the transferrer (so to speak) to the transferee. It is of great importance to understand and forefront the needs of recipient countries in any process of technology transfer: this is a point we shall return to. The framework does this, but it is nevertheless striking that despite the fact that developing countries are the bearers (under Art. 4.5) of rights but not of duties, each of these rubrics (with the possible exception of “mechanisms”) places an onus on those countries rather than on the actual duty-bearers: the Annex 2 countries. As we have seen, the precise role of the latter countries – the content of their obligation – is somewhat unclear from Art. 4.5. It is thus striking that the framework invests so little in clarifying that role.<sup>76</sup>

### **Altering and increasing the burden**

Second, and relatedly, the tendency of the framework, step-by-step, is in fact towards the imposition of an *extensive* onus on developing countries. The burden is not merely to compile information relating to “technology needs”, which is clearly vital. The assessment of “capacity” and of their “enabling environment” also falls to developing countries, as does the burden of taking steps to build capacity and improve the

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76 Of the 40 “indicators” produced by the EGTT, a single indicator (PI-EE-06) specifically targets Annex 1 Parties (“volume of export credits”), and not even one specifies Annex 1 countries, the duty-bearers as per Article 4.5, as the relevant actor. Of the 14 indicators targeting “all parties”, only one (PI-EE-05: “Presence of tax preferences and incentives on imports/exports of ESTs”) appears to prioritise measures specific both to developed countries and to “transfer” (rather than “investment”). See the table in Annex II to FCCC/SB/2009/4, “Performance indicators to monitor and evaluate the effectiveness of the implementation of the technology transfer framework”, 11 November 2009.

“environment”.<sup>77</sup> The framing of both “capacity building” and of an “enabling environment” will tend towards legislative, regulatory and policy measures in developing countries whose full extent is not clear or even foreseeable in advance.<sup>78</sup> This will, in fact, turn out to be the case in subsequent work on technology transfer under the UNFCCC rubric, where there is a growing onus on developing countries to produce conditions for the reception of technologies.<sup>79</sup>

### Requiring an “enabling environment”

Third, and again relatedly, the specific language that appears in the framework – and in particular the terms “capacity building” and “enabling environment” – derives from other areas of the international arena, in particular from development practice and from international economic law. (This is also true of the term “technology transfer” itself, which has roots in an earlier and very different moment in international law, but reappears in TRIPS; see Chapter 4, below). The various texts produced through the UNFCCC process offer little clarification of the principal aim of supporting an “enabling environment” (technological absorption? technological development? technological needs assessment?). It is defined as “government actions, including the removal of technical, legal and administrative barriers to technology transfer, sound economic policy and regulatory frameworks to create a conducive environment for private and public sector investment in technology transfer”.<sup>80</sup>

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77 On capacity building, see FCCC/CP/2001/13/Add.1, annex to decision 4/CP.7; See also FCCC/SBSTA/2006/INF.4, para. 2: “Within the context of enhancing the implementation of Article 4, paragraph 5, of the Convention, **capacity-building** is a process which seeks to build, develop, strengthen, enhance and improve existing scientific and technical skills, capabilities and institutions in Parties other than developed country Parties, and other developed Parties not included in Annex 1I to the Convention, particularly developing country Parties, to enable them to assess, adapt, manage and develop ESTs.”

78 Indeed, as the EGTT noted in compiling “performance indicators”: “Although the formulation of the performance indicators was relatively easy for some key themes (technology needs, technology information and mechanisms) of the technology transfer framework, it could be observed that other key themes (enabling environments and capacity-building) are vast, essentially encompassing every other theme of the technology transfer framework and beyond, which resulted in the formulation of either a large number of indicators (in the case of enabling environments) or indicators that are highly aggregated (in the case of capacity-building).” FCCC/SB/2009/4, para. 17.

79 Eight of the performance indicators require information specifically from non-Annex 1 Parties, three of which also target LDCs. FCCC/SB/2009/4, table at Annex II.

80 GEF/C.34/5/Rev.1 (2008), para. 4. (Compare FCCC/SBSTA/2006/INF.4, para. 2, which uses identical language, but also includes “fair trade policies” as an exemplary “action” and leaves out the term “investment in”.)

This formulation has a long association with development practice since the mid-1980s, where it has come to signify, in particular, an enabling environment for *investment*. The term is closely associated with “governance” and “the rule of law” as part of a standard policy set promoted by the World Bank and other financial institutions since the 1980s.<sup>81</sup> For our purposes, the point is to note that the thrust of this language has generally been to require a legislative and regulatory framework within developing countries to encourage foreign investors by facilitating security of property and contractual rights and various freedoms (of investment, capital movements, labour flexibility, and so on) for private investors.

These associations appear to have remained in place within the (otherwise quite different) UNFCCC regime. Ironically, then, as this sketch already shows, on this model, not only do obligations to “facilitate” and “promote” technology transfer move to the recipient countries, but the entire obligatory basis for transfer itself begins to dissipate within a larger discourse in which technology transfer is made to depend upon foreign investment, which in turn is seen as something to be “enabled” through the correct regulatory incentives.<sup>82</sup> What these “incentives” are has been described at length in a series of “indicators” produced in particular through the World Bank and its affiliate institutions. The essential focus is on market freedoms: optimal conditions for an enabling environment for investment, at least as presented in World Bank documents, actively *discourage* government intervention that might redirect the benefits of investment towards the most vulnerable.<sup>83</sup> Whether this is appropriate for “development” policy is debatable – on the Bank’s own analysis, there is little evidence that it works<sup>84</sup> – but such a framing seems particularly inappropriate for technology transfer, as explored here, which (as noted in Chapter 1), while it shares certain substantive aims with “development”, is intended to respond to a much more urgent and localised exigency.

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81 See in this regard, Stephen Humphreys, *Theatre of the Rule of Law*, Cambridge University Press (2010).

82 This too is borne out in the EGTT document on performance indicators. Among the indicators relevant to ensuring an “enabling environment” are (PI-EE-01) the World Bank’s “governance indicators”, described as necessary “to enhance legal systems (including those related to trade and intellectual property rights)”, and (PI-EE-08) “Rating of investment climate according to World Bank business indicators” – relevant “to creat[ing] an environment conducive to investment”. FCCC/SB/2009/4, table at Annex II.

83 See Humphreys (2010), note 81 *supra*.

84 See Deepa Narayan, *Voices of the Poor: Can Anybody Hear Us?*, World Bank (2000).

## A passive approach to “mechanisms”

Fourth, the framework has a single header that might appear to refer to proactive steps by Annex 2 countries: “mechanisms for technology transfer”. In fact, however, as defined, the scope of “mechanisms” is considerably broader than that. They are to involve “the coordination of the full range of stakeholders in different countries and regions”.<sup>85</sup> This is sufficiently broad as to potentially *exclude* regulatory steps taken by Annex 1 country governments (since, arguably, unilateral regulation is not “coordination”): it certainly doesn’t entail or expect such steps. Beyond this, the wording is sufficiently vague that mechanisms might equally refer to, for example, “ad hoc working groups” or websites designed as “clearing houses” to facilitate “information exchange” (such as the UNFCCC’s own “TT: Clear”)<sup>86</sup>, and so on. These things may all be useful, of course, but again they take us no closer to an understanding of the core obligation of technology transfer under the UNFCCC regime. In practice, little has, in fact, been explored under this rubric that would require any proactive steps (or indeed any steps at all) by Annex 2 country Parties.<sup>87</sup>

Remarkably, then, in the EGTT published list of 40 “performance indicators” on technology transfer, not one of the indicators targets Annex 2 countries alone (and very few include developed countries among their targets); the great majority target non-Annex 1 countries (developing countries).<sup>88</sup> Further, the indicators refer to intrusive and far-reaching measures in gauging developing country adherence to a set of informal international business norms, including the World Bank’s

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85 FCCC/CP/2001/13/Add.1, annex to decision 4/CP.7; FCCC/SBSTA/2006/INF.4, para. 2: “Mechanisms for technology transfer are to facilitate the support of financial, institutional and methodological activities: (a) to enhance the coordination of the full range of stakeholders in different countries and regions; (b) to engage them in cooperative efforts to accelerate the development and diffusion, including transfer, of ESTs, know-how and practices to and between Parties other than developed country Parties and other developed Parties not included in Annex 2 to the Convention, particularly developing country Parties, through technology cooperation and partnerships (public/public, private/public and private/private); and (c) to facilitate the development of projects and programmes to support such ends.”

86 See [unfccc.int/home/items/3092.php](http://unfccc.int/home/items/3092.php).

87 The two indicators that might conceivably require Annex 2 country action are (PI-MECH-01) “Innovative public-private financing mechanisms and instruments” (though it is tagged for “All parties”) and PI-MECH-05, subheaded “Promotion of collaborative research and development on technologies”, although there is no indication as to whether such collaboration need be public at all, much less who the relevant parties are if so.

88 See note 64, above.

governance and investment climate indicators, assessing the degree to which the legal regimes of developing countries are business-friendly.

Unsurprisingly, this framework has not been especially successful at clarifying what technology transfer is nor how it should take place, certainly not when viewed, as UNFCCC Article 4.5 indicates it should be, as an obligation on Annex 2 countries. Certainly some of these issues are of great importance. TNAs are indispensable to the correct targeting of technologies where they are needed, and attention must be paid to the absorptive capacity (“enabling environment”) of recipient countries for new technologies. Moreover, it is unlikely, at this juncture, that dogged insistence on an “obligation” to transfer technologies will be productive in moving things ahead. However, it is equally clear that technology transfer has *not* been moving ahead, and that part of the reason for this is, in fact, due to a lack of clarity about who should be taking the lead, how they should do so and what is to be gained from doing so.

## **2. “Development, application and diffusion”**

Although R&D of climate technologies plays, as we have seen, no part in the binding provisions relating to technology transfer in the UNFCCC, something along these lines does emerge in Article 10 of the Kyoto Protocol:

*[Countries shall] cooperate in the **promotion of effective modalities for the development, application and diffusion of**, and take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies [emphasis added].*

This new text does not in any way modify the UNFCCC provisions on technology transfer, and so can reasonably be viewed as an additional obligation on states parties to also undertake, cooperatively, the development, application and diffusion of technologies. What might this mean? In the context of the Kyoto Protocol, *application* and *diffusion* seem to reinforce “transfer”, but they cannot substitute for it since neither term embeds the cross-border thrust of “transfer”. Presumably, then, “application and diffusion” must refer to the process of making technologies available *in-country* to those localities where they are needed. This sense is already implicit in “transfer”, but there is clearly no loss in making the requirement to apply and distribute technologies explicit.

“Development” on the other hand, is something new, and in the time since the Kyoto Protocol, there has been a marked tendency to use the terms “the development and diffusion of technology” as substitutes for “the transfer of technology”. This has been noticeable in the mandates and work of the EGTT, but also in soft law texts resulting from successive COPs. The

Bali Action Plan, for example, speaks sometimes of “the development and transfer” of technologies, and at other times of “technology development, transfer and diffusion”. The Plan speaks of “scaling up” and accelerating” these things, and of “cooperation on research and development of current, new and innovative technology”.<sup>89</sup>

In the Cancún Agreements, this tendency is even more pronounced. The “shared vision” refers to “enhanc[ing] technology development and the transfer of technologies to developing country Parties to enable action on mitigation and adaptation” – a wording that clearly holds apart the development of technology and its “transfer ... to developing countries”.<sup>90</sup> Otherwise, however, the reference is almost consistently to variations on the expression “*technology development and transfer*” – and indeed this is the title of section IV.B of the Cancún Agreements, which deals principally with the topic of technology transfer.

What, if anything, does this repeated iteration of “development” in the language of technology transfer mean for the relevant policies? Three possible responses follow.

- (1) **Not much.** Technology development is clearly one thing; technology transfer another. Both are desirable, and they are obviously related insofar as newly developed technologies too must be available to transfer. There does not seem an available reading of any of the relevant texts that would make “transfer” dependent upon *prior* “development”. Since, as noted earlier, any such reading would risk undermining the very principle of technology transfer, it does not seem to merit serious consideration. The new emphasis in recent documents reminds us that “development” of technologies is course indispensable to the ultimate fulfilment of the UNFCCC’s objectives, but this is simply not the same thing as “technology transfer”.
- (2) **A strong case can be made to link development and transfer.** From a certain perspective, technology may be viewed as inherently dynamic: it is constantly improvable and improving. When improvements take place, it is, on most theories, in response to market signals. On such a view, any notion of “technology transfer” as involving the wholesale transfer of a given technology to a new location at a given time would be inherently static. A technology arriving in a new location would lack the context for

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89 FCCC/CP/2007/6/Add.1, Decision 1/CP.13.

90 UN Doc. GE.10-70914, Draft decision [-/CP.16].

easy absorption and also for improvement: the innovation that produces and hones the technology would not be present; nor would the market signals that facilitate take-up and direct further innovation. On this perspective, if “transfer” is to involve the adoption and widespread use of a technology and not merely the physical movement of hardware that remains either unused or prone to obsolescence (there is a history of such unproductive “transfer”), it cannot be delinked from “development”. There is much to be said for this view. For highly sophisticated technologies in particular, ongoing maintenance and improvement is not easily imaginable in a context lacking the basic economic and technological infrastructure that provide a home for innovation.

Put differently, the question here is: what conditions are needed to ensure a relevant technology will thrive in a new environment. Even if a technology is highly sought after due to climatic changes, it cannot take hold if there is no support network for its long term sustainability. When it comes to the most sophisticated technologies, ensuring sustainability requires local understanding, knowledge and a capacity to develop or adapt a technology.<sup>91</sup> It will also require the *right* to make alterations to the transferred technology, where necessary. This indicates that technology transfer must also comprise access to the knowledge, means and skills to upgrade and adapt technologies to local conditions. It is for this reason that “technology transfer” has been consistently defined to include each of these elements beyond mere hardware (more on this below).

Even if we accept, then, that there is a case for linking development and transfer, it remains the case that the UNFCCC allocates these responsibilities separately. Both responsibilities fall initially to *developed* countries. Whereas countries are required, per the Kyoto Protocol, to “cooperate” to this end, such cooperation must also be understood in the light of the principle of “common but differentiated responsibilities”.<sup>92</sup> In other words, developed countries would be expected to take the lead. Encouraging innovation and technology development in developing countries is a vital part of the future management of climate change and

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91 See Richard Klein and Clarisse Siebert, *Technology Policies to Support Adaptation in Developing Countries: Equity and Rights Considerations* (2009), on file with the ICHRP.

92 The principle is laid out in Art. 3.1 of the UNFCCC. Lavanya Rajamani, *Differential Treatment In International Environmental Law*, Oxford University Press (2006); ICHRP (2008), 59–64.

it seems right that it should find its way into the negotiating structures. At the same time, these goals and aims are separable from the particular urgency of “transfer”, and it seems sensible that this separation should remain in place: ESTs may be transferred in their existing form even as better technologies are developed – there is no need to delay the first for the second.

- (3) **This increasing juxtaposition of “development” and “transfer” in UNFCCC documents may be deleterious to the activation of the principle of technology transfer.** The mandate of the new Technology Mechanism (and its subcomponents) is framed entirely with reference to “technology development and transfer”. In a context in which the meaning of the term “transfer” remains ambiguous, it is not difficult to imagine a Mechanism that focuses primarily or even solely on “cooperative development”. No doubt, cooperative development between rich and poor countries would be worthwhile, particularly in the area of climate change adaptation. However, it would be counterproductive if such a focus were to come at the expense of the transfer of technologies needed now and urgently. It would also be out of line with the explicit text of the UNFCCC (a binding document, unlike the Cancún agreements).

Fortunately, the Cancún wording does not expect any prioritisation of development over transfer, or even any linkage between the two. Despite the apparent cumulative dilution of the term “technology transfer”, it has continued to retain its dominance in most of the relevant literature.<sup>93</sup> Ultimately, it is the *urgency* of technology transfer, given the potential havoc of climate change, that stands to dissuade a reading of these texts in such a way that “development” might pose a priority over, and thus brake on, “transfer”. As detailed below, among the purposes of this report is to underline and forefront these urgencies by making explicit the human rights considerations that hang on the transfer of technologies.

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93 So, for example, even the key relevant documentation of the principal UNFCCC funding mechanism, the GEF, sticks to the simpler term “technology transfer”. See, in this respect, GEF/C.34/5.Rev.1, Elaboration of a Strategic Program to Scale up the Level of Investment in the Transfer of Environmentally Sound Technologies (November 13, 2008).

## **C. MECHANISMS FOR TECHNOLOGY TRANSFER IN THE UNFCCC**

With the new Green Climate Fund and the Technology Mechanism pending, and their full role as yet unknown, the two principal mechanisms usually invoked for the transfer of technologies to date are the GEF and the CDM. Neither is focused primarily, much less solely, on technology transfer. Both are claimed to have promoted technology transfer in practice. We examine these claims below.

### **1. The Global Environment Facility**

The primary source of funding for most actions undertaken beneath the UNFCCC rubric has been the GEF, a funding body founded in 1991, hosted and co-managed by the World Bank (with UNDP and UNEP). The GEF has a mandate to support mitigation, adaptation and technology transfer, but to date it has consistently focused on mitigation to the relative neglect of adaptation.<sup>94</sup> Adopting the broad IPCC definition of technology transfer cited above, the GEF recently undertook a retrospective analysis of the relevance of its mitigation funding to technology transfer. It concluded as follows:<sup>95</sup>

*The general conclusion is that GEF operations have always focused on the deployment and diffusion of climate-friendly and environmentally sound technologies. Virtually all GEF mitigation and adaptation projects aim to promote climate-friendly technologies and expand the capacity for their utilization and reach in the market. GEF funding has focused on supporting innovative approaches and technologies to benefit the global environment while enhancing development goals.*

This conclusion allows the GEF to make the claim, in a technology transfer “factsheet”, to have allocated, over 18 years, “\$2.5 billion [its total allocations to mitigation projects] to support more than 30 climate-friendly technologies in more than 50 developing countries”.<sup>96</sup> Of this, \$1 billion has been allocated to energy efficiency projects and \$800 million to “projects promoting the transfer of renewable energy

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94 See ICHRP (2008), 22.

95 GEF/C.34/5/Rev.1, Elaboration of a Strategic Program to Scale up the Level of Investment in the Transfer of Environmentally Sound Technologies (November 13, 2008), para. 2.

96 The GEF, “Technology Transfer for Climate Change” (2009), 1. Online at: [www.thegef.org/gef/sites/thegef.org/files/publication/TechTransfer-FS-June2009.pdf](http://www.thegef.org/gef/sites/thegef.org/files/publication/TechTransfer-FS-June2009.pdf) (as of October 2011).

technologies to developing countries and countries with economies in transition”.<sup>97</sup> The GEF describes the nature of these projects as follows:<sup>98</sup>

*[Relevant] operational programs ... focused on energy efficiency and renewable energy technologies, respectively, that were mature, available on the international market, and profitable on paper, but were not disseminating widely because of the existence of institutional, technological, policy, or financial barriers. Projects ... sought to remove these barriers and promote accelerated growth in the adoption of the new technologies.*

In these cases, transfers of technology were essentially incidental to wider mitigation goals and the degree to which technologies have, in fact, been transferred has not been tested. According to the GEF its enumeration of these projects in this context “is not to claim that all of these technologies have been successfully transferred, but rather that the GEF portfolio provides an indication that there has been a need expressed in expanding markets for the particular technologies by the countries listed”.<sup>99</sup>

Among the questions that would presumably need to be answered for a more thorough assessment of the efficacy of GEF programmes, viewed from a technology transfer perspective, are the following: Are these technologies now available (both legally and materially) for widespread and sustainable diffusion in host countries? Have they taken hold? Are they appropriate to their new context? Are they cost-effective? Who has borne the costs of transfer, and who will bear those costs moving forward into sustainable diffusion? Perhaps most importantly, do the technologies reach those populations most vulnerable to the impacts of climate change? The GEF makes little information of this sort available,

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97 Ibid., 2. Energy efficiency projects are described as “from efficient lighting and appliances to chillers, boilers, motors, and brick kilns; from building design and construction materials to district heating systems; and from power generation and distribution to combined heat and power (“co-generation”) and industrial energy efficiency technologies.” The named renewable energy technologies are: “solar energy (photovoltaics or PVs, solar homes, and solar water heaters), wind turbines, geothermal, small hydro, methane, and biomass for heat and electricity generation”.

98 GEF/C.34/5/Rev.1, Elaboration of a Strategic Program to Scale up the Level of Investment in the Transfer of Environmentally Sound Technologies (November 13, 2008), para. 16.

99 Ibid., para. 22.

although there have been some studies conducted elsewhere on a related set of themes.<sup>100</sup>

In the same 18-year period, a mere \$130 million in total has been mobilised through the GEF for adaptation projects – the amount specifically involving technology transfer, if any, is undisclosed. The only explicit funding support under the UNFCCC for adaptation-oriented technology transfer is through the Special Climate Change Fund (SCCF), although the Fund’s “technology transfer” window (one of four) has not yet been deployed.<sup>101</sup> A second fund, the Least Developed Countries Fund (LDCF) also has nominal potential for technology transfer, but it too has not been tapped to that end.<sup>102</sup>

## **2. The GEF strategic programme on technology transfer**

In 2007, the COP at Bali requested the GEF to elaborate “a strategic programme to scale up the level of investment for technology transfer to help developing countries address their needs for environmentally sound technologies.”<sup>103</sup> In its “elaborated strategy paper” to that end, produced in 2010, the GEF concluded that, among the “gaps” in its current operations is “the weak link between GEF project development and TNAs”. That is, in its project funding, the GEF has so far effectively taken no account of the TNAs that developing countries have been compiling and publishing as a preliminary step to developed countries’ mobilisation of technology transfer.<sup>104</sup> Among the reasons given

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100 See contributions to Keith Maskus and J. H. Reichman (eds.), *International Public Goods and Transfer of Technology under a Globalized Intellectual Property Regime*, Cambridge University Press (2005) and to Prabuddha Ganguli, Rita Khanna, Ben Prickril (eds.), *Technology Transfer in Biotechnology: A Global Perspective*, Wiley (2009).

101 The SCCF has four windows: adaptation; transfer of technologies; “energy, transport, industry, agriculture, forestry and waste management”; and “economic diversification”. Two of 33 projects currently approved under the SCCF involve technology transfer (involving wave energy technology in Jamaica and irrigation technology in Jordan); at time of writing none had yet begun implementation. See [www.gefonline.org](http://www.gefonline.org).

102 See GEF/LDCF.SCCF.9/5/Rev.1, *Accessing Financing under the Least Developed Countries Fund*, GEF (October 26, 2010), 8, which states that the LDCF was set up specifically in response to UNFCCC Art. 4.9 (“The Parties shall take full account of the specific needs and special situations of the least developed countries in their actions with regard to funding and transfer of technology.”) The document, which lays out how to access financing under the fund, makes no further reference to technology. A search on the GEF website ([www.gefonline.org](http://www.gefonline.org)) finds 95 LDCF projects, none of which involve technology transfer.

103 FCCC/CP/2007/6/Add.1, Decision 4/CP.13.

104 GEF/LDCF.SCCF.9/5/Rev.1, paras. 2 and 32.

for this are that “the quality of TNAs varies substantially in terms of analytic rigor, often with little effort being devoted to indentifying the cost-effectiveness and market potential of technologies, barriers that prevent the market potential from being realized, and the means of overcoming these barriers.”<sup>105</sup>

In response, the new GEF strategy proposes to use existing resources from the GEF Trust Fund and the SCCF’s technology transfer window. “The proposed programme will consist of three funding windows to support technology transfer activities: (1) TNAs; (2) piloting priority technology projects linked to TNAs; and (3) dissemination of GEF experience and successfully demonstrated ESTs.”<sup>106</sup> The key point will be to direct GEF input into the compilation of TNAs such that they reflect a market focus and are in line with existing GEF project priorities. The GEF describes this “enhanced TNA process” as follows:<sup>107</sup>

*Prioritizing the technologies that are considered to be of strategic importance to the country, including the potential to bring global environmental as well as local development benefits; assessing the policy, institutional, and market conditions, such as analysis of the barriers to the deployment and diffusion of the technologies, detailed market assessment, and recommendation of approaches and actions to remove those barriers; and, where feasible, evaluating the technical, economic and financial viability of the priority technologies that will lead to concrete project proposals.*

This forthright focus on the stimulation of markets in developing countries for technologies continues throughout the strategy. The GEF suggests that in the longer term, it should focus on “expanding support for existing and new public-private partnerships” as well as “development of policy frameworks and institutions, and synergy with the emerging climate investment funds as well as the carbon market”.<sup>108</sup> It is worth pointing out that they do not prioritise vulnerable countries,

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105 GEF/LDCF.SCCF.9/5/Rev.1, para. 32.

106 GEF/LDCF.SCCF.9/5/Rev.1, paras. 4 and 60–75.

107 GEF/LDCF.SCCF.9/5/Rev.1, para. 66. The document adds: “The goal of GEF support is to make the TNAs a useful tool for policy makers, potential users, intermediaries, financiers of the technologies, and other stakeholders, so that all parties can better understand not only the technology needs but also how to facilitate their implementation in a collective and coordinated manner.”

108 GEF/LDCF.SCCF.9/5/Rev.1, para. 3; 43; 47–59.

much less vulnerable populations.

### **3. The GEF adaptation strategy**

The GEF has also produced a strategy on adaptation through the SCCF and LDCF, which has now been approved for the period through 2014.<sup>109</sup> The strategy, which is premised on the future availability of \$1 billion over four years, has three principal objectives, one of which focuses on technology transfer.<sup>110</sup> That objective breaks down into two key projected “outcomes”: (1) Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas; (2) Enhanced enabling environment to support adaptation-related technology transfer.<sup>111</sup>

Unlike GEF mitigation-focused activities, these latter projected activities do target the more vulnerable countries (at least insofar as these are the world’s poorest countries – they would not necessarily stretch to cover all of the threatened small island states). The funding is uncertain, however, with disbursements into both the SCCF and the LDCF being voluntary (and with a new Green Climate Fund in the offing since Cancún, there is renewed diversification of options for funders): not only is it difficult to tell how much of the “requested” \$1 billion will ever appear, there are no details on how much of whatever is received will be earmarked for the third of the three listed objectives (the other two objectives do not obviously entail technology transfer).<sup>112</sup>

Perhaps most saliently, however, here, as in the case of the GEF mitigation strategy, the predominant focus is on the creation of in-country market

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109 GEF/LDCF.SCCF.9/4/Rev.1, *Revised Programming Strategy on Adaptation to Climate Change for the Least Developed Countries Fund and the Special Climate Change Fund* (October 19, 2010).

110 GEF/LDCF.SCCF.9/4/Rev.1, 26–28. The three objectives are: “Objective CCA-1 – Reducing Vulnerability: Reduce vulnerability to the adverse impacts of climate change, including variability, at local, national, regional and global level”; “Objective CCA-2 – Increasing Adaptive Capacity: Increase adaptive capacity to respond to the impacts of climate change, including variability, at local, national, regional and global level”; “Objective CCA -3 – Adaptation Technology Transfer: Promote transfer and adoption of adaptation technology.”

111 GEF/LDCF.SCCF.9/4/Rev.1, 28 (Table 2). See also Annex 11I.

112 The GEF describes the problem as follows: “a major limitation to the effectiveness of the LDCF and SCCF has been the lack of predictability of financial resources. Unlike the GEF, which is replenished every four years, the LDCF and SCCF receive voluntary contributions without a regular replenishment schedule. Countries and agencies that support their work need to know the available resources sufficiently far in advance to plan their projects and especially their programs; this is an impossible exercise when resources are mobilized in relatively small amounts on an ad-hoc basis.” GEF/LDCF.SCCF.9/4/Rev.1, para. 14.

conditions, including a legal and regulatory environment, to support investment in the relevant technologies. Investment in technology is of great importance, of course. As we have already seen, it is not clear that investment must take place in developing countries as part of technology transfer process. If it is the case that technology transfer must entail something more than ordinary market mechanisms; and if it is to respond urgently and precisely to the predictability of climate change harms in the face of the unpredictability of market outcomes, it is unclear how GEF activities can meet the challenge.<sup>113</sup>

#### **4. The Clean Development Mechanism**

The CDM was created through the 1997 Kyoto Protocol as a “flexible mechanism” to allow developed countries meet their mitigation commitments through activities undertaken in developing countries. By investing in a project that would, by virtue of that investment, produce fewer GHG emissions than would otherwise have been the case (on a BAU scenario), the developed country partner is permitted through the CDM to acquire the emissions thereby reduced (as “certified emission reductions” or CERs) which can then be set against its own targets or sold on an emissions market. The developing country benefits, in principle, from the extra investment and also – or so it has frequently been claimed – from a resulting transfer of technologies.

As of December 2010, there were 2,558 CDM projects registered with the CDM Executive Board.<sup>114</sup> There were 275 projects in the process of registration and a further 3,103 in the pipeline (that is, being examined by various operational entities). It is worth noting that CDM projects are heavily skewed towards a small number of countries. China and India between them accounted for more than half of the total with 1,064 registered projects in China and 567 in India (there were a further 347 in Brazil). There were a mere 41 registered projects on the entire African continent (that is, 1.6% of the total), and these were located almost exclusively in South Africa, Egypt and Morocco.

The CDM has been functioning for some time and a number of analyses have determined the degree to which it has, in fact, resulted

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113 For concrete examples of GEF-funded technology projects, see GEF, *Transfer of Environmentally Sound Technologies: Case Studies from GEF Climate Change Portfolio* (November 2010).

114 The data in this paragraph is taken from UNEP Risoe CDM/JI Pipeline Analysis and Database, December 1st 2010 (available at: [cdmpipeline.org](http://cdmpipeline.org)).

in transferred technologies.<sup>115</sup> The number of projects examined varies widely – by far the most ambitious, undertaken in late 2008 by Stephen Seres for the UNFCCC, covered 3,296 projects then registered or in the pipeline. The studies are hampered by the fact that they rely mainly on the “project description documents” produced for project approval rather than on empirical examination of project outcomes. The results of these studies are summarised by Gary Cox in an article published in 2010 in the *Law, Environment and Development Journal*. In general, the studies share a few common conclusions:

- About half of all CDM projects claim to include a technology transfer component (the figure was lower in the larger Seres study, at 36%. A later study by the same author shows the number may be falling as newer projects in China benefit from technologies already available in earlier projects.<sup>116</sup>) The relevant projects account for between 50%–80% of the expected CERs.
- There is great variation in the degree to which host countries benefit from actual transfer of technologies in CDM projects – with rates significantly higher in projects in China (59%, according to a study by Glachant *et al.*) than those in India (12%).
- The “transfer” involves “knowledge and skills” as well as hardware (none of the studies make explicit whether any IP rights have been made available to host country actors and if so on what terms.)
- The principal sources of technology transfer were (1) “end of pipe destruction” of non-CO<sub>2</sub> GHGs (that is, for example, projects eliminating high-intensity GHGs such as HFCs from chemical and industrial processes) – which are in general not capital intensive, and (2) (comparatively) capital-intensive wind power projects.
- By far the primary source of technologies has been the European Union, at around 80% of relevant projects. This is unsurprising, as the United States is not a signatory to the Kyoto Protocol, although a number of United States companies are nevertheless involved.

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115 See M. Glachant, A. Dechezleprêtre and Y. Ménière, “Clean Development Mechanism and Technology Transfer”, Cerna, Ecole des mines de Paris (2008); H.C. de Coninck, F. Haake, N.H. van der Linden, “Technology Transfer in the Clean Development Mechanism”, Energy Research Centre of the Netherlands (Doc. ECN-E--07-009) (January 2007); Stephen Seres, “Analysis of Technology Transfer in CDM Projects”, Prepared for the UNFCCC Registration and Issuance Unit CDM/SDM (December 2008); Gary Cox, “The Clean Development Mechanism as a Vehicle for Technology Transfer and Sustainable Development – Myth or Reality?” 6(2) *Law, Environment and Development Journal* 179 (2010).

116 Stephen Seres, Erik Haites and Kevin Murphy, “Analysis of technology transfer in CDM projects: An update”. 37(11) *Energy Policy* 4919–4926 (2009).

Unfortunately, this information falls far short of what would be needed to understand the degree to which the CDM provides a source of technology adequate to the needs of the combined exigencies on developing countries of constrained development and climate change harms identified earlier. Nevertheless a few points are worth noting:

- (1) The CDM does not address adaptation (this is not its role).
- (2) The CDM is largely a business-to-business mechanism. It includes, for example, “transfers” between parent and subsidiary companies – although according to one study a more important actor has emerged, “CDM designers”, equipped to manage a CDM project from inception through implementation through CER capitalization.<sup>117</sup>
- (3) The CDM does not generally operate as an element of state policy; rather, it is driven by private sector activities where these seem profitable.
- (4) As a corollary, it is thoroughly market-oriented, in that it is designed to ride on existing market opportunities.
- (5) No doubt in part for that very reason, the CDM does not extend to LDCs and is far more relevant in the high-emitting “emerging economies” (whose status in the climate change arena is in any case ambiguous).

For all these reasons, the CDM is unlikely to reach those whose rights are put most at risk by climate change in a significant way.

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117 See Antoine Dechezleprêtre, Matthieu Glachant, Yann Ménière Cerna, École des Mines de Paris, *The North–South Transfer of Climate-Friendly Technologies through the Clean Development Mechanism*, ADEME (October 2007): “Companies such as AgCert, EcoSecurities, Carbon Resource Management, Agrinergy or Carbon Asset Services Sweden are now key players in the production and sale of carbon credits. We refer to these companies as CDM project designers. They manage the whole CDM project cycle, from PDD writing to credit sale. Their diversified portfolio of CDM projects allows risk minimization and exploitation of economies of scale in administrative tasks”.

## IV. “BARRIERS” TO TECHNOLOGY TRANSFER

Much of the discussion of technology transfer revolves around the question of barriers to transfer. As with the broad definition commonly cited, the 2000 special report on technology transfer of IPCC Working Group III referred to earlier also provides a description of “barriers”:<sup>118</sup>

*Barriers to the transfer of ESTs ... vary according to the specific context, for example from sector to sector, and can manifest themselves differently in developed countries, developing countries and countries with economies in transition. These barriers range from lack of information; insufficient human capabilities; political and economic barriers such as lack of capital, high transaction costs, lack of full cost pricing, and trade and policy barriers; lack of understanding of local needs; business limitations, such as risk aversion in financial institutions; and institutional limitations such as insufficient legal protection, and inadequate environmental codes and standards.*

The above set of barriers easily align with the technology transfer framework identified above. Indeed, the IPCC special report focuses on that framework (technology information, capacity building, enabling environments and “mechanisms”) to seek “government actions [which] can transform the conditions under which technology transfer takes place”.<sup>119</sup> Some of the above barriers appear to be fixed in the relevant landscape (“lack of capital”; “risk aversion in business institutions”); others appear alterable, at least in principle (“trade and policy barriers”; “inadequate environmental codes”).

This broad-brush approach to “barriers” is clearly problematic, at least insofar as it fails to prioritise between the barriers or to identify the criteria used to detect various barriers (and which barriers fit which criteria). On one hand, it tends to elide the key question about technology transfer: who has an obligation to act and what, exactly, should they be doing? On the other, it fails to recognise that different barriers embody different stakes and stakeholders: different people will win or lose depending on which barriers we choose to eliminate.

Unsurprisingly, the choice of focus when barriers are invoked tends to assume some implicit premise about what “technology transfer”

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118 Metz et al. (2000), “Summary for Policymakers”, 4.

119 Ibid. Under mechanisms, the report restricts itself to the GEF, ODA, the multilateral development banks (such as the World Bank) and “national systems of innovation”, which amount to technology transfer focal points in developing countries.

actually *is*. Two main sorts of barrier are usually identified, falling into the two familiar camps we have already remarked, and which have long structured discussions of technology transfer: market barriers, on one hand, by which is meant obstacles to the free exchange of the market; and *structural* barriers, on the other, by which is meant barriers that stand in the way of more widespread access to the world's public goods.

The identification of *market* barriers sees the solution to lie in the regulatory and policy frame of developing countries, and the proper application of international trade, investment and IP law. By contrast, the focus on *structural* barriers has largely viewed those same bodies of law as themselves the source of obstacles to technology transfer: the archetypal obstructive obligations are IP rights, such as those provided in the TRIPS regime.

In the remainder of this chapter we will review each of these positions and suggest that both tend easily to exaggeration. We will then propose some means by which the “barrier” posed by IP rights, where it exists, might be evaded or avoided. It is possible, however, that the battle over international legal obligations is largely symbolic or ideological. The greatest barrier to technology transfer, arguably, lies neither in international law nor in the domestic regulatory environment of developing countries. Rather it lies in the failure (of developed countries in particular) to produce a policy and mechanism to facilitate technology transfer.

## **A. MARKET BARRIERS**

On one side, the barriers to technology transfer are conceived largely in market terms. That is to say, in many countries, market barriers exist that pose an obstacle to technological movement. These barriers are often conceived of as policy barriers – the same set of issues referred to in the “enabling environment” element of the technology transfer framework discussed above: “technical, legal and administrative barriers” or the absence of “sound economic policy and regulatory frameworks to create a conducive environment for private and public sector investment in technology transfer”.<sup>120</sup>

Among these latter obstacles to technology transfer are often included the desirability of the removal of trade barriers and the enforcement of IP rights. “Trade barriers” is, of course, a long-standing term of art with its own disciplinary associations. In principle, any policy or regulation that has the effect of slowing the movement of goods or services across borders (such as sustaining domestic industries) or increasing the costs of doing so (such as customs duties) might be thought of as

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120 See for example: GEF/C.34/5/Rev.1 (2008), para. 4; FCCC/SBSTA/2006/INF.4, para. 2.

a trade barrier. IP rights provide guarantees to technology innovators that their investment of time and expertise will be rewarded, in the form of state guarantees to protect IP rights, monitor the deployment of copyrights and patents, prohibit counterfeits and copies from their markets, and punish copyright and patent infringements.

Trade barriers, IP rights, and other encouragements to trade and investment are not the only cited market barriers to the transfer of technologies, however. Others include the availability and circulation of information – on which functioning markets are assumed to depend and thrive – and institutional capacity. The latter includes the existence of institutions that can support a market – these tend to centre on judicial, law enforcement and penal institutions (to enforce contracts, protect property, and punish violations) but may also extend to stock markets, financial institutions such as banks or other institutions capable of lending and supplying mortgages, and so on. A much fuller list of relevant institutions is found in the literature of the principle international financial institutions such as the World Bank – whose “governance matters” indicators, for example, focus precisely on this question and are themselves included among the EGTT’s list of “performance indicators”.<sup>121</sup>

Two things are worth noticing about this articulation of the problem of “barriers” to technology transfer:

- (1) They cover three of the five elements of the UNFCCC’s technology transfer framework: technology information, capacity building and enabling environments. For this reason, these “barriers” have already been the locus of considerable interest and research in the technology transfer literature and undoubtedly dominate the subject’s analytical space, so to speak.
- (2) These “barriers” are located exclusively in the host countries: none of them are seen as relevant to the developed country (or, for that matter, private) source of an existing technology.

## **B. STRUCTURAL BARRIERS (INTELLECTUAL PROPERTY RIGHTS)**

In their TNAs, developing countries have not generally focused on market barriers. Indeed, in a 2006 EGTT synthesis report summarising the TNAs, only two barriers appear under the rubric “market barriers”, these being: “low income among consumers” and an “unstable market situation ... which hinders the procurement of international technological

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121 See above FCCC/SB/2009/4. The World Bank’s Governance Indicators use six measures: voice and accountability; political stability and absence of violence; government effectiveness; regulatory quality; rule of law; and control of corruption. See [info.worldbank.org/governance/wgi/index.asp](http://info.worldbank.org/governance/wgi/index.asp).

investment from donors.”<sup>122</sup> In other words, the principal “market barrier” is the relative poverty of the country in question. Needless to say, if there were no poverty, there would be no need for “technology transfer” at all. As suggested in Chapter 1, technology transfer only appears in the UNFCCC precisely because ordinary market demand is lacking. Moreover, demand for climate technologies is not driven by market expectations but by exogenous forces – the need to adapt to climate change and for continued development despite mitigation constraints. For LDCs at a minimum, technology transfer is aimed precisely as a response to emerging challenges that local markets are simply not equipped to meet.

Developing countries also mention institutional and regulatory barriers to transfer, but by far the main concern was with what are termed “financial barriers”, under which rubric the following obstacles were listed:<sup>123</sup>

- Lack of financial resources;
- High level of debt;
- Incompatible price, subsidies, tariffs;
- Lack of incentives;
- Lack of access to credit;
- High up-front costs;
- Low economic productivity.

In short, the principal obstacles identified by countries to accessing the technologies needed for climate change mitigation and adaptation are inadequate resources to purchase the technologies themselves, and the supplementary “barrier” that the “international community” has not stepped into the breach. In a report section on “identification of measures to address barriers”, the EGTT synthesis report continues the general trend of transferring the burden of obligation to facilitate technology transfer to developing countries.<sup>124</sup> There is no mention of “measures” undertaken or lacking in Annex 2 countries.

Elsewhere in the climate change literature and in the negotiations themselves, however, the principal “barriers” to technology transfer are often located in developed countries. IP rights, to pick the most visible example, are represented as an obstacle not because of their absence in developing countries but rather by their presence in developed countries and in international law – and by the obligation on developing

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122 FCCC/SBSTA/2006/INF.1, “Synthesis report on technology needs identified by Parties not included in Annex 1 to the Convention”, 38.

123 FCCC/SBSTA/2006/INF.1, 38. In its narrative, the report unhelpfully lumps these “economic” barriers together with the two “market barriers”. See *ibid.*, para. 86. The analysis lacks detail on what constitutes these or other (such as “regulatory”) barriers.

124 *Ibid.*, paras. 91–97.

countries to respect them. For example, the Nairobi Declaration adopted at the Special session of the African Ministerial Conference on the Environment on climate change refers explicitly, in its Annex 1V C 3 (b), to “technology transfer barriers including rules of trade tariffs, intellectual property right-barriers and technical trade barriers.”<sup>125</sup>

The same concern that IP rights may constitute a barrier to technology transfer recurs forcefully in a draft decision of the Copenhagen COP explicitly addressing the issue. Five optional texts are included, each one acknowledging IP rights as a potential barrier to technology transfer. One such reads: “Specific and urgent measures shall be taken and mechanisms developed to remove barriers to the development and transfer of technologies arising from intellectual property rights protection.”<sup>126</sup> (None of the five optional texts was ultimately adopted: the text agreed at Cancún remains silent on IP rights.)

The view that IP right protections are a barrier to the transfer of technology is not new. Indeed, it is to be found right at the inauguration of the term, at least as far back as 1961, when the UN General Assembly passed resolution 1713 (XVI) on “the role of patents in the transfer of technologies to under-developed countries”, which inaugurated a series of studies on the subject.<sup>127</sup> On most accounts, succeeding efforts culminated first, in 1974, in a “Declaration on the Establishment of a New International Economic Order”,<sup>128</sup> and later, in 1985, in a “Draft International Code of Conduct on the Transfer of Technologies” under the auspices of the UN Conference on Trade and Development (UNCTAD).

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125 [www.unep.org/roa/Amcen/Amcen.../nairobi-Deccration-2009.pdf](http://www.unep.org/roa/Amcen/Amcen.../nairobi-Deccration-2009.pdf)

126 FCCC/AWG/LCA/2009/17 [advance version], para. 17 bis. Other options include interpretative declarations to ensure that existing international agreements on IP rights do not pose an obstacle to transfer, and that “all necessary steps” be taken “in all relevant forums to exclude from [IP right] protection and revoke any such existing [IP right] protection in developing countries and least developed countries on [ESTs] to adapt to and mitigate climate change” (ibid., para. 17).

127 See for background: G. Zaphiriou, “An International Code of Conduct for the Transfer of Technologies” 26 *International and Comparative Law Quarterly* 210 (1977); Pedro Roffe, “Transfer of Technology: UNCTAD’s Draft International Code of Conduct” 19 *International Lawyer* 689 (1985). For a good timeline, see the website of the UNCTAD Committee on Technology Transfer: [anewmanifesto.org/timeline/unctad-committee-on-transfer-of-technology/](http://anewmanifesto.org/timeline/unctad-committee-on-transfer-of-technology/).

128 A/RES/S-6/3201, 3201 (S-VI). Declaration on the Establishment of a New International Economic Order (May 1, 1974):

Art 4.: The new international economic order should be founded on full respect for the following principles: ... Giving to the developing countries access to the achievements of modern science and technology, and promoting the transfer of technology and the creation of indigenous technology for the benefit of the developing countries in forms and in accordance with procedures which are suited to their economies.

## **1. The Draft International Code of Conduct on The Transfer of Technologies**

Although always contentious and ultimately never adopted, the Code is an excellent repository of the key concerns for which the term “technology transfer” became the expression in the last quarter of the Twentieth Century. That the Code’s primary subject matter is a set of concerns that ordinarily fall beneath the rubric of IP is clear from its definition of technology transfer:

*1.2. Transfer of technology under this Code is the transfer of systematic knowledge for the manufacture of a product, for the application of a process or for the rendering of a service and does not extend to the transactions involving the mere sale or mere lease of goods.*

In short, “mere” commercial transactions relating to technological hardware are specifically excluded from the scope of the term “technology transfer”. The Code clarifies what processes do fall within its scope:

*1.3. Transfer of technology transactions are arrangements between parties involving transfer of technology, as defined in paragraph 1.2 above, particularly in each of the following cases:*

*(a) The assignment, sale and licensing of all forms of industrial property, except for trade marks, service marks and trade names when they are not part of transfer of technology transactions;*

*(b) The provision of know-how and technical expertise in the form of feasibility studies, plans, diagrams, models, instructions, guides, formulae, basic or detailed engineering designs, specifications and equipment for training, services involving technical advisory and managerial personnel, and personnel training;*

*(c) The provision of technological knowledge necessary for the installation, operation and functioning of plant and equipment, and turnkey projects;*

*(d) The provision of technological knowledge necessary to acquire, install and use machinery, equipment, intermediate goods and/or raw materials which have been acquired by purchase, lease or other means;*

*(e) The provision of technological contents of industrial and technical co-operation arrangements.*

Moreover, the Code is clear that “parties” in this case is not restricted to states, but nor is it restricted to private parties. It rather extends to:

*[A]ny person, either natural or juridical, of public or private law, either individual or collective, such as corporations, companies, firms, partnerships and other associations, or any combination thereof, whether created, owned or controlled by States, Government agencies, juridical persons, or individuals ... The term “party” includes, among the entities enumerated above, incorporated branches, subsidiaries and affiliates, joint ventures or other legal entities...*

The main thrust of the Code therefore is to provide parameters within which transnational private, and indeed public–private, transactions are to be framed. Explicitly it is concerned with a set of permissible state capacities (“state rights”) to impose conditions on transnational technology suppliers,<sup>129</sup> on one hand, and with a set of prohibitions (or regulations) to be applied to the practices of transnational technology suppliers, in their contractual relations in host countries, on the other.<sup>130</sup> Implicitly, the concern is to ensure that the benefits of foreign investment in technological processes in developing countries (1) can be retained insofar as possible within the host state and (2) can be subjected to a set of policies to maximise their potential to contribute to social and economic development of the host state.

The term “intellectual property rights” does not itself appear in the Code, but it is clear that the Code is concerned not with the restriction or promotion of IP rights *per se* but with their parameters. It is not that IP rights are viewed as intrinsically obstructive to the transfer of technology. Rather, the strength of IP rights are understood to determine the old question *cui bono* – *who benefits* from cross-border transactions involving technological knowledge and know-how. From this perspective, the disagreements in the course of the Code’s negotiation between developed and developing countries appear to be differences of prioritisation. Developing countries prioritised the public (that is the state acting on behalf of the general public) over the private (the private sector) as the relevant beneficiary of technological transactions. Developed countries, by contrast, prioritised the private over the public.

The distinction is well illustrated in their contrasting approaches

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129 See Art. 2.2(ii): “States have the right to adopt all appropriate measures for facilitating and regulating the transfer of technology, in a manner consistent with their international obligations”; Art. 3.1: “States have the right to adopt measures such as those listed in paragraph 3.4 of this Chapter.” The relevant measures are listed in Chapter 3 of the Code.

130 The practices in question are listed in Chapter 4 of the Code.

to Chapter 4 of the Code, concerning contractual practices to be prohibited or regulated. For the most part, agreement was reached on what practices should be regulated. However, there was no agreement over how the chapter was to be titled. Developed countries suggested “restrictive business practices” whereas developing countries preferred “the regulation of practices and arrangements involving the transfer of technology”. This seemingly cosmetic disagreement points to a marked disjuncture over the very purpose of the Code. As Pedro Roffe pointed out, the developing countries’ “test” for unfair practices was a “development test” (does the practice hinder the contribution of the technology to economic development?) Developed countries’ test, by contrast, was a “competition test” (does the practice distort markets?)<sup>131</sup>

These differences were never ultimately resolved, nor was the difference of view over whether the Code should be legally binding (the developing country position) or serve merely as guidance (the developed country view). Ultimately, the Code was never adopted in any form. At the time of the Code’s negotiation, a main objection was that it intruded upon domains that were properly the prerogative of national legislation – best dealt with through conflict of laws rules where conflicts arose (a similar argument could, however, be made for many areas of international law).<sup>132</sup> At the same time, it was felt that the Code overreached in a number of areas where states already had international obligations (both conventional and customary).<sup>133</sup> Moreover, it was argued that to regulate technology transactions would have the reverse of the intended effect, impeding rather than encouraging the transfer of technologies. One person’s “barrier”, in short, is another person’s facilitator.

## **2. Trade-Related Aspects of Intellectual Property and Services**

The import of these various positions becomes much clearer with the adoption, a mere decade later, of Trade-Related Aspects of Intellectual Property and Services (TRIPS) under the auspices of the World Trade Organization (WTO). Under TRIPS, states are required to intervene strongly in very much the same areas as the Draft Code had foreseen. However, the contested “balance” of the Code had tilted decisively in TRIPS. The Code, being neither finalised nor legally binding, was essentially over-coded in a number of key domains and today no longer appears relevant.

TRIPS does, in fact, have a provision on technology transfer, but the relevant Article bears little in common with the Code’s objectives

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131 Roffe, *supra*, 699–700.

132 See generally Zaphiriou, *supra*.

133 *Ibid*.

and purposes. TRIPS Article 66.2 provides that “[d]eveloped country Members shall provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members in order to enable them to create a sound and viable technological base.” The result is a quite different regime than that envisaged in the Code, one in which private investors are essentially freed of obligation in this regard, but benefit from the “encouragement” of home governments to enter foreign markets.<sup>134</sup> With TRIPS the balance tilts towards from public to private.

The UNFCCC appeared around the same time as TRIPS, however, and appears to take a step in precisely the opposite direction. Whereas the Code at all times treated technology transactions as entirely voluntary arrangements between contractual partners, albeit subject to public controls, the UNFCCC, as we saw above, apparently introduces an obligation upon states to achieve transfer.

### **International Investment Law**

The web of bilateral investment treaties (BITs) and international investment agreements (IIAs), cumulatively referred to as “international investment law”, are also relevant to technology transfer. IIAs typically protect investors from expropriation or nationalization by the state, unless it is done “(a) for a public purpose; (b) in a non-discriminatory manner; (c) on payment of prompt, adequate, and effective compensation; and (d) in accordance with due process of law”.<sup>135</sup> If IP, or patents, are considered to amount to a form of property under the domestic law of a given state (as TRIPS appears to expect), these provisions will be relevant.

Moreover, in the “performance requirements” clauses found in many IIAs, some countries impose explicit restrictions on actions undertaken

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134 The article also provides that states shall report on progress to that end – however, an analysis of the resulting reports to date shows that very little has been done in practice to “promote and encourage” technology transfer, and that developed countries have divergent views on what the obligation actually entails. Suerie Moon, “Does TRIPS Art. 66.2 Encourage Technology Transfer to the LDCs?: An Analysis of Country Submissions to the TRIPS Council (1999–2007)” (16 June 2008) ICTSD at [www.iprsonline.org/ictsd/Dialogues/2008-06-16/2008-06-16\\_doc.htm](http://www.iprsonline.org/ictsd/Dialogues/2008-06-16/2008-06-16_doc.htm), accessed 7 June 2010.

135 See, for example, US 2004 Model BIT, Article 6, according to which neither party to the BIT may, “in connection with the establishment, acquisition, expansion, management, conduct, operation, or sale or other disposition of an investment ... in its territory, impose or enforce any requirement or enforce any commitment or undertaking ... to transfer a particular technology, a production process, or other proprietary knowledge to a person in its territory”. Online at: [www.state.gov/documents/organization/117601.pdf](http://www.state.gov/documents/organization/117601.pdf).

in furtherance of technology transfer.<sup>136</sup> This clearly ties the hands of host states intending to effect technology transfer and may affect the ability of governments to require open licensing or patent pooling on foreign investors in technology (see below). Agreement to these provisions does not mean that states entirely relinquish the capacity to regulate foreign investment in technologies. However, they do subject any such regulation to multiple procedural hurdles.

### **A Bridgeable Gap?**

Do IP rights protections hinder or help technology transfer? Some studies reportedly show “positive impact” of IP rights on technology transfer, demonstrating “a link between stronger patent rights and productivity, trade flows, foreign direct investment and the sophistication of technologies transferred.”<sup>137</sup> Other studies have found, by contrast, that “the market power provided by patents and other IP rights over certain technologies (by allowing owners to limit the availability, use, or development of a process or product) may also result in prices that exceed the socially optimal level and hamper the transfer of those technologies.”<sup>138</sup>

Elsewhere again it is claimed that the specific reasons that have caused IP rights to impede the availability of technology in developing countries (the case of pharmaceuticals is often cited) do not apply for climate technologies, or not, at least, mitigation technologies. This is because competition among manufacturers of these technologies is sufficiently vigorous that royalties on them do not amount to a substantial addition to their price.<sup>139</sup>

IP rights might also be thought to encourage innovation in developing countries, which is undoubtedly vital to the future objectives of low-carbon global growth. However, there has been little evidence that this has been in the case in fact – and especially in the LDCs – the reverse may be true. IP rights pose a cost to the use of certain technologies – to their dismantling, reverse engineering, reconstruction, and cheap local

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136 US 2004 Model BIT, Article 8; 8(f).

137 “Climate Change, Technology Transfer and Intellectual Property Rights”, ICTSD (August 2008), citing Keith Maskus, “Transfer of Technology and Technological Capacity Building”, paper presented at the ICTSD UNCTAD Dialogue, 2nd Bellagio Series on Development and Intellectual Property (2003).

138 Ibid., citing Dominique Foray, *Technology Transfer in the TRIPS Age: The Need for New Types of Partnerships between the Least Developed and Most Advanced Economies*, ICTSD (2008) and Bernard Hoekman, Keith Maskus and Kamal Saggi, “Transfer of Technologies to Developing Countries: Unilateral and Multilateral Options” World Bank Policy Research Working Paper 3332 (2004).

139 John Barton, “Future Climate Technology Regimes: An Assessment of the Macro-Environmental Context from a Human Rights Perspective”, paper produced for the ICHRP (May 2009), 4.

production. If they are not retained through a process of technology transfer, there are presumably costs to the IP proprietors. If they are retained, someone else has to pay the cost.

In short, the tension between technology transfer and IP rights protection concerns costs: how much will the transfer of technology cost and who is going to pay? Higher IP right protections assumes increased profits from technology dissemination and higher costs to recipient states; lower IP barriers transfer costs to the private sector (in the form of reduced revenues) in the public interest. That, at least, is the theory. However, it is far from clear that significant costs are at stake in practice, in particular with regard to climate change mitigation technologies. For example, John Barton writes:

*For the technologies typically likely to be transferred for the areas of mitigating climate change ... royalties (whether explicit or implicit in the price of the product) are generally small, typically at most a percent or two of the total price of the product. This is because the market conditions associated with these technologies are quite competitive. Thus, they are very different from those associated with pharmaceuticals, where the royalties are a much larger portion of the overall product price.<sup>140</sup>*

Barton is far from alone in concluding that the obstacle posed by IP to technology transfer is not decisive.<sup>141</sup> Adaptation, on the other hand, is less dependent on proprietary technologies; there is greater scope for “South–South” technology transfer, which presumably might be facilitated through the climate regimes. The assumption that IP right protections will necessarily be costly may not withstand empirical scrutiny.

But even where there are significant costs associated with IP rights, there are numerous ways to moderate and share them. Among the options included in the draft decision of the Copenhagen COP in late 2009, for example, were measures “to remove barriers to development and transfer of technologies”, including the following:<sup>142</sup>

*Creation of a Global Technology Property Rights Pool for Climate Change that promotes and ensures access to intellectual property protected technologies and the*

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140 Ibid.

141 See too, in this regard, Dalindyebo Shabalala and Marcos Orellana, [Technology transfer in the UNFCCC and Other International Legal Regimes: The Challenge of Systemic Integration](#) (2010), available at [www.ichrp.org](http://www.ichrp.org).

142 FCCC/AWGLCA/2009/17, para 17 bis.

*associated know-how to developing countries on non-exclusive royalty-free terms.*

*Take steps to ensure sharing of publicly funded technologies and related know-how, including by making the technologies and know-how available in the public domain in a manner that promotes transfer of and/or access to environmentally sound technology and know-how to developing countries on royalty-free terms.*

Other suggestions that have been made include the creation, consistent with TRIPS, of exemptions to patentability (that is, determining that certain public interest technologies might no longer be considered patentable), exceptions to patent rights (determining that where technologies are put to certain public interest ends, patent rights no longer apply) and compulsory licences (public provision of licences for patented technologies to other private actors on a compulsory, but compensated, basis).<sup>143</sup>

It is also possible to envisage a situation, particularly with regard to mitigation technologies in future, wherein significant public investment might be directed toward clean technological development, effectively displacing the need for IP rights protections. The imperative public need, posed by climate change presumably alters the incentive structures.

All told, then, it is far from clear that IP rights must, in fact, constitute a significant barrier to technology transfer in practice. Were concrete steps to be taken towards the transfer of technologies, it is difficult to see why IP rights would pose an insuperable obstacle. Should IP rights increase the costs of technological movement significantly, there are ways to manage those costs. A more pressing problem is that, as yet, no concrete steps to proactive technology transfer appear to have been proposed by Annex 2 parties.

It may be that IP functions in this debate largely at the symbolic level. When IP is raised, whether viewed as an obstacle to or an enabler of technology transfer, it tends to bring with it predetermined ideas about what technology transfer is and how it should function (or not). The positions are well known and difficult to shift, and the result is to reproduce deadlock.

The urgency of climate change requires that this deadlock be broken. If climate change is a “collective action problem” or a “market failure”, it is surely because there is a larger public interest at stake in climate change that is not adequately addressed in the familiar stand-off between market and state, IP rights versus technology transfer or public versus private interest. The question is how to recalibrate the public interest under

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143 These are the suggestions made in ICTSD (2008), *supra*.

the new conditions presented by climate change? To this question one modest, even minimalist, response is to turn to human rights. We do this in Chapters 5 and 6. In the remainder of this chapter, we take the IP right obstacle seriously and examine how it might be addressed within the confines of the existing international law environment.

### **C. MANAGING INTELLECTUAL PROPERTY RIGHTS IN TECHNOLOGY TRANSFER**

Various means of avoiding or mitigating the potential obstacles IP rights may pose for technology transfer exist. These include *compulsory licensing*, *open licensing* and *patent pools*. In the following section we discuss each of these three and, having looked at the related option of speeding up the entry of technologies into the *public domain*, conclude with some proactive approaches that might be taken at the international level to manage the “barrier” of IP rights.

#### **1. Compulsory licensing**

Compulsory licensing refers to the regulatory power of a state to require the holder of a patent in a given technology to grant access to the patented technology either to the state itself or to a third party.<sup>144</sup> The effect of a compulsory license is to limit the patent-holder’s right to exclude others from producing, using, selling or distributing the patented technology. The government might itself make use of the rights (that is, use or produce the technology in question) or license the rights to another public or private body, who might then produce or use the patented technology.

Compulsory licensing may be relevant where royalties on patents are prohibitively expensive, where patent holders refuse to make licences available on reasonable terms (or at all), where a public emergency demands rapid or scaled-up production and distribution of a patented technology, or where the government decides it is necessary for some public non-commercial use. In 2001, for example, during the Anthrax bacteria scare the US gave serious consideration to issuing a compulsory license to maximise production of the antibiotic Ciprofloxacin.<sup>145</sup> Patent holders may be compensated for the royalties lost due to compulsory licenses. The standard in the United States is “reasonable and entire” compensation

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144 See generally CIEL (2010), available at [www.ichrp.org](http://www.ichrp.org).

145 See Jason Ferrone, “Compulsory Licensing during Public Health Crises: Bioterrorism’s Mark on Global Pharmaceutical Patent Protection”, 26 *Suffolk Transnational Law Review* 385–410 (2003). Ultimately the Government reached agreement with Bayer to purchase 100 million tablets at 95 cents per tablet, 20% of their retail value (at a cost of US\$ 9,500,000,000 to the US taxpayer).

for lost royalties; in TRIPS the standard is “adequate remuneration”.<sup>146</sup> Compensation does not generally extend to compensation for any profits the patent holder may believe they have lost due to the production or sale of the technology under the compulsory license.<sup>147</sup>

Compulsory licenses are recognised under international law. According to the TRIPS agreement, a compulsory license can only be sought if the state has made “efforts to obtain authorisation from the right holder on reasonable commercial terms and conditions and that such efforts have not been successful within a reasonable period of time.”<sup>148</sup> This provision can be waived, however, in circumstances of national (or “extreme”) emergency, and for public non-commercial uses. At Doha in 2001, the TRIPS condition that compulsory licenses must be “predominantly for the supply of the domestic market” was effectively suspended for the supply of pharmaceuticals to LDCs without domestic manufacturing capacity. However, the proposed system for acquiring compulsory licenses in these circumstances is exceedingly complex and remains underused to date.<sup>149</sup> Under TRIPS, regardless of the circumstance in which a compulsory license is obtained, “adequate remuneration”

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146 28 U.S.C. 1498, stating “Whenever an invention described in and covered by a patent of the United States is used or manufactured by or for the United States without license of the owner thereof or lawful right to use or manufacture the same, the owner’s remedy shall be by action against the United States ... for the recovery of his reasonable and entire compensation for such use and manufacture”. See Daniel Cahoy, “Breaking Patents” 32 *Michigan Journal International Law* 461 (2011).

147 *Gargoyles, Inc. v United States*, 37 Fed Cl 95 (1997), subsequent app 42 USPAQ 2d (1997, CA FC), finding that “lost profits would be available only upon a showing of “strictest proof” that the plaintiff would have actually earned and retained sums claimed on its sales to the government, and that but for the government’s infringement, the plaintiff would have made the infringer’s sales”. See Lauren Keller, “Ciprofloxacin and Compulsory Licensing of Pharmaceutical Patents” (unpublished, 2002); Robert Shapiro, “Patent Infringement During a Time of National Emergency: Are Canadian, American and Mexican Governments Permitted to do so Under Their National Law, NAFTA and TRIPS; If So At What Cost?” 18 *Windsor Review of Legal and Social Issues* 37 (2004).

148 Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS), Article 31(b). See generally Article 31 (“Other Use Without Authorization of the Rightsholder”). TRIPS Agreement is Annex 1C of the Marrakesh Agreement Establishing the WTO, signed in Marrakesh, Morocco on 15 April 1994. The TRIPS agreement mirrors Canadian legislation on compulsory licensing. See R.S.C. 1985 c. P-4 s.19, detailed in Shapiro (above, note 147), 45–46.

149 TRIPS, Article 31(f). Doha Declaration on the TRIPS Agreement and Public Health (hereafter “Doha Declaration”, an international agreement clarifying certain aspects of the application of TRIPS), para. 6; Duncan Matthews, “The WTO Decision on Implementation of Paragraph 6 of the Doha Declaration on the TRIPS Agreement and Public Health: a Solution to the Access to Essential Medicines Problem?” (2004) 7 *Journal of International Economic Law* 73.

must be paid to the patent-holder.<sup>150</sup> Both the legality of acquisition and the level of remuneration are subject to judicial review.<sup>151</sup>

Compulsory licensing is clearly a potentially important tool in addressing technology transfer for climate change, but only where international policy has effectively failed to create conditions rendering such blunt measures unnecessary. Generally, compulsory licensing signals a breakdown in cooperation between public and private sectors, or even **between private actors in a given market**. In the absence of international movement on technology transfer, it may, however, be necessary, in cases where patent-holders are proving uncooperative, and where uses are “public” and “non-commercial” or technologies are needed to address public emergencies resulting from climate change-related disasters.<sup>152</sup> These conditions are highly likely to be fulfilled once climate change begins to pose urgent public policy problems, as predicted.

## 2. Open licensing

Open licensing is the adoption by rights-holders of licences that allow free access to licensees to use a given technology in a variety of ways without needing to pay royalties. Open licensing has been most thoroughly explored in the area of software copyrights (although it is increasingly relevant to patents too), where it is closely associated with “open source code”. An open source code is one the rightsholder has made available for copying, distribution and modification without royalty payments. In practice open licensing can apply to any invention or technology (the recurrence of the term “open source” in these contexts is therefore unnecessary and somewhat confusing).<sup>153</sup> The success of open licensing depends on making subsequent adaptations and modifications of the relevant technology available on the same royalty-free full access terms.

The open source analogy is a reminder that open licensing not only ensures that technological development is cheaper than it might otherwise be (if royalties were payable); it can also be speedier and

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150 TRIPS, Article 31(h).

151 TRIPS, Article 31(i) and (j).

152 The 2001 Doha Declaration states that, each country “has the right to grant compulsory licences and the freedom to determine the grounds upon which such licences are granted” and countries also have “the right to determine what constitutes a national emergency or other circumstances of extreme urgency.” WT/MIN(01)/DEC/2, Declaration on the TRIPS agreement and public health, Adopted on 14 November 2001, paragraph 5(c).

153 For more on open source and its origins, see Yann Joly, “Open Source Approaches to Biotechnology: Utopia Revisited” 59 *Maine Law Review* 385 (2007) at 387; Lisa Larrimore Ouellette, “Addressing the Green Patent Global Deadlock Through Bayh-Dole Reform” 119 *Yale Law Journal* 1738 (2010).

more durable, opening the door to independent and collaborative development. The fact that a license is open also does not mean that there is no patent or that the technology is placed in the public domain. An open license is a kind of license applied to a patent that is not in the public domain.<sup>154</sup> Nor do open licenses mean licensees (or licensors) cannot charge for their products – it simply means that there are no royalty charges to the licensor included in the price.

US lawyer Lawrence Rosen suggests five principles of open licensing. His principles, developed for open source software, have been modified here to highlight their relevance to a broader range of technologies, referred here as “patented technologies”, including in the domain of climate change.<sup>155</sup> Here, licenses are free for the following uses:

- (1) To use the patented technology for any purpose whatsoever;
- (2) To make copies of the patented technology and to distribute them without payment of royalties to a licensor;
- (3) To create derivative works of the patented technology and to distribute them without payment of royalties to a licensor;
- (4) To access and use the description of the patented technology;
- (5) To combine the patented technology with other technologies.

Open licensing is applicable as a matter of law to most areas in which patents (and copyrights) apply. It has been suggested as an ideal model wherever universities or government-funded research institutions undertake research, such as in the context of pharmaceutical development in the face of global health threats.<sup>156</sup> It has been applied in the field of biotechnology.<sup>157</sup>

In climate change, open licensing has been suggested as a means to accelerate the development of renewable energy technologies.<sup>158</sup> This might be done in a number of ways. Incentives, for example: governments

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154 See Brad Frazier, “Open Source is not Public Domain: Evolving Licensing Philosophies” 45 *Idaho Law Review* 349 (2009).

155 See Lawrence Rosen, *Open Source Licensing*, Prentice Hall PTR (2004), 9–11.

156 Amy Kapczynski, Samantha Chaifetz, Zachary Katz and Yochai Benkler “Addressing Global Health Inequities: An Open Licensing Approach for University Innovations”, 20 *Berkeley Technology Law Journal* 1031 (2005).

157 Joly *supra* note 153; Andrew Pollack, “Open-Source Practices for Biotechnology”, *The New York Times*, February 10, 2005.

158 Jacob Wiener, “Sharing Potential and the Potential for Sharing: Open Source Licensing as a Legal and Economic Modality for the Dissemination of Renewable Energy Technologies” 18 *Georgetown International Environmental Law Review* 277 (2006).

might make funding for R&D into renewable energies, in public and private institutions, conditional on licenses remaining open.<sup>159</sup> But governments can also require institutions researching in certain domains to enter open licensing arrangements. As Jason Wiener notes, “governments may force universities and agencies to use open source products as alternatives to proprietary ones [on the basis] that open source products are more reliable, efficient, adaptable, quicker to improve and cost considerably less overall”.<sup>160</sup> The Brazilian government has already taken this approach to government funded software research.<sup>161</sup> At the international level, the UNFCCC technology transfer provisions clearly foresee, if they do not indeed require, similar cost-saving and collaborative efforts between developed and developing countries.<sup>162</sup>

Crucially, however, open licensing is fundamentally a voluntary process and cannot be imposed, except as a condition of receiving government funds and support. Any mandatory system of open licensing becomes a system of compulsory licensing without that voluntary component. The levers wielded by governments are therefore limited to procurement and R&D funding policies.

### **3. Patent pools**

The establishment of global voluntary patent pools is another strategy for avoiding IP conflicts in technology transfer. Global voluntary patent pools consist of rights-holders placing technologies in exchange pools where they will be able to access other technologies, as well as the know-how and capacity building to make the most effective use of these other technologies.<sup>163</sup> Voluntary patent pools are often viewed as an innovation to help overcome some of the inefficiencies associated with highly restrictive IP regimes. They are initiated by patents-holders when confronted by “patent thickets”, where fragmented ownership of complementary technologies blocks progress on all of them.<sup>164</sup>

As with compulsory or open licensing, patent pools might also be encouraged or even mandated by governments, acting together, either through the UNFCCC or through other relevant fora, such as the World

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159 Wiener, 295–296.

160 Wiener, 296.

161 Wiener, 296.

162 Wiener, 299–300.

163 See CIEL (2010), on file with the ICHRP.

164 See in this regard, Teneille R. Brown, “The Eminence of Imminence and the Myopia of Markets”, 9 *The John Marshall Review of Intellectual Property Law* 674 (2010), 690–691; 739.

Intellectual Property Organization (WIPO).<sup>165</sup> The EGTT specifically recommended patent pooling as a useful tool in developing climate change technologies.<sup>166</sup> Small renewable energy technology companies in particular may have a lot to gain from patent pooling, especially if the potential costs of sharing information are compensated by proactive government or multilateral financing in the public interest.

However, there are also dangers associated with patent pooling, as outlined by Jerome Reichman.<sup>167</sup> Patent pools, he notes, can themselves pose an obstacle to technology innovation, by “enabl[ing] large corporations that are sometimes slothful innovators to accumulate pools of cross-licensed patents that create barriers to entry for the truly innovative small- and medium-sized firms”.<sup>168</sup> Similarly, technology transfer can be blocked where “powerful foreign companies ... accumulate patents on incremental innovations to block local improvers in developing countries and to maintain patent pools that could create formidable barriers to entry.”<sup>169</sup>

This is not to say that patent pooling as a public investment strategy – particularly between countries (either developing countries or in developed-developing country partnerships), or through multilateral partnerships – might not prove a valuable tool in ensuring climate technology access.<sup>170</sup>

#### **4. Public domain**

Finally, governments could take steps to create conditions for speedier entry of climate technologies into the public domain, to make them readily accessible where needed. Again this might be done through funding incentives or conditions requiring shortened patent lifetimes or immediate entry into the public domain. Where patents have not been used, they might become immediately available for compulsory licences (this is, for example, the situation under Mexican law), or they might fall into the public domain. Rights-holders are, in these cases, subject to “working requirements” in order to retain control over patents.

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165 See in this regard, Antony Taubman, “Sharing Technology to Meet a Common Challenge: Navigating Proposal for Patent Pools, Patent Commons and Open Innovation”, WIPO Magazine (2009), online at: [www.wipo.int/wipo\\_magazine/en/2009/02/article\\_0002.html](http://www.wipo.int/wipo_magazine/en/2009/02/article_0002.html).

166 FCCC/SB/2009/3, Annex II.

167 Jerome H. Reichman, “Intellectual Property in the Twenty-First Century. Will the Developing Countries Lead or Follow?” 46 *Houston Law Review* 1115 (2009).

168 Reichman, 1121.

169 Reichman, 1134.

170 Reichman, 1142: “developing countries may need to assist each other with access to essential climate change technologies, and pooled procurement strategies may become advisable.”

Alternatively, at the international level, it might be achieved through coordinated efforts to reform the legal environment regarding patent protections for climate technologies. Expiry times for patents relating to climate change technologies might, for example, be shortened.

#### **D. PROACTIVE APPROACHES TO INTELLECTUAL PROPERTY RIGHTS**

The above examples demonstrate that the climate change regime finds itself inevitably in a context of interaction with other legal regimes, which have their own “objects and purposes” that may, in some cases, pull in different directions from climate law. Given the broad range of areas affected by climate change, conflicts regarding both objectives and methodologies are inevitable. However, there are strategic approaches available to manage these conflicts.

It would be useful, for example, if the new UNFCCC Agreement, or the COP decisions relating to any such Agreement(s), elaborate general interaction and savings clauses that account for the broad shared objectives and the specific shared provisions among the UNFCCC and other regimes. These “interaction clauses” will enable the agreement to more comprehensively address its relationship to other regimes, and put forward a pro-active mode of cooperation.<sup>171</sup> In the specific case of technology transfer, an option may be the use of an International Declaration on Climate Change and Intellectual Property Rights (DCCIPR). Similar to the Doha Declaration on Public Health (see above), such a DCCIPR would be an interpretive statement of existing international law on the issue, while also providing a decision framework for organizations that encounter the issue. While the Doha Declaration was largely limited to the issuance of compulsory licenses, the DCCIPR should address the full panoply of flexibility and policy options available to member states under the international IP regimes.

As a matter of strategy, discussion of any proposed declaration need not, and probably should not, take place in the forum of the WTO. It may be more appropriate to seek such a declaration in the context of the broader mandate of the UNFCCC rather than the relatively narrow focus of the WTO TRIPS Agreement.<sup>172</sup>

The proposed DCCIPR could outline the urgency of climate change, the urgency of the human rights challenge, the key obligations of states to fulfil and protect those human rights, and the necessity for technology transfer to

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171 Harro Van Asselt et al., “Global Climate Change and the Fragmentation of International Law” (2008) 30 *Law and Policy* 423, at 431.

172 Frederick M. Abbott, *Innovation and Technology Transfer to Address Climate Change: Lessons from the Global Debate on Intellectual Property and Public Health* (Intellectual Property and Sustainable Development Series: Issue Paper 24, June 2007).

achieve those rights. The proposed declaration would provide interpretive force if adopted through a COP decision, particularly if this were done in coordination with the Human Rights Council, the WIPO General Assembly, and the WTO General Council (other relevant international organs are the UN Commission on International Trade Law and the International Centre for Settlement of Investment Disputes rule-making bodies).

There are other areas of international economic law that may conflict with the UNFCCC's objectives regarding technology transfer. Notably, government subsidies for R&D can be regarded as causes for action under the WTO, which clearly poses a problem for developing countries wishing to move quickly on climate change technologies. This obstacle could be addressed within the UNFCCC accord by specifically allowing R&D subsidies for developing countries (alone), for the purpose of enabling them to subsidise environmentally sustainable climate technologies.<sup>173</sup> Such a provision might also extend to multilateral R&D partnerships, including those involving developed countries.

These examples illustrate the possibility of an agreement to be reached under the UNFCCC, without exacerbating conflicts between different international law regimes. These specific examples would not require amendment to the TRIPS Agreement or to other relevant treaties.

States are in a position to encourage each of the above means of ensuring that IP rights do not pose an obstacle to technology development and transfer.<sup>174</sup> In each of these domains, indeed, the UNFCCC forum provides an ideal policy context for the agreement of means and principles to be followed across multiple states. Doing so creates predictability and security in the legal environment and, most importantly, avoids regulatory competition.

In Chapter 5, we look at how the calculation of human rights impacts into climate change technology policy changes the equation. Human rights exigencies provide a floor for policy. They indicate a minimal threshold level that policy steps must attain given the damage caused, and the constraints imposed, by climate change.

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173 Bernard Hoekman and others, "Transfer of Technology to Developing Countries: Unilateral and Multilateral Policy Options" (1 June 2004) World Bank Policy Research Working Paper No. 3332, 25. At: [ssrn.com/abstract=610377](https://ssrn.com/abstract=610377) accessed 8 June 2010.

174 See, for example, Ouellette (note 153, *supra*) at 1728, arguing that "the United States could reduce IP-related market inefficiencies and appease its global critics—without changing international IP laws—by making nonpatenting or nonexclusive licenses the default for federally funded technologies."

## V. HUMAN RIGHTS AND TECHNOLOGY POLICY FOR ADAPTATION

This paper has drawn a number of connections between climate technology policy and human rights. In Chapter 1, we pointed out that climate change affects human rights and that technologies will frequently provide a solution for avoiding those effects or a remedy where they cannot be avoided. In Chapter 2 we outlined a case for a duty of technology transfer between developed and developing countries. In Chapter 3 we showed how there already exists a legal basis for an obligation to technology transfer, but also how, until now, that obligation has not been discharged. We suggested that human rights may help to provide a solution to the deadlock that has often characterised discussion of these issues.

In this chapter as well as Chapter 6, we will explore the affected human rights in more detail, expand upon the degree to which the need to protect these rights under conditions of climate change must involve transfers of technology, and outline some of the ways in which technology policy might be oriented to these ends. Again, it makes most sense to follow the distinction between adaptation (this chapter) and mitigation (Chapter 6).

In 2000, the IPCC published a Special Report on Methodological and Technological Issues in Technology Transfer (SRTT).<sup>175</sup> The SRTT contains two chapters devoted entirely to adaptation (“Human health” and “Coastal adaptation”), and several other chapters that discuss both mitigation and adaptation (e.g. “Residential, commercial and institutional buildings sector” and “Agricultural sector”). The SRTT emphasises that transferred technologies must meet local priorities and needs.

The set of technologies for adaptation determined by developing countries themselves to be of priority importance are gathered in the EGTT’s synthesis report of TNAs (reproduced in Annex 1 to this report). As we have noted, the existence of TNAs has not itself provided the requisite kickstart to initiate technology transfer at policy level. Given that the obligation to perform technology transfer resides with Annex 2 Parties, it is not in itself surprising that the TNAs of developing countries have not provided the necessary trigger. At some level, the initiative must come from the wealthy countries.

This report has suggested that human rights can be helpful in moving things forward for a number of reasons. For one, human rights reinforce

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175 Bert Metz et al., “Methodological and Technological Issues in Technology Transfer”, IPCC Working Group III Special Report (2000).

the case for urgent action on the part of Annex 2 Parties with regard to developing countries, at the moral, practical and legal levels. At the moral level, as laid out in Chapter 2, human rights provide a solid platform for the obligation to supply climate technologies for mitigation and adaptation. At a practical level, on one hand, as mentioned in the introduction, encroaching human rights concerns remind us of the potentially explosive consequences of not acting soon to meet these challenges; on the other, human rights provide a pragmatic guide to the prioritisation of needs that may prove vital to focused technology policy. At a legal level, despite the widely acknowledged ambiguity surrounding the nature of the obligation to address extraterritorial human rights harms,<sup>176</sup> there is little doubt that the avoidance of further human rights violations in many states requires concerted action in all states. In fulfilling their own human rights obligations states vulnerable to climate change must necessarily leverage international assistance to that end.<sup>177</sup>

The present chapter focuses on food security – an issue generally treated in human rights law under the rubric of the “right to adequate food”. That right is used here as a case study – in part because it has been more closely examined than other human rights in the climate context (although not previously focused with regard to technology policies).<sup>178</sup> Arguments along broadly similar lines could be made with regard to various other human rights, such as to health, water and housing.<sup>179</sup>

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176 On extraterritoriality, see ICHRP (2008); Mcinerney-Lankford et al. (2011); Humphreys (forthcoming 2011).

177 This is a legal obligation on states parties to the ICESCR, Art. 2.1, which says “Each State Party to the present Covenant undertakes to take steps, individually and through international assistance and co-operation, especially economic and technical, to the maximum of its available resources, with a view to achieving progressively the full realization of the rights recognized in the present Covenant”.

178 This section largely reproduces a paper produced by María Julia Oliva for the ICHRP project on Technology Transfer and Human Rights, “Promoting the Transfer of Technologies for Adaptation in Agriculture: A Role for the Right to Food?” (November 2009). Significant related research has been undertaken by the current Special Rapporteur on the Right to Food, available on his website, [www.srfood.org](http://www.srfood.org). See also Christoph Bals, Sven Harmeling and Michael Windfuhr, *Climate Change, Food Security and the Right to Adequate Food*. Climate Change Study, *Brot für die Welt, Diakonie Katastrophenhilfe, Germanwatch* (2008); Thomas Hirsch, Christine Lottje, *Deepening the Food Crisis? Climate change, food security and the right to food*, *Brot für die Welt, Diakonie* (August 2009); and Elisabeth Caesens and Maritere Padilla Rodríguez, “Climate Change and the Right to Food A Comprehensive Study”, *Publication Series on Ecology* Vol. 8, Heinrich Böll Foundation (2009).

179 Operating under space constraints, given the choice between examining one human right in some detail or a number of human rights in a more cursory fashion, we have opted for the former. A paper on the right to health was commissioned for the present project from Sisule Musungu. That paper is available at [www.ichrp.org](http://www.ichrp.org).

## A. FOOD SECURITY AND CLIMATE CHANGE

As the current Special Rapporteur on the Right to Food has remarked, in order that interventions may be targeted, a human rights framework requires an adequate mapping of food insecurity and vulnerability.<sup>180</sup> In this section we look first at the expected impacts of climate change on food security, then at the technologies that have been identified to date to help adapt to these impacts, and finally at the ways in which a human rights framing may help orient and motivate policy in this domain.

### 1. Expected effects of climate change on food security

Even before we take account of the current and expected impacts of climate change, it is worth noting that the data on global food security paints a terrifying picture.<sup>181</sup> The number of people suffering from hunger reached 1 billion in 2009, up from 800 million earlier in the decade.<sup>182</sup> This, according to the World Food Programme (WFP), was a new record. The WFP further claim that global hunger levels rose in 2009 despite the availability of food. “The message”, according to the WFP, was “stark”:

*Many people were unable to feed themselves in 2009 not because they could not find food, but rather because they could no longer afford it. ... The explosion in hunger needs over the past few years has made it clear that we are living in a world where risk is the new normal.*<sup>183</sup>

Climate change will exacerbate this situation. The IPCC expect 50 million extra people to be at risk of hunger by 2020 as a direct result of climate change.<sup>184</sup> Any significant change in the global climate will affect agricultural production to dramatic effect. There will be considerable regional variation and the intensity of impacts will depend on the economic, technological and social context in which they occur. It is

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180 A/HRC/9/23, Report of the Special Rapporteur on the Right to Food, Olivier De Schutter, “Building resilience: a human rights framework for world food and nutrition security” (8 September 2008).

181 For a good source, see Hirsch and Lottje (2009), 10–13.

182 World Food Programme, “2010 Annual Report: Fighting Hunger Worldwide”, WFP (2010), 4. According to the Food and Agricultural Organisation, the number decreased slightly in 2010 only to rise again in 2011. See FAO, *State of Food Report 2011*.

183 WFP (2010), 4.

184 IPCC AR4, 44–47. See also OHCHR press release, Cancún Climate Summit: UN food expert calls for a “Green Marshall Plan for Agriculture” (29 November 2010), claiming that by 2080, “600 million additional people could be at risk of hunger as a direct result of climate change.”

clear, however, that the worst impacts will occur soonest in developing countries, where agriculture is a major source of livelihoods and which are, moreover, already vulnerable due to the broad socio-economic shifts of recent decades.<sup>185</sup>

The IPCC identifies a number of cumulative climate change effects expected to impact agricultural output and the food supply in many countries.<sup>186</sup> On the whole, the IPCC projects that global food production will increase with temperatures increasing over a range of 1°C to 3°C, but start decreasing with any higher increases in temperature.<sup>187</sup> However, in lower latitude regions, yields are expected to deteriorate even with moderate warming. Moreover, some trends previously considered as potentially beneficial – such as expected increases in crop yield due to CO<sub>2</sub>-related increases in photosynthetic activity – no longer attract scientific confidence.<sup>188</sup>

Indeed, as *The Economist* puts it, in agriculture as in other areas, “global warming does far more damage to poor countries than they do to the climate.”<sup>189</sup> The regions likely to face the biggest challenges are Africa and Asia. In Asia, the IPCC quotes research predicting a decline in rice production and a reduction in areas suitable for wheat cultivation. In South Asia, currently host to approximately a third of the malnourished

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185 See generally, for example, Background document prepared by the UN Special Rapporteur on the Right to Food, Olivier De Schutter, on his mission to the WTO, presented to the Human Rights Council in March 2009 (background study to UN doc. A/HRC/10/005/Add.2).

186 In this section, unless otherwise noted, information regarding impacts of climate change on agriculture is taken from W.E.Easterling, P.K. Aggarwal, P. Batima, K.M. Brander, L. Erda, S.M. Howden, A. Kirilenko, J. Morton, J.-F. Soussana, J. Schmidhuber and F.N. Tubiello, “2007: Food, fibre and forest products” in M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press (2007), 273–313.

187 IPCC, “Summary for Policymakers” in S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press (2007).

188 BBC News, Climate crisis ‘to deepen’ September 25, 2005, citing work by Prof. Steve Long at the University of Illinois. Data analyses had found that greater atmospheric concentrations of carbon dioxide could result – in some crops – in yield increases of up to 20%. However these findings are now thought to have neglected to factor in other consequences of climate change and are thus widely believed to overestimate the benefits.

189 *Ibid.*

people in the world, the production of many crops – including staples such as wheat, rice and millet – is “highly likely” to decrease as a result of climate change.<sup>190</sup> Indeed, crop yields in Central and South Asia are predicted to fall by up to 30%.<sup>191</sup>

Agricultural production in Africa, largely reliant on rainfall for irrigation, will be severely compromised, particularly for subsistence farmers and in sub-Saharan Africa. Some predictions estimate that as much as a fifth of Africa’s farmland will be severely stressed. One of the crops most likely to be negatively impacted, for example, is maize, currently the most important source of calories for the poor in Southern Africa.<sup>192</sup> Studies found that impacts in Africa can range from a potential loss of \$25 billion to a loss of \$194 billion per year, with the most pessimistic forecast suggesting African countries could lose 47% of their agricultural revenue because of global warming.<sup>193</sup> It is important to remember, however, that any such predictions must make assumptions in advance about adaptive capacity and technological availability.

The increased frequency of extreme events is expected to have a momentous impact on agriculture, lowering crop yields beyond the effects of a changing climate alone.<sup>194</sup> Heavy precipitation will become more frequent in tropical and high-latitude areas, causing damage to crops and soil erosion. On the other hand, there is a greater risk of droughts in mid-continental areas. In Africa, the effect of more droughts and floods, given existing constraints in agricultural development, could be devastating. The IPCC has found that shifts in the quantity and quality of freshwater resources, which are likely to be strongly impacted by climate change, will affect the availability and stability of food resources, particularly in the arid and semi-arid tropics and the Asian and African mega-deltas.<sup>195</sup>

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190 D. B. Lobell et al., “Prioritizing Climate Change Adaptation Needs for Food Security in 2030”, 319 *Science* 1 February 2008.

191 See UNFCCC. *Climate Change: Impacts, Vulnerabilities and Adaptation in Developing Countries*.

192 D.B. Lobell et al., *supra*.

193 See R. Mendelsohn, A. Dinar and A. Dalfelt, *Climate Change Impacts on African Agriculture*, World Bank (2000).

194 Easterling et al., *supra*.

195 B.C. Bates, Z.W. Kundzewicz, S. Wu and J.P. Palutikof (eds.), *Climate Change and Water*. Technical Paper of the Intergovernmental Panel on Climate Change, IPCC (2008), at 210. It should be noted that the impacts of climate change on water will also have wide-ranging consequences for human societies and ecosystems, although the human right to water falls outside the scope of this chapter.

A warmer climate will also provide favourable conditions for the proliferation of pests, and changes in climate variables will – at the same time – mean different interactions between pests, pathogens and hosts.<sup>196</sup> With pests currently causing yield losses over 40% worldwide, losses could climb steeply to include the majority of food crops, especially for tropical crops such as sugarcane.<sup>197</sup> In India, for example, agricultural productivity is already reportedly shrinking, in part due to waning resistance to pests and disease.<sup>198</sup>

## **2. Technologies for adaptation in agriculture**

In the agricultural sector, there is nothing intrinsically novel about the notion of adaptation. Farmers have traditionally had to adapt to variations in the weather – either seasonal or more long-term – as well as to changing socio-economic circumstances.<sup>199</sup> Climate change, however, poses new risks at an unprecedented scale. Adaptation in this domain refers to adjustments in physical, ecological or human systems to reduce vulnerability or enhance resilience in response to expected or experienced changes in climate and associated extreme weather events.<sup>200</sup> Given the relative speed with which changes will take place, and the relative weakness of those affected in terms of access to resources and relevant expertise (the source of their “vulnerability”), many of these adjustments will not happen autonomously. Instead they will require specific policies and initiatives, particularly when it comes to ensuring access to the relevant technologies.

The IPCC’s Fourth Assessment Report noted the critical role of technology

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196 The interaction of increased carbon dioxide, rising temperatures and increased precipitation are all recognised as relevant to determine plant damage from pests in future decades, but there is still uncertainty as to what or how significant this damage is likely to be.

197 C. Rosenzweig et al. “Climate Change, Crop Pests and Diseases” in *Climate Change Futures: Health, Ecological and Economic Dimensions*. The Center for Health and the Global Environment, Harvard Medical School (2005).

198 “Developing countries and global warming: A bad climate for development”, *The Economist*, September 17 2009.

199 C. Rosenzweig and F. Tubiello, “Adaptation and mitigation strategies in agriculture: An analysis of potential synergies”, *Mitig Adapt Strat Glob Change* 855–873 (2007).

200 Neil Adger, S. Agrawala, MM.Q. Mirza, C. Conde, K. O'Brien, J. Pulhin, R. Pulwarty, B. Smit and K. Takahashi, “2007: Assessment of adaptation practices, options, constraints and capacity” in M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press (2007), 717–743.

in adaptation in agriculture.<sup>201</sup> The UN Food and Agriculture Organization (FAO) has also identified technology as the key to adaptation in the agricultural sector. In particular, it considers technological solutions could avoid disruptions or declines in food supplies through more efficient water management, improved management of cultivated land and the use of new, more energy-efficient technologies by agro-industries.<sup>202</sup> According to the EGTT's synthesis report of TNAs, developing countries have themselves stressed the technology-related needs in adaptation in the agriculture and fisheries sector.<sup>203</sup>

Studies have begun to examine the range of specific technologies that could prove effective in addressing the impacts of climate change on agriculture (Table 1). The IPCC has highlighted the importance of strategies such as the adoption of climate-resistant plant varieties for adaptation in agriculture.<sup>204</sup> It has noted that genetic improvements in crop varieties are responsible for half of the yield growth behind rising agricultural production and are likely to play an even greater role. While noting the "great hopes" placed on biotechnology, however, the IPCC also acknowledges significant concerns, including the suitability, accessibility and affordability of genetically engineered crops for developing countries. As recently pointed out by *The Economist*, seeds engineered in the 1960s to be higher-yielding and pest-resistant have proven to be less effective at adapting to changing climates and weather patterns than the old-fashioned seeds that are now less widely used.<sup>205</sup>

A range of technologies for adaptation in agriculture are documented in a variety of reports produced through the UNFCCC process.<sup>206</sup> Emphasis is generally placed on crop management, efficient irrigation and land management. For crop management, countries identify the need for

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201 Easterling et al., *supra*.

202 *Climate change and food security: a framework document*, FAO (2008).

203 FCCC/SBSTA/2007/6, "Synthesis report on technologies for adaptation identified in the submissions from Parties and relevant organizations" (1 October 2007). 34% of all cited technologies in this report were in the agriculture and fisheries sector.

204 IPCC, *Methodological and Technological Issues in Technology Transfer: Special report of Working Group III*, Cambridge University Press (2000).

205 "Developing countries and global warming: A bad climate for development", *The Economist*, September 17 2009.

206 These reports include a compilation of technology-related needs in adaptation and a synthesis of technologies identified in TNAs, both conducted by the UNFCCC Secretariat. See FCCC/SBSTA/2007/6, and FCCC/SBSTA/2006/INF.1, Synthesis report on technology needs identified by Parties not included in Annex 1 to the Convention (21 April 2006).

crop varieties tolerant to the changes expected in coming decades, including increased drought, heat, and pests. For water conservation, various technologies and strategies for more efficient water utilization are identified, including drip irrigation, improved networks of reservoirs, and the use of treadle pumps. Land management techniques and practices include terracing and stabilization of slopes, application of minimum or no tillage, probes for the measurement of soil moisture and changing farming practices to conserve soil moisture and nutrients. Reports also pinpoint the need for meteorological observation and monitoring equipment.

**Table 1. Examples of technologies for adaptation in agriculture**

<b>RESPONSE STRATEGY</b>	<b>ADAPTATION OPTIONS</b>
<b>Use different crops or varieties to match changing water supply and temperature conditions</b>	<ul style="list-style-type: none"> <li>▪ Conduct research to develop new crop varieties;</li> <li>▪ Mechanisms for seed/crop distribution;</li> <li>▪ Integrated pest management.</li> </ul>
<b>Introduce systems to improve water use and availability and control soil erosion</b>	<ul style="list-style-type: none"> <li>▪ Pumps and water supplies;</li> <li>▪ Drip irrigation systems;</li> <li>▪ Networks of reservoirs;</li> <li>▪ Canal networks;</li> <li>▪ Level fields, recycle tailwater, irrigate alternate furrows;</li> <li>▪ Water diversion systems;</li> <li>▪ Improved drainage.</li> </ul>
<b>Land management</b>	<ul style="list-style-type: none"> <li>▪ Technologies relating to ploughing, tillage, mulching, landscaping, livestock management, harvesting.</li> </ul>

Source: B. Smit (ed.), "Adaptation to Climatic Variability and Change", Occasional Paper No. 19, University of Guelph, Guelph, ON, Canada (1993), cited in IPCC, Methodological and Technological Issues in Technology Transfer: Special report of Working Group III. Cambridge University Press (2000); FCCC/SBSTA/2007/6, "Synthesis report on technologies for adaptation identified in the submissions from Parties and relevant organizations" (1 October 2007).

## **B. THE RIGHT TO FOOD IN PROMOTING ACCESS TO TECHNOLOGIES FOR ADAPTATION**

The right to food has been recognised in a range of international instruments: the Universal Declaration on Human Rights, the ICESCR, the Convention on the Elimination of All Forms of Discrimination against Women and the Convention on the Rights of the Child. Human rights bodies and experts have further developed the concepts, obligations, and means of implementation relating to the right to food. As a result, the right to food has been recognised by the current UN Secretary-General as "a basis for analysis, action and accountability" in promoting food

security.<sup>207</sup> The right to food can also provide, alongside other human rights, such as the rights to water and health, pointers and approaches relevant to the transfer of adaptation technologies for agriculture.

Technology transfer can be realized without expressly invoking the right to food or other pertinent human rights, but human rights concepts, tools and methodologies can support efforts and policies to promote the transfer of technologies, including those needed for adaptation in the agricultural sector. Obligations deriving from the right to food, for instance, reinforce the imperative for technology transfer in the UNFCCC. These obligations also define what countries and other entities are actually required to do with respect to policies, measures and activities that may promote or hinder such transfer.

Consideration of the right to food may contribute, as well, to the more practical aspects of technology transfer. The focus of human rights on actual persons – “who, precisely, is likely to suffer what and why”<sup>208</sup> – can guide and inform TNAs, for example, in order to evaluate needs, barriers and potential responses in regards to the transfer of technologies for adaptation. This section, therefore, after a brief overview of the concepts and obligations linked to the right to adequate food, provides some initial suggestions of the ways in which it can contribute to more concrete and effective measures for the transfer of technologies for adaptation in agriculture.

## **1. What is the right to food? What does it imply?**

The Universal Declaration on Human Rights recognised the right of everyone to an adequate standard of living, which includes food, clothing, housing and medical care.<sup>209</sup> The right to food has since been specifically developed in a number of human rights treaties, most notably the ICESCR. In its Article 11, 160 States parties recognize, *inter alia*, the right to adequate food and commit to taking appropriate steps to ensure the realization of this right, including through international cooperation. In particular, parties agree to take measures to “improve methods of production, conservation and distribution of food by making full use of technical and scientific knowledge, by disseminating knowledge of the principles of nutrition and by developing or reforming agrarian systems in such a way as to achieve the most efficient

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207 UN Secretary-General Ban Ki-moon, in his closing remarks to the January 2009 High-Level Meeting on Food Security for All, held in Madrid.

208 ICHRP (2008), 6.

209 Universal Declaration on Human Rights, Article 25.

development and utilization of natural resources” (Art. 11.2(a)).

The content of the right to adequate food was elaborated by the Committee on Economic, Social and Cultural Rights (CESCR) in 1998 in its General Comment No. 12.<sup>210</sup> Responding to the “disturbing gap” between the aspiration to fulfil a right to food expressed in Article 11 and the widespread prevalence of hunger in fact, the Committee noted that “fundamentally, the roots of the problem of hunger and malnutrition are not lack of food but lack of access to available food,” including due to poverty (para. 5). Indeed, General Comment 12 considers the right to adequate food as “requiring the adoption of appropriate economic, environmental and social policies, at both the national and international levels” (para. 4).

In particular, the Committee found that the core content of the right to adequate food entails:<sup>211</sup>

- The availability of food in a quantity and quality sufficient to satisfy the dietary needs of individuals, free from adverse substances, and acceptable within a given culture – either directly from productive land or through a well functioning distribution, processing and market systems.
- The accessibility – both economic and physical – of such food in ways that are sustainable and that do not interfere with the enjoyment of other human rights.

As with other economic, social and cultural rights, the right to food is subject to “progressive realization” (ICESCR, Art. 2.1). However, states have a core obligation to take the necessary action to mitigate and alleviate hunger, even in times of natural or other disasters. Again, as with other human rights, three types of obligations are ordinarily identified for States parties in relation to the right to food: obligations to respect, to protect and to fulfil (para. 15). Violations of the right to food can occur through the direct action of states or of other entities. Possible violations range from direct denial of access to food to particular individuals or groups, to the adoption of legislation or policies which are manifestly incompatible with pre-existing legal obligations relating to the right to food and failure to regulate activities of individuals or groups to prevent them violating the right to food of others (para. 19).

The ICESCR imposes clear obligations on states with regard to individuals

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210 E/C.12/1999/5, CESCR, Substantive Issues Arising in the Implementation of the International Covenant on Economic, Social and Cultural Rights: General Comment 12. The right to adequate food (Art. 11) (12 May 1999).

211 E/C.12/1999/5, para. 8.

on their territories. The Committee has closely followed acts undertaken in reporting States parties that have appeared to violate their obligations under the Covenant and has made recommendations in that regard in its concluding observations.<sup>212</sup> The Committee has also, in recent years, begun to explore the degree to which climate change must be taken into consideration with regard to States parties' fulfilment of their obligations under the ICESCR. A recent comment by the Committee addressing Australia's report is worth quoting at some length:

*The Committee is concerned at the negative impact of climate change on the right to an adequate standard of living, including on the right to food and the right to water, affecting in particular indigenous peoples, in spite of the State party's recognition of the challenges imposed by climate change ... The State party is encouraged to reduce its greenhouse gas emissions and to take all the necessary and adequate measures to mitigate the adverse consequences of climate change [by which is meant to take "adaptation" measures], impacting the right to food and the right to water for indigenous peoples, and put in place effective mechanisms to guarantee consultation of affected Aboriginal and Torres Strait-Islander peoples.<sup>213</sup>*

However, national policy is not the only, nor even necessarily the most relevant, domain of policy affecting food security. Threats to food security come in large part from acts undertaken outside of developing countries, including in international markets, where prices for staples

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212 See for example, E/C.12/CAN/CO/4; E/C.12/CAN/CO/5, Consideration of reports submitted by States parties in accordance with articles 16 and 17 of the Covenant, Concluding observations of the CESCR: Canada (22 May 2006), para. 27; E/C.12/KHM/CO/1, Concluding observations of the CESCR: Cambodia (12 June 2009), para. 28; E/C.12/AGO/CO/3, Concluding observations of the CESCR: Angola (1 December 2008), para. 29; E/C.12/TCD/CO/3, Concluding observations of the CESCR: Chad (16 December 2009), paras. 25 and 28.

213 E/C.12/AUS/CO/4, Concluding observations of the CESCR: Australia (June 12, 2009), para. 27. The Committee also calls for harness[ing] the potential of their traditional knowledge and culture (in land management and conservation)". Climate change has also been considered by the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), the Committee on the Elimination of Racial Discrimination (CERD) and the Committee on the Rights of the Child (CRC). The CRC for example in 2010 urged Grenada "to be extremely conscious in the development of programmes and policies of the need to manage their environmental dimensions, with the cooperation of regional and international partners, in order to reduce to the maximum extent possible the negative impact of climate change. The Committee also encourages the State party to put in place natural disaster preparedness programmes." CRC/C/GRD/CO/2, para. 52.

may be set at levels that make them unaffordable in poor countries. Global energy policies too may affect access to food: a policy shift in support of biofuels in the United States and Europe in 2008 is believed to have contributed to the spike in corn prices and related food crisis that year.<sup>214</sup> In this, international markets mirror climate change itself, which creates harms on territories other than those where the relevant acts are undertaken. What, then, are the relevant obligations of states with regard to fulfilling these rights outside of their territorial jurisdiction?

Article 2.1 of the ICESCR speaks of the obligation on all states to act to fulfil the protected rights “individually and through international assistance and co-operation, especially economic and technical, to the maximum of its available resources.” The Committee has expressed the view that the latter phrase “was intended by the drafters of the Covenant to refer to both the resources existing within a State and those available from the international community through international cooperation and assistance”.<sup>215</sup> According to the Committee, “international cooperation for development and thus for the realization of economic, social and cultural rights is an obligation of all States”, especially wealthier states.<sup>216</sup>

Despite this, the scope and content of this “obligation” remain unclear and hotly contested.<sup>217</sup> Unlike its twin Covenant, the ICCPR, the ICESCR does not specify that a State party must limit its guarantees of the relevant rights “to all individuals within its territory and subject

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214 See ICHRP (2008), 33–36.

215 CESCR, The nature of States parties obligations (Art. 2, par.1), CESCR General comment 3. (General Comments), 14 December 1990, para. 13.

216 CESCR General comment 3, para. 14. See also CESCR, International technical assistance measures (Art. 22) CESCR General comment 2. (General Comments), February 2, 1990.

217 The informal development aid target of 0.7% of GDP has frequently been endorsed by (and for) OECD countries, indicating a possible crystallisation of such a goal as a matter of customary law. But as very few countries have consistently reached the target, its status remains contested. Even were such a target regarded as obligatory, it says little about the money is to be spent, or who is the appropriate beneficiary (development aid, notoriously, is frequently tied to the national interests of the dispenser). It is in any case far from clear that 0.7% of the GDP of the wealthier countries, even were it met and used optimally, would be sufficient to meet the needs of developing countries.

to its jurisdiction”.<sup>218</sup> It would appear there must be some obligation on states with regard to other states: any other interpretation of Art. 2.1 would tend to undermine the object and purpose of the Covenant itself. The Covenant’s wording on the right to food is unusually clear in this respect (at Art, 11.2(b)):

*The States Parties to the present Covenant, recognizing the fundamental right of everyone to be free from hunger, shall take, individually and through international co-operation, the measures, including specific programmes, which are needed: [...]*

*(b) Taking into account the problems of both food-importing and food-exporting countries, to ensure an equitable distribution of world food supplies in relation to need.*

Both “the fundamental right of everyone to be free from hunger” and “an equitable distribution of world food supplies” unambiguously place the right to food in an international context. Indeed, the latter expression foregrounds the international as the locus of the fulfillment of the right to food and so (by corollary) of its violation. Moreover it provides the basis for determining the scope of such an obligation: presumably “equitable distribution” may be ascribed a minimal core content.

Setting aside this (frequently contentious) question for now, States parties are clearly obliged, at a minimum, to avoid taking steps that will worsen economic, social and cultural rights in other states, i.e., “globally”. A “negative obligation” of this kind should also not appear especially onerous on states. We will return to this point about negative obligation in a moment.

The Special Rapporteur on the Right to Food, mandated by the Human Rights Council since 2000, has devoted considerable time to the international context for fulfilment of the right to food.<sup>219</sup> The present Rapporteur, Olivier De Schutter has examined the implications of the

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218 Art. 3 states: “The States Parties to the present Covenant undertake to ensure the equal right of men and women to the enjoyment of all economic, social and cultural rights set forth in the present Covenant.” This Article is common to both Covenants, however, and is generally understood as a prohibition on gender discrimination. The right to education does, however, restrict its application to the territory of states parties (Art. 14): indeed this specific restriction would appear to support the view that obligations regarding the other rights are rather transnational.

219 In 2003, the first Rapporteur Jean Ziegler noted the growing relevance of transnational businesses for the realization of the right to food, given their increasing control over the production and provision of both food and water. See A/58/330, Report by the Special Rapporteur on the Right to Food, Jean Ziegler, to the General Assembly (28 August 2003).

trade regime for the right to food,<sup>220</sup> and both he and his predecessor, Jean Ziegler, have documented the degree to which the processes and attributes of “globalisation” have had harmful effects on food security – and so the right to food – in poorer countries.<sup>221</sup>

The right to food has been affirmed by states in other fora: notably the Food and Agricultural Organisation (FAO). The FAO was the lead organisation driving the 1996 Rome Declaration and Action Plan on World Food Security, which were critical to setting in motion further work on the right to food in the human rights bodies. In the Rome Declaration, states explicitly “reaffirm[ed] the right of everyone to have access to safe and nutritious food, consistent with the right to adequate food and the fundamental right of everyone to be free from hunger”.<sup>222</sup> The two instruments reassert the ICESCR’s “global” perspective, defining food security as “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.” The Action Plan asserts that “in a world of increasingly interlinked institutions, societies and economies, coordinated efforts and shared responsibilities are essential.”<sup>223</sup>

The Action Plan on World Food Security includes specific references to technology transfer. Commitments made by states in the Action Plan include advancing a political, social and economic environment providing the best conditions to eradicate poverty, improving access to adequate and safe food, and developing participatory and sustainable agricultural and rural development policies. Within the latter commitment on sustainable policies, there is express recognition of the need to promote sound policies and programmes on the transfer and use of technologies, skills development and training appropriate to the food security needs of developing countries and compatible with sustainable development.

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220 See A/HRC/10/5/Add.2, Report of the Special Rapporteur on the Right to Food, Olivier De Schutter, Addendum, Mission to the World Trade Organization (4 February 2009). See also Background document prepared by the UN Special Rapporteur on the Right to Food, Olivier De Schutter, on his mission to the World Trade Organization (WTO), presented to the Human Rights Council in March 2009 (background study to UN doc. A/HRC/10/005/Add.2). See generally: [www.srfood.org/index.php?option=com\\_content&view=article&id=69&Itemid=55&lang=en](http://www.srfood.org/index.php?option=com_content&view=article&id=69&Itemid=55&lang=en).

221 A/HRC/10/5/Add.2; E/CN.4/2005/47, Report by the Special Rapporteur on the Right to Food, Jean Ziegler, to the Commission on Human Rights (24 January 2005).

222 Rome Declaration on World Food Security and World Food Summit Plan of Action, World Food Summit, 13–17 November 1996, online at: [www.fao.org/DOCREP/003/W3613E/W3613E00.HTM](http://www.fao.org/DOCREP/003/W3613E/W3613E00.HTM).

223 World Food Summit Plan of Action (1996), para. 1.

Technology is not, of course, a quick fix to realizing the right to food, but it is an essential element of any lasting solution to increased hunger, particularly in the context of climate change. In general, access to adequate technologies can enhance the sustainability of food production and agriculture, while improving the quality and safety of the food available for consumption.<sup>224</sup> To illustrate with a concrete example, a 1997 study found great potential for irrigation as a means of achieving food security in certain sub-Saharan countries.<sup>225</sup> It noted, however, that most of the relevant irrigation equipment – electric motors and pumps, diesel engines, and sprinkler and drip irrigation systems – was imported from European countries at great expense. Smallholders were unable to invest in this equipment and remained vulnerable to changes in rainfall. The study proposed measures to promote technology transfer as a key component of sustainable agriculture policies.

## **2. The transfer of technology in realizing the right to food**

As noted by a recent report by the Special Rapporteur on the Right to Food on innovation, a focus on human rights “obliges us to ask not only which policies may maximise yields – agricultural outputs – but also, and primarily, who will benefit from any increases achieved by whichever policies are put in place. The right to food requires that we place the needs of the most marginalised groups, including in particular smallholders in developing countries, at the centre of our efforts.”<sup>226</sup>

It is generally accepted that states have duties to respect, protect and fulfil human rights, explicitly affirmed, in the case of the right to food, in the CESCR’s General Comment (No. 12) on the matter. In this section we lay out what those duties might amount to when thinking through the role of technology transfer in addressing the right to food under conditions of climate change.

## **3. The obligation to respect**

The obligation to respect existing access to adequate food requires

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224 The FAO initiative Technology for Agriculture (TECA) aims at addressing this problem – improving access to information and knowledge about existing technologies in order to enhance their adoption in agriculture. See [www.fao.org/teca/](http://www.fao.org/teca/).

225 K. Palanisami, “Economics of Irrigation Technology Transfer and Adoption”, in *Irrigation Technology Transfer in Support of Food Security*, Proceedings of a Subregional Workshop, FAO (1997).

226 A/64/170, Interim report of the Special Rapporteur on the Right to Food, Olivier de Schutter to the General Assembly: Seed policies and the right to food: enhancing agrobiodiversity and encouraging innovation (23 July 2009).

states not to take any measures that result in obstructing, preventing or diminishing access. The term “adequate” is important here: the point is not that states refrain altogether from active intervention in food markets; rather, it is that they refrain from steps that would reduce the food supply for certain members of the polity below “adequate” levels.

As noted above, on the ICESCR wording, this (essentially negative) obligation has both national and international elements. At the international level, the obligation to respect entails that states abstain from activities or measures that will have a negative impact on access to food outside their territories.<sup>227</sup> Essentially, this is an obligation to “do no harm” that requires assessing and addressing the effect of government action on the right to food globally. The burden of this (and other) obligations of the right to food is internal. Externally, in general, few states will be placed to affect negatively food supplies in other countries, yet some such states exist – and climate change additionally burdens this negative obligation.

In the context of promoting the transfer of technologies for adaptation in agriculture, the obligation to respect the right to food may be relevant in a number of ways – particularly in relation to IP rules and policies. It has been widely recognised that the broadening scope of IP rights, particularly as they extend over seeds, is threatening rural livelihoods and access to food. The erosion of the freedom to save, exchange and resell seeds, for instance, due to conditions attached to patents or revised versions of plant breeders’ rights, are undermining traditional seed systems, which had been “a source of economic independence and resilience [for small farmers] in the face of threats such as pests, diseases or climate change.”<sup>228</sup>

Adaptation strategies that rely on or promote the use of varieties protected by patents or plant breeder’s rights would compound the problem. Despite concerns about the suitability or effectiveness of genetically modified crops for adaptation in agriculture, it is likely that biotechnology may ultimately play a role in limiting the impacts of climate change on food production, assuming it can be safely and justly deployed (an assumption at present unwarranted). Given the obligation to respect the right to food, the use of proprietary seeds will mean, in turn, that states and other stakeholders must address any debilitating effects of IP rights on the accessibility and affordability of varieties needed for such adaptation strategies.

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227 E/C.12/1999/5, General Comment 12, para. 36.

228 A/64/170, Interim Report of the Special Rapporteur on the Right to Food.

The present Special Rapporteur makes several recommendations with regard to this specific issue.<sup>229</sup> He calls on states to advance the diffusion of the improved commercial varieties that can truly benefit poor farmers – suggesting that farmers may have a right to access seeds even if these are proprietary and not in the public domain. He also calls on states to address barriers to the use of protected seed varieties to further research that contributes to food security. The report suggests innovative mechanisms such as patent pools and the institutionalisation of open source licensing for seeds, as well the use of compulsory licensing in cases where patents create obstacles to the development of varieties that can contribute to food security. These same tools may be equally useful in cases where patents constitute obstacles to the transfer of improved crop varieties needed for adaptation for climate change.

These suggestions resonate with proposals made in the negotiations underway at the UNFCCC. As suggested above, as solutions to the “barrier” posed by IP rights, the G-77 and China have proposed compulsory licensing, limited duration for patents on climate-friendly technologies, revocation of patents on essential and urgent technologies to adapt and mitigate climate change, and financial support to support access to technologies by developing countries.<sup>230</sup>

IP rights are clearly not the only domain engaged by the obligation to respect the right to adequate food. As food staples are priced as global commodities, a certain amount of coordination is vital to ensure that policies adopted in one or more large suppliers do not have deleterious effects in smaller countries. The paradigmatic example is, perhaps, impact of land use and energy policies on food security. When in 2007–2008, the United States initiated biofuel-supportive policies to promote “energy security”, immense swathes of land that had been producing corn and wheat were recategorised as fuel-producing. Subsidies for corn and wheat production were re-directed towards biofuel production; food prices on world commodity markets soared; commodity speculation pushed prices of other commodities up (the price of rice increased by 165% between April 2007 and April 2008); some poorer countries experienced sharp price increases in basics

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229 The source for this paragraph is “Seed policies and the right to food: Enhancing agrobiodiversity, encouraging innovation”, Background document to the report (A/64/170) presented by Olivier De Schutter, Special Rapporteur on the Right to Food, at the 64th session of the UN General Assembly (October 2009)

230 Contact Group on Enhanced Action on Development and Transfer of Technology (2009). Non-paper No. 29. Ad Hoc Working Group on Long-term Cooperative Action under the Convention, First part of the seventh session, Bangkok, 28 September to 9 October 2009.

such as bread; 40 million people were pushed into hunger.<sup>231</sup>

In response, the Special Rapporteur recommends that trade policy and pricing in foods be monitored and coordinated.<sup>232</sup> This is in line with the obligation to respect the right to adequate food, under conditions of climate change. Climate change mitigation itself is vital in ensuring that existing food supplies are not unduly unsettled in poorer countries, though such mitigation must be undertaken with an eye to possibly negative human rights outcomes (as the biofuel example illustrates).

As in the case of IP rights, each of these areas too has a potential technological aspect. For example, to safeguard against the deleterious effects on food of sudden switches in energy or trade policy in supplier countries might also, in principle, be mitigated through the transfer of technologies that encourage increased local productivity in staples. This would make states less reliant on access to international foodstuffs and less vulnerable to price shocks. Even if staples will never be produced by all states everywhere, a general increase in the loci of productivity will reduce vulnerability, for, as we shall see in a moment, general reliance on international trade in food is itself a source of food insecurity for importer states everywhere.

#### **4. The obligation to protect**

The obligation to protect is a well-established principle of human rights requiring that states protect individuals from violations of the right due to actors other than the State itself. According to the CESCR, this “requires measures by the State to ensure that enterprises or individuals do not deprive individuals of their access to adequate food.”<sup>233</sup> Such an obligation is clearly relevant in the area of agricultural and food technologies in which the private sector has become the principal actor in recent decades.

Where private actors lead in food production or distribution, it falls to the state to monitor their activities to ensure they do not result in deterioration (below “adequate” levels) of food access for vulnerable persons. To the degree, for example, that the 2007–2008 price spike in basic food commodities was due to a speculative bubble, it would fall to states to

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231 ICHRP (2008), 33–36; A/HRC/10/005/Add.2 and the background document prepared for it. On food price volatility, Olivier de Schutter, UN Special Rapporteur on the Right to Food, “Food Commodities Speculation and Food Price Crises, Regulation to reduce the risks of price volatility”, Briefing Paper no.2 (September 2010).

232 Ibid., notably at 2–3.

233 E/C.12/1999/5, General Comment 12, para. 15.

ensure that such private speculation did not result in food shortages.<sup>234</sup>

International trade is a good example of an area in which governments frequently place vulnerable populations at risk by permitting free rein to private actors. In his report on his mission to the WTO, the Special Rapporteur on the Right to Food has identified three areas in which, merely by relying on international trade to ensure food security, governments are likely to risk violations of the right to food. These are:<sup>235</sup>

*1) Increased reliance on international trade in order to ensure food security results in a dependency on international trade, which is a source of various vulnerabilities: loss of export revenues when the prices of export commodities go down, threats to local producers when low-priced imports arrive on the domestic markets, balance of payments problems for the net food-importing countries when the prices of food commodities go up ....*

*2) Increased reliance on international trade ... also reinforces the power of highly concentrated transnational corporate actors: increased cross-border trade implies an increased role for transnationals rather than domestic agro-food systems. Global sourcing increases the number of suppliers and thus, the competition between them, leading dominant actors to force [debilitating] low prices on agricultural producers. The current trade regime also encourages the segmentation of the farming sector, increasingly divided between one segment which has access to high-value markets and, as result, to the best technologies, inputs (including land, water, and state support), credit, and political influence, and another segment which is left to serve only the low-value, domestic markets, and is comparatively neglected and marginalized.*

*3) Finally, increased reliance on international trade ... promotes long supply chains which imply long distances in transport and unsustainable modes of production, with serious implications for climate change and human health and nutrition.*

Of these three points, the latter two are most evidently relevant to the

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234 See de Schutter, Briefing Paper no.2 (September 2010).

235 Report of the Special Rapporteur on the Right to Food, Olivier De Schutter, Mission to the WTO, Presented to the Human Rights Council, March 9, 2009, Summary, 2.

transfer of technologies in the context of climate change. The second point is relevant insofar as it is a reminder that, in general, it is not the case that advanced technologies are entirely absent in developing countries: it is rather that, in the poorest countries in particular, they tend to be oriented towards export markets and are thus of no benefit to those most vulnerable to climate change. The challenge is to ensure that the relevant technologies are actually reaching those whose right to food is threatened. The third point is a reminder that, under conditions of climate change, global transportations of foodstuffs (*inter alia*) must ultimately be reduced as part of the wider mitigation effort: food production will need to become increasingly (albeit not exclusively) local and therefore the technologies for its production too will need to be localised.

IP rights too are relevant to the states' obligation to protect the right to food in conditions of climate change. Governments are well placed to agree – in the UNFCCC context – to find ways to ensure that technology owners' ordinary business activities do not exacerbate hunger by, at a minimum, providing incentives (tax breaks, subsidies, and so on) to them to provide technologies for adaptation in agriculture on preferential terms to countries with populations at risk of hunger. There may also be a need for policies to orient R&D towards food security needs: only 1% of the R&D budget in the seed sector is currently spent on crops of interest to developing countries.<sup>236</sup> Public funding for technology development might also involve commitments to allow broad access to any resulting knowledge and equipment.

Finally, the obligation to protect also requires states to ensure the protection of the right to food when adopting bilateral and multilateral agreements.<sup>237</sup> In this domain, the focus to date has been on calling on states to avoid proposals that may negatively impact upon access to food, such as clauses calling for the patenting of plants and animals.<sup>238</sup> These calls need reinforcement in light of the particular challenges to food

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236 P.L. Pingali and G. Traxler, "Changing focus of agricultural research: will the poor benefit from biotechnology and privatization trends", VOL Food Policy 27 (2002). Quoted in the report submitted by the Special Rapporteur on the Right to Food, Jean Ziegler, to the sixtieth session of the Commission on Human Rights. 2002.

237 E/C.12/1999/5, General Comment 12, para. 36: "States parties should, in international agreements whenever relevant, ensure that the right to adequate food is given due attention and consider the development of further international legal instruments to that end."

238 See, for example, 3D – Trade, Human Rights, Equitable Economy (2009). Burkina Faso: Menace sur le droit à l'alimentation de l'enfant : la protection intellectuelle des semences. Rapport soumis au Comité des droits de l'enfant, 53e Groupe de travail de présession (October 2009).

security caused by a changing climate. In addition, it may be necessary to develop a positive agenda on the transfer of technologies for adaptation in agriculture to use in such negotiations, including special provisions or collaboration to address the needs of the developing country parties.

## **5. The obligation to fulfil**

The obligation to fulfil the right to food focuses on the duty of the state to facilitate access to food and to step in proactively to provide it where it is lacking for individuals or groups for reasons beyond their control.<sup>239</sup> Developing states that do not possess the necessary resources for the full realization of the right to food are, as we saw above, obliged by the ICESCR to actively seek targeted international assistance.<sup>240</sup> Wealthier states have, on most accounts, a responsibility to help (see the discussion of ICESCR Art. 2.1, above), a responsibility that is further entrenched under the UNFCCC's provisions on the transfer of technology (see in particular, UNFCCC Art. 4.7).

The obligation to fulfil the right to food thus strengthens developing country calls for sufficient financial and technical support to advance adaptation efforts in the context of the UNFCCC, including for technologies in the agriculture sector. The tendency to date in the UNFCCC process has been to focus on "sectors", such as agriculture and fisheries. Supplementing that lens with to the "right to food" refocuses attention on those individuals and populations most vulnerable to the effects of climate change as a first priority, which in turn can facilitate identifying the technologies needed most urgently and also in delineating how they will be put to use.

## **C. THE RIGHT TO FOOD IN IDENTIFYING TECHNOLOGY NEEDS AND RESPONSES**

The key stages of the technology transfer process involve the assessment of technology needs and the selection and adaptation of appropriate technologies. These steps require developing specific tools and parameters to assist in understanding and addressing local conditions and identifying the most pressing requirements. The various

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239 E/C.12/1999/5, General Comment 12, para. 15: "The obligation to fulfil (facilitate) means the State must pro-actively engage in activities intended to strengthen people's access to and utilization of resources and means to ensure their livelihood, including food security. Finally, whenever an individual or group is unable, for reasons beyond their control, to enjoy the right to adequate food by the means at their disposal, States have the obligation to fulfil (provide) that right directly. This obligation also applies for persons who are victims of natural or other disasters."

240 E/C.12/1999/5, General Comment 12, para. 17. See also Ziegler (2005), note 221, above.

insights developed in the process of elaborating the “right to adequate food” can be particularly useful in addressing the practicalities of determining what is needed, where, and by whom.

In the UNFCCC context, Technology Needs Assessments (TNAs) constitute the main approach to the identification and evaluation of the means necessary to achieve mitigation and adaptation in developing countries. Work on TNAs began in 2001 and almost one hundred TNAs have now been undertaken by UNFCCC parties. Although the process and results of TNAs have been useful, there is clearly a need for additional work, particularly regarding the balance of the various elements and the cross-sectoral implications of assessing needs and technologies for adaptation to climate change.<sup>241</sup> Moreover, as TNAs involve a broad range of stakeholders and are linked to broader sustainable development goals,<sup>242</sup> they could be important entry points for human rights notions and concerns. As a result, there is an important potential for TNAs to more effectively address some of the practical challenges of technology transfer.

## **1. Assessing needs**

TNAs require the evaluation of the relevance and importance of a range of issues. In order to establish technological needs and responses in adaptation, countries must consider, *inter alia*, the sectors most vulnerable to the impacts of climate change and the most appropriate technologies according to national and local circumstances, including their possible contribution to development goals, their accessibility and availability, and the need to avoid or minimise maladaptation.<sup>243</sup> Prioritising food security and the right to food – insofar as these require a focus on the particular individuals and populations most vulnerable to climate change – can provide a compass to indicate appropriate priorities for technological needs.

Deliberately focusing on vulnerable individuals and groups, as required in any human rights assessment, would enrich the process of TNAs. National development goals, while fundamental to the elaboration of TNAs, rarely concentrate explicitly on the most vulnerable. This is in part because the development policies promoted by the leading donors have for some time concentrated on creating enabling conditions for budding entrepreneurs to succeed (at least nominally),

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241 UNFCCC (2005). Report on the seminar on the development and transfer of technologies for adaptation to climate change. FCCC/SBSTA/2005/8. 16 September 2005.

242 R. Gross, W. Dougherty, and K. Kumarsingh, *Conducting Technology Needs Assessments for Climate Change*. UNDP, New York, United States. July 2004.

243 Ibid.

conditions that do not necessarily help the poorest. It is in part because recipient states frequently view development as an opportunity for large infrastructural projects. Climate change dramatically alters the context for development policy, however, in ways outlined above. A focus on human impacts can help articulate the innovative integration of development and climate policies that will henceforth be needed.

The right to food can help in other respects. Adequate stakeholder participation is already considered essential in TNAs, as it helps to clarify the range of impacts and potential solutions, as well as to facilitate implementation. Assessments of the impact of climate change on the right to food will be valuable for identifying relevant stakeholders in the agricultural sector and to ensure that the interests of those most impacted are sufficiently represented. The General Comment on the right to adequate food, for instance, identifies “landless persons and other impoverished segments of the population” as particularly vulnerable.<sup>244</sup> Physically vulnerable individuals, such as infants, young children and elderly people are also more at risk from changes to agricultural protection and access to food.

The content and characteristics of the right to food, specifically, can also contribute to TNAs. For example, the right to food requires that possibilities exist either for feeding oneself directly from productive land or other natural resources, or on the basis of well-functioning distribution, processing and market systems.<sup>245</sup> If these possibilities do not exist, the availability of food, one of the core elements of the right to adequate food, may thus be affected. This would then represent a priority for the policies articulated through TNAs.<sup>246</sup>

The right to food also requires that food be free from adverse substances.<sup>247</sup> However, warmer temperatures brought on by climate change may cause food quality to deteriorate in certain circumstances. TNAs would thus need to prioritise protective measures to prevent contamination of foodstuffs through adulteration and/or through bad environmental hygiene or inappropriate handling.

Finally, access to food, another critical aspect of the right to food, is also relevant in the context of adaptation to climate change. Less production may mean higher prices locally, as well the loss of income-generating opportunities. It may also lead some households to make difficult food

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244 E/C.12/1999/5, General Comment 12, para. 113.

245 See E/C.12/1999/5, General Comment 12, para. 21.

246 E/C.12/1999/5, General Comment 12, para. 12.

247 E/C.12/1999/5, General Comment 12, para. 10.

allocation choices among family members. To advance the realization of the right to food, however, states must ensure there is both economic and physical accessibility to food. Socially and physically vulnerable groups may need special attention in this regard.<sup>248</sup>

## **2. The right to food provides indicators for interventions**

Another added value for the process of assessing technology needs relates not to the right to food itself, but to the vast international experience around assessing factors impacting food security and the right to food. Since 1996, the World Food Summit and other international instruments on the right to food have called for the development of national “food insecurity and vulnerability information and mapping systems” (FIVIMS) aimed at identifying areas and populations affected by or at risk of hunger and malnutrition, and the elements contributing to such food insecurity (Table 2).<sup>249</sup>

The FIVIMS initiative was established in 1997 as a network of technical cooperation agencies, international non-governmental organisations, regional and research institutions. The main focus of efforts is assisting countries in carrying out a more careful characterisation of food insecure and vulnerable population groups, improving understanding of the underlying causes, and promoting a more effective utilisation of information in decision-making, planning, and policy and programme formulation. FIVIMS, for instance, has developed food security and nutrition indicators, as well as methods of identifying the most vulnerable groups and the underlying causes of their vulnerability.<sup>250</sup>

As noted above, the EGTT has already spent considerable time tracking “performance indicators” on technology transfer. The FIVIMS indicators must presumably belong to any such endeavour. It has been noted that FIVIMS may be limited in its current articulation: doubtless, the specific challenges arising from climate change must be integrated into this model if it is to continue to be of use in gauging contemporary realities.<sup>251</sup> As one report notes: “the data FIVIMS use are static rather than dynamic – and may therefore be inadequate to address climate change. Also, FIVIMS are generally silent about international causes of food vulnerability, which is problematic given the transboundary nature of climate change.” The same report suggests that the “FAO could collaborate with the UNFCCC Secretariat to redesign this food security assessment tool to better capture climate change threats by including an explicit analysis of

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248 E/C.12/1999/5, General Comment 12, para. 13.

249 FIVIMS, *Making FIVIMS Work for You: Tools and Tips*, FAO (2002), 3. See [www.fivims.org](http://www.fivims.org).

250 See generally FIVIMS (2002).

251 Caesens et al. (2009), 21.

vulnerabilities to climate change.”<sup>252</sup> Other indicators exist which would also benefit from factoring in climate change vulnerability.<sup>253</sup>

**Table 2. FIVIMS Food Security and Nutrition Indicators**

<b>FOOD SECURITY AND NUTRITION STATUS INDICATORS (CORE INDICATORS)</b>	
<b>Food Consumption</b>	<ul style="list-style-type: none"> <li>▪ Average per person dietary energy supply (DES);</li> <li>▪ Cereals, roots and tubers as a percentage of DES;</li> <li>▪ Percentage of populations undernourished.</li> </ul>
<b>Health Status</b>	<ul style="list-style-type: none"> <li>▪ Life expectancy at birth;</li> <li>▪ Under-five mortality rate.</li> </ul>
<b>Nutritional Status</b>	<ul style="list-style-type: none"> <li>▪ Proportion of children under 5 that are underweight, stunted or wasted;</li> <li>▪ Percentage of adults with body mass index less than 18.5.</li> </ul>
<b>NATIONAL FOOD ECONOMY INDICATORS (ADDITIONAL INDICATORS)</b>	
<b>Economic Conditions</b>	<ul style="list-style-type: none"> <li>▪ GNP per capita;</li> <li>▪ Growth in GNP per capita;</li> <li>▪ GNP per capita at purchasing power parity.</li> </ul>
<b>Food Availability</b>	<ul style="list-style-type: none"> <li>▪ Food production index by country;</li> <li>▪ Volume of production, food use, trade and stock changes for major food commodities, by commodity group and by country groupings;</li> <li>▪ Ratio of five major grain exporters' supplies to requirements.</li> </ul>
<b>Food Access</b>	<ul style="list-style-type: none"> <li>▪ Gini Index of income distribution;</li> <li>▪ People living below national poverty line;</li> <li>▪ People living on less than \$1 per day.</li> </ul>
<b>Stability of Food Supplies and Access</b>	<ul style="list-style-type: none"> <li>▪ Index variability of food production;</li> <li>▪ Food prices index;</li> <li>▪ Changes in cereal production in low-income food deficit countries (LIFDCs), with or without China and India;</li> <li>▪ Export price movements for wheat, maize and rice.</li> </ul>
<b>Risks, Hazards and Shocks</b>	<ul style="list-style-type: none"> <li>▪ Number of countries facing food emergencies.</li> </ul>

Source: FIVIMS, *Making FIVIMS Work for You: Tools and Tips*, FAO (2002), 3.

Indicators of this kind can be deployed to provide guidance for either a TNA (conducted by the host country) or a technology exporting country.

252 Caesens et al. (2009), 21.

253 Caesens et al. (2009). In this regard, another available option is the IBSA Procedure (Indicators, Benchmarks, Scoping, Assessment), a collaborative project, started in 2004, between the University of Mannheim, FIAN International and the German Ministry of Consumer Protection, Food and Agriculture (not yet integrating climate factors). See FAO, *Methods to Monitor the Human Right to Adequate Food*, Volume I: Making the case for Rights-Focused and Rights-Based Monitoring, FAO (2008).

### **3. Determining adequate technological responses**

Within the TNA process, the right to food may also be relevant in ensuring the adequacy of technological responses. A range of technologies may be relevant to agricultural adaptation, but their eventual role can only be determined on the basis of their correspondence to the specific social, economic and environmental conditions in each country and community. The UNFCCC already considers some of these conditions – including development priorities, the affordability of technologies and their diffusion potential.<sup>254</sup> Consideration of the right to food would bring in other fundamental criteria in the choice of technologies for adaptation, specifically those linked to the need for the cultural acceptability of foods.

Biotechnology, though expected to contribute significantly in the crop management for adaptation to climate change, also raises concerns along these lines. The FAO has noted that biotechnology can contribute to meeting the unprecedented challenges that agriculture is facing, by overcoming production constraints associated with conventional farming.<sup>255</sup> The IPCC refers to a number of studies that have demonstrated genetic modifications to major crop species that increased their water-deficit tolerance or enhanced their resistance to pests and disease.<sup>256</sup> Biotechnology companies emphasise the importance of genetic improvements in helping agriculture achieve higher yields with limited land and water resources, “squeezing the most out of unpredictable rainfall.”<sup>257</sup>

There are questions about the effectiveness of agricultural biotechnology, as well as their suitability and affordability for developing countries. The IPCC acknowledges that many research challenges lie ahead, and little is actually known about how the desired traits achieved by genetic modification perform in real farming applications.<sup>258</sup> Moreover, it is still unclear how the potential of biotechnology can be brought to bear on the actual agricultural problems of developing country farmers, particularly under climate change stress. The World Bank’s *2008 World Development Report* notes that current biotechnology investments are

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254 FCCC/SBSTA/2007/11, Report on the workshop on best practices in conducting technology needs assessments (21 September 2007).

255 FAO, *The State of Food and Agriculture 2003–2004*. Agricultural Biotechnology: Meeting the needs of the poor? (2004).

256 Easterling et al, *supra*.

257 Monsanto, “How can we squeeze more food from a raindrop?” At: [www.monsanto.com/pdf/sustainability/advertisement.pdf](http://www.monsanto.com/pdf/sustainability/advertisement.pdf).

258 Easterling et al., *supra*.

concentrated largely in the private sector, driven by commercial interests, and, perhaps unsurprisingly, not focused on the needs of the poor.<sup>259</sup> Even with recent innovations apparently geared to allow farmers to select and adapt technologies to local conditions, the continuing concerns about food safety, environmental risks and access to proprietary technology are such that it is unclear whether biotechnology will ever benefit small and resource-poor farmers.

While many of these concerns may be taken into account in existing analyses of appropriateness and affordability of technologies, the deployment of a human rights lens would bring an additional and equally important consideration to bear in TNAs: the degree of cultural acceptability of technological solutions. According to the CESCR, the core content of the right to adequate food requires the availability of food acceptable within a certain culture – a condition that may not be fulfilled by genetically modified crops.<sup>260</sup> Indeed, public attitudes to agricultural biotechnology differ widely across countries – as with any other technology, the perceived benefits and risks of biotechnology are closely linked to cultural factors.<sup>261</sup>

Attention to the human right to adequate food would permit such considerations to be adequately addressed in the process of transfer of adaptation technologies. Even beyond biotechnology, the cultural appropriateness of food production, delivery and preparation processes is of immense importance as we head into a climate-constrained world because the notion of what constitutes acceptable food is an important part of the cultural stability of a society.<sup>262</sup> Food has innumerable associations and significations beyond diet and nutrition alone. Taking these into account can only help in locating the best policies for technological adaptation in agriculture.

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259 World Bank (2008). *World Development Report 2008: Agriculture for Development*.

260 See E/C.12/1999/5, General Comment 12, para. 8: “The Committee considers that the core content of the right to adequate food implies: The availability of food in a quantity and quality sufficient to satisfy the dietary needs of individuals, free from adverse substances, and acceptable within a given culture; The accessibility of such food in ways that are sustainable and that do not interfere with the enjoyment of other human rights.” Para. 11: “Cultural or consumer acceptability implies the need also to take into account, as far as possible, perceived non nutrient-based values attached to food and food consumption and informed consumer concerns regarding the nature of accessible food supplies.”

261 The FAO (see note 255, *supra*), looking at most extensive international study of public perceptions of biotechnology, notes that more than 60% of the respondents thought that “Modifying the genes of plants or animals is ethically and morally wrong.”

262 P. Fieldhouse, *Food and Nutrition: Customs and Culture*, Chapman & Hall (December 1995).



## VI. HUMAN RIGHTS AND TECHNOLOGY POLICY FOR MITIGATION

At present, 1.4 billion people live without access to electricity and at least 2.7 billion depend on biomass burning for their cooking and heating.<sup>263</sup> Among the consequences of this “energy poverty”, according to the report of an Advisory Group on Energy and Climate Change (AGECC) set up by the UN Secretary-General, are profound threats to human rights:<sup>264</sup>

*Current energy systems are inadequate to meet the needs of the world's poor and are jeopardizing the achievement of the Millennium Development Goals (MDGs). For instance, in the absence of reliable energy services, neither health clinics nor schools can function properly. Access to clean water and sanitation is constrained without effective pumping capacity. Food security is adversely affected, often with devastating impact on vulnerable populations.*

Consider, moreover, the following three figures, taken from the *World Energy Outlook 2010* (WEO), produced by the OECD's International Energy Agency (IEA):<sup>265</sup>

- \$312 billion – the cost of consumption subsidies to fossil fuels in 2009;
- \$57 billion – the cost of support given to renewable energy in 2009;
- \$36 billion per year – the cost of ending global energy poverty by 2030.

As these figures indicate, current patterns of global expenditure are geared towards neither the eradication of “energy poverty” nor the restructuring of energy use patterns to meet GHG mitigation exigencies. Subsidies to the fossil fuel industry alone currently cost governments nine times as much annually as it would cost to universalise access to electricity.<sup>266</sup> These subsidies contribute directly to the intensification of

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263 UN Secretary-General's Advisory Group on Energy and Climate Change, *Energy for a Sustainable Future* (28 April 2010) [hereafter, “AGECC”], 7. The figure of 2.7 billion is from OECD/IEA, *World Economic Outlook 2010* (September 2010) [hereafter “WEO 2010”], 56; AGECC gives 3 billion (at 7), citing WHO.

264 AGECC, 7.

265 WEO 2010, 3.

266 The AGECC too (at 7) notes the dangerous preponderance of fossil fuels in the current global energy mix: “Reducing the carbon intensity of energy – that is, the amount of carbon emitted per unit of energy consumed – is a key objective in reaching long-term climate goals. As long as the primary energy mix is biased towards fossil fuels, this would be difficult to achieve with currently available fossil fuel-based energy technologies.”

GHGs in the atmosphere, indicating that those living in energy-intense localities continue to this day to take a toll, with their lifestyles, on those vulnerable to climate change in energy-poor countries.

It is hardly an exaggeration to think of contemporary energy use as a kind of energy apartheid: there are clear energy haves and have-nots and evident policy patterns that sustain the imbalance. As we head into a climate-constrained world, in which fossil fuel use must be curtailed rather than expanded, subsidies to the fossil fuels industry supporting current usage patterns look increasingly like a means to ensure energy inequality for the long term.

At the same time, the AGECC notes that current energy use is extremely inefficient:<sup>267</sup>

*Given that the world economy is expected to double in size over the next twenty years, the world's consumption of energy will also increase significantly if energy supply, conversion and use continue to be inefficient. Energy system design [to achieve] reduced GHG emissions in supply and increased end-use efficiency will therefore be critical for reducing the risk of irreversible, catastrophic climate change.*

There are thus two domains in which technologies are central to meeting the mitigation challenge:

- (1) Clean technologies both to substitute current supplies and also to reach people who lack modern energy services;
- (2) Technologies for improving end-use efficiency.

As the foregoing shows, there has already been much work conducted to predict energy use patterns and monitor their effects on individuals in much of the world – and to review these patterns in the light of the climate change mitigation challenge. In Chapter 6, we will demonstrate the relevance of all this work for human rights in order both to introduce those working in this domain to the relevance of human rights to that work, on one hand, and, on the other, to awaken human rights groups and activists to the importance of the technology–energy debate in furthering human rights goals over the mid- to long-term.

## **A. THE ROLE OF TECHNOLOGY TRANSFER**

The relationship between human rights and climate change mitigation is of a qualitatively different kind than that regarding adaptation. Climate change mitigation involves the reduction of global use of GHGs to

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<sup>267</sup> AGECC, 7.

sustainable levels over the long term. Not all countries can contribute to this effort immediately. It is universally recognised that, as the UNFCCC puts it (and the Cancún Agreements reiterate), “economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties” (Art. 4(7)). At the same time, it is increasingly recognised that the imperative to address climate change is such that, sooner or later, every country will need to contribute to this effort.

GHGs are emitted through numerous activities, and they can, therefore, be mitigated in many different sectors.<sup>268</sup> However, given that “the energy system – supply, transformation, delivery and use – is the dominant contributor to climate change, representing around 60% of total current GHG emissions”<sup>269</sup>, on one hand, and the direct relationship between energy access and the fulfilment of a broad spectrum of human rights, on the other, the present chapter approaches mitigation principally through the prism of energy access.

The mitigation challenge, then, viewed from the perspective of energy access, is a question of squaring two distinct goals, both of which are broadly accepted but tend to pull in different directions. These are:<sup>270</sup>

- (1) Increasing standards of living globally (providing, at a minimum, universal access to electricity);
- (2) Reducing global GHG emissions to sustainable levels over the long term.

It is also broadly accepted that the first goal requires that in some parts of the world, GHG emissions will continue to rise over the mid-term.<sup>271</sup> So how are these goals to be achieved together? How do we determine what levels of GHG emissions should be available to developing countries over the longer term? The same question arises for all countries: how

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268 The IPCC’s Fourth Assessment Report attributes 56.6% of anthropogenic GHG emissions to carbon dioxide released through fossil fuel usage. This is dispersed among different sectors, however, including “energy supply” (25.9%), transport (13.1%), industry (19.4%) and “residential and commercial buildings” (7.9%). Pachauri, R.K. and Reisinger, A. (eds.), “Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Climate Change 2007: Synthesis Report”, IPCC (2007) [hereafter IPCC AR4, Synthesis Report], 36.

269 AGECC, 7.

270 These track roughly the “two key goals” identified in AGECC, which are (i) “universal access to modern energy” and (ii) “reduce global energy intensity by 40% by 2030”. AGECC, 9.

271 Baer et al, (2008), *supra*.

are we to determine the quantity of emissions that ought to be available anywhere? What is a fair allocation of the global carbon dump?

The political difficulty of arriving at a response to this question has dogged climate negotiations for years, and will not be resolved quickly or easily. Nevertheless, a number of useful attempts have been undertaken to set basic parameters relevant to any solution, which we shall examine later in this chapter. In all scenarios, the question is essentially (if not solely) technological. The central role of technology in moving the world's economy onto a low-carbon path has long been plain.

This is a question that has two principal, and by now familiar, prongs. One prong is technological development. Although carbon-clean technologies exist for energy production and transport (the two principal sectors for emissions cuts), there is immense scope for increasing efficiency, reducing production costs, and maximising our capacity to run our economies on solar, hydro, wind, geothermal and other carbon-free sources of power.<sup>272</sup> However in this regard it is relevant to note that there are no projections of “carbon-free” electricity production in the near future. According to the WEO, the best expectation is that “Globally, the shift to ... low-carbon technologies is projected to reduce the amount of CO<sub>2</sub> emitted per unit of electricity generated by one-third between 2008 and 2035.”<sup>273</sup> A doubling in electricity production, under these circumstances, would lead to a net increase in GHGs. Where electricity levels must rise, in other words – i.e., in the poorest countries – these will inevitably be accompanied by some increase in emissions. This increases the pressure on wealthy countries precipitously: their own emissions-cutting burden increases further to the degree that poor country emissions rise. Technological development and (as we shall see) transfer are the means of reducing this pressure.

The second prong, then, is transfer: the widespread dissemination and diffusion of existing clean technologies.<sup>274</sup> No matter which perspective we begin from, there can be no doubt that, in conditions of increasing climate constraints, mass dissemination of clean energy-producing and transport technologies is in everyone's best interests. That is, technology transfer – in the generally accepted sense of scaled-up movements of technologies from richer to poorer countries – is in the

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272 There is an immense literature on clean technology. For a representative introduction, see Lester Brown, *Plan B 3.0: Mobilizing to Save Civilization*, Norton (2008).

273 WEO 2010, 51.

274 For a discussion on the relationship between technology “development”, “diffusion” and “transfer”, see above, Chapter 3.

interests of the people of both richer and poorer countries. It is in the interests of poorer countries for the obvious reason that the carbon constraints of climate change itself threaten to put development goals out of reach. It is in the interests of richer countries because increased recourse to clean technologies everywhere eases the global burden of achieving cuts anywhere – under conditions where the latter burden is carried in the main by carbon-intense economies.

Technology transfer, viewed from this perspective, is simply the application of common sense to a global problem: emissions should be reduced where it is cheapest and easiest to do so. Axiomatically: large emissions reductions anywhere benefit people everywhere. Where there is immense hydropower potential (e.g., the great rivers of sub-Saharan Africa), there should be hydropower electricity production. Where there is massive solar power (the world's deserts), solar energy should be produced. Where wind speeds are high- or low-intensity volcanoes warm the earth, there is potential to be exploited. And so on.

Calculations along these lines must be treated with immediate caution. At present, in many countries, notably in sub-Saharan Africa, the availability of high-tech capacity for oil extraction (for example) has not led to universal access to electricity in those countries: the oil is simply exported to more lucrative markets. Elsewhere, the same is true for plutonium or natural gas extraction. The existence of technology in a locality, in short, may contribute only minimally, or not at all, to that locality's wellbeing. Indeed, it may be detrimental, as appears to have been the case in, for example, the Niger Delta or Equatorial Guinea.<sup>275</sup> Renewable power sources too, such as solar power, can be captured and harvested in poor countries for export elsewhere without benefitting the host state (plans already exist to do just this).<sup>276</sup>

The simple observation that the mere existence of technology in a given country is no guarantee of national-level benefits goes to the heart of much of the contemporary debate over technology transfer. It is clear that such an arrangement does not amount to "transfer" as it is defined in

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275 Dee Burton, "Niger Delta: Case study in human rights and public health effects of oil companies' exploration" (2006).

276 See e.g., Lewis Page, "Big EU imports of Sahara sun-power coming soon?", *The Register* (June 22, 2010), The article refers to the Desertec project, involving Siemens among others, and cites European Energy Commissioner Guenther Oettinger: "Maybe a bigger percentage of the electricity will be exported to Europe but at the same time we have to export the technology, tools, machines, experts, and so it's a real partnership, not only a partnership by selling and by buying." See also Nidhal Guessoum, "Will the future be sunny?", *Gulfnews.com* (21 January 2011). The project's future is uncertain at time of writing.

the Code, nor would it meet the conditions of “transfer” as laid out in the UNFCCC (“to enable [recipient countries] to implement the provisions of the Convention”). Arrangements of this kind would, by contrast, appear to meet a definition of technology transfer focused on encouraging foreign investment. Likewise, overly zealous insistence on IP rights would tend to expect extractive scenarios of this kind: they would permit activities in-country while presuming against in-country ownership over the means or outputs of those activities. As discussed in Chapter 1, technology transfer, if it is to fit meaningfully within the UNFCCC’s overarching objectives, must entail something beyond this expectation.

Taking this latter caveat into account, the fact remains that technology transfer supplies an indispensable, element of any global cooperative endeavour to reduce GHGs substantially while energy consumption levels rise simultaneously.

Fortunately much work has already been done, both in projecting the scale and urgency of global reductions, on one hand, and assessing the extent to which developing countries will require energy for their future needs, on the other. As to the first, groundbreaking work was undertaken by EcoEquity (and others) in recent years. The “greenhouse development rights” (GDR) framework, first produced in 2007 and revisited a number of times since, provides a means to compare the amount of GHG emissions currently in use in different countries and to relate to it basic development indicators.<sup>277</sup> The GDR framework has also been used to envision the degree to which, looking ahead, high emissions countries will need to cut their emissions, and how much low-emissions countries might expect to increase their emissions, in the near- to mid-term, to reach minimal standards of living.

As to the second, two recent sources lay out in great detail the extent of future energy needs in developing as well as developed countries, factoring in not only climate change constraints, but also available and future energy sources, current trends in investment and subsidies, and the comparative costs of various different scenarios. A first source is the AGECC, which released its report “Energy for a Sustainable Future” in April 2010, calling for the universalisation of access to modern energy resources by 2030.<sup>278</sup>

The second source echoed this call in September 2010: the WEO, a co-production of the IEA, the UN Development Programme and the UN Industrial Development Organization. Among other things, the report devotes chapters to “Energy Poverty: How to make modern

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277 Baer et al., *supra*.

278 AGECC, 9.

energy access universal” and “Energy and the ultimate climate change target”.<sup>279</sup> The WEO is a serious document – meticulously prepared by a small army of experts led by IEA Chief Economist Fatih Birol, and 738 pages in length, it provides a thorough assessment of contemporary energy usage trends and their sustainability over the mid-term.

The next section provides a summary of the main points and conclusions of these three sources (relying in particular on the WEO). A subsequent section will then explicitly raise the human rights implications that run implicitly through the discussion as a whole.

## **B. THE MITIGATION CHALLENGE**

Two apparently opposed goals were identified above as central to the mitigation challenge:

- (1) Universalising access to clean energy services;
- (2) Constraining GHG emissions to sustainable levels.

This section looks at the second of these.

The level of GHGs in the atmosphere today is at least 455 ppm CO<sub>2</sub>-eq (i.e., 455 parts per million of carbon dioxide equivalent).<sup>280</sup> This means that for every million parts of the atmosphere, 455 parts consist of gases that have a greenhouse intensity equivalent to carbon dioxide. Within this cloud of gases, carbon dioxide is by far the most important GHG, itself having an atmospheric intensity of about 389 ppm (up from 379/380 in 2006 and 353 in 1991).<sup>281</sup> However, because other gases (notably aerosols) counteract the warming effect of the GHGs, the effective level of GHG intensity is currently given as somewhat lower, at between 311–435 ppm CO<sub>2</sub>-eq (averaged at 375).<sup>282</sup>

To have a “reasonable chance” of keeping global warming to an increase of no more than 2°C above preindustrial levels – the formal target agreed on in Cancún<sup>283</sup> – the IPCC reckons that the total effective amount of GHG

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279 WEO 2010.

280 IPCC AR4 Synthesis, 67, table 5.1, at note (b). See also ICHRP (2008), 27–31.

281 See data on the US Government National Oceanic and Atmospheric Administration website: Dr. Pieter Tans, NOAA/ESRL ([www.esrl.noaa.gov/gmd/ccgg/trends](http://www.esrl.noaa.gov/gmd/ccgg/trends)). The figure of 379 appears in ICCP AR4, published in 2007, and is still widely used although it is now outdated. The amount of CO<sub>2</sub> in the atmosphere has been rising by 1–2 ppm annually.

282 IPCC AR4, Working Group III, Technical Summary (2007), 27; IPCC AR4 Synthesis, 67, table 5.1, at note (b).

283 LCA COP 16, para. 4. The text also, somewhat vaguely, “recognizes the need to consider ... strengthening the long-term global goal on the basis of the best available scientific knowledge, including in relation to a global average temperature rise of 1.5°C”. Ibid.

intensity in the atmosphere should not exceed 450 ppm CO<sub>2</sub>-eq. Even at that level, there is a high risk of overshooting.<sup>284</sup> Given this and that a rise of 2°C will result in devastation for certain peoples in the most highly vulnerable areas, many commentators argue for a target of 350 ppm in the hope of keeping the temperature rise to 1.5°C (average temperatures are already 0.7°C above preindustrial levels). No matter how it is viewed, there is little “development space” left for any countries, rich or poor, and whatever there is depends upon much better use of the available space.

The argument of the present chapter is that human rights must be our guide in prioritising objectives as we turn to technology to this end.

The WEO looks ahead to three future energy scenarios. The first is a “Current Policies Scenario”, which extrapolates to 2035 the continuation of policies currently in place around the world, a scenario of disaster and devastation. The second “New Policies Scenario” (NPS) assumes that governments will implement the pledges already made (but not yet put into practice) to curb GHG emissions and (in some cases) reduce fossil fuel subsidies. The principal claim made regarding the NPS is that global energy consumption trends “are in line with stabilising the concentration of GHGs at *over 650 ppm* CO<sub>2</sub>-eq, resulting in a likely temperature rise of *more than 3.5°C* in the long term”.<sup>285</sup> In short, even if the many pledges made in the run up to the Copenhagen and Cancún meetings are kept, we will overshoot 2°C dramatically. The consequences of a rise of 3.5°C are truly catastrophic.

In response, the WEO also includes a third, “450 scenario”, in which energy consumption patterns are brought into line with an atmospheric GHG emissions concentration of 450 ppm CO<sub>2</sub>-eq, consistent with curbing the rise in global temperatures at or near 2°C. The report notes that “[r]eaching that goal would require a phenomenal policy push by governments around the world ... The technology that exists today could enable such a change, but such a rate of technological transformation would be unprecedented.”<sup>286</sup> In essence, the IEA’s 450 scenario recognises that demand for energy will rise inexorably between now and 2035, but assumes the increased demand is met by (1) increasing reliance on non-carbon fuels (renewables and nuclear), particularly in power generation;

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284 IPCC AR4 Synthesis, 67, table 5.1. In fact, the table posits that for a GHG intensity between 445 and 490 ppm CO<sub>2</sub>-eq, the likely rise in temperature will be between 2° and 2.4°C. Notwithstanding the high chance of overshooting 2° at 450 ppm CO<sub>2</sub>-eq, this has nevertheless become the figure of choice in policy circles, reflected in the WEO Report, which includes a “450 Scenario”.

285 WEO 2010, 53 (emphasis added).

286 WEO 2010, 55.

(2) heavy reliance on carbon capture and storage (CCS) in regard to coal and natural gas usage; and (3) much increased energy efficiency.<sup>287</sup>

The extent to which fossil fuels continue to provide basic energy requirements in this scenario has not diminished markedly by 2035 from 2008. Rather, it is held steady while any increases are tackled with CCS, and other low-carbon fuel sources supply the difference. In effect, while oil consumption falls precipitously in developed countries, it rises dramatically in developing countries – leaving overall global consumption only marginally below current levels. This assumption recognises not only the realities of future development but also the principle of “common but differentiated responsibilities” embedded in the UNFCCC.<sup>288</sup>

However, the WEO report has two immense drawbacks. The first is its assumption of 450 ppm as the most ambitious available goal. As noted above, the effects of 450 ppm are unpredictable in the main, but even were they to achieve a 2°C target, this would still entail massive human harms. Its second drawback is its heavy reliance on CCS. Not only does this technology remain unproven, and not only would the consequences be catastrophic were it to later fail after early success, but at present, research is not making significant progress.

The WEO report should not, then, be regarded as providing the best guide to future direction. However, its detail is unparalleled: below are a few salient predictions gleaned from the report.

The WEO report should not, then, be regarded as the best guide to future direction, but its detail is unparalleled, covering expected energy and emissions trends globally and in non-OECD countries. For example, some of its forecasts regarding renewable energy technologies under both the Current and New Policies Scenarios are worth noting:

- *The share of renewable energies in world energy supply is currently about 20% and under current policies will rise to 23% by 2035. In the New Policies Scenario, this rises to 32% by 2035. In the 450 scenario, it must rise to 45% [this figure depends on the parallel success of CSS].*<sup>289</sup>
- *GHG reductions due to energy shifts:* Globally, the shift to nuclear power, renewables and other low-carbon technologies is projected to reduce the amount of CO<sub>2</sub> emitted per unit of electricity generated

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287 WEO 2010, Chapter 14 (especially 417).

288 For discussion see ICHRP (2008).

289 WEO 2010, 303.

by one-third between 2008 and 2035.<sup>290</sup>

- *Role of government:* The future of renewables hinges critically on strong government support ... The greatest scope for increasing the use of renewables in absolute terms lies in the power sector. In the New Policies Scenario, renewables-based generation triples between 2008 and 2035 and the share of renewables in global electricity generation increases from 19% in 2008 to almost one-third.<sup>291</sup>
- *Share of renewables in heating:* In the 450 Scenario, the share of modern renewables in total heat increases sharply, from 10% in 2008 to 21% in 2035. The most significant increase is in buildings, where renewables supply over one-quarter of the need for heat in 2035, up from 8% now.<sup>292</sup>

These and many other indicators of the extent of the mitigation challenge outlined in the WEO report speak for themselves and need little further analysis here. The point is merely to note the immensity of the challenge in terms of managing energy use in the face of climate change. Furthermore, the report is clear from its opening sentences that the answer does not lie in markets alone: if a solution is to be found, it is governments, acting in concert, that must find it:

*The global economic crisis of 2008–2009 threw energy markets around the world into turmoil and the pace at which the global economy recovers holds the key to energy prospects for the next several years. But it will be governments, and how they respond to the twin challenges of climate change and energy security, that will shape the future of energy in the longer term.*<sup>293</sup>

### **C. UNIVERSALISING ACCESS TO CLEAN ENERGY SOURCES**

To the challenge of mitigation must be added the second challenge of achieving universal access to modern energy sources. This second challenge is also repeatedly affirmed in mainstream policy documents.

The Millennium Development Goal of halving poverty and hunger by 2015 (MDG 1), as is frequently pointed out, cannot be met without

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290 WEO 2010, 51.

291 WEO 2010, 51.

292 WEO 2010, 339.

293 WEO 2010, 45.

significantly increasing access to modern energy services.<sup>294</sup> Likewise, with regard to MDGs 4–6, dealing with child mortality, maternal health, and combating diseases, the reliance on biomass for cooking for 2.6 billion people is estimated by the World Health Organisation to cause 1.4 million premature deaths each year (that is, 4,000 per day) due to household air pollution from inefficient biomass combustion.<sup>295</sup> According to the WEO, on its New Policies Scenario this figure is likely to increase by 2030, to over 1.5 million deaths annually.<sup>296</sup>

Indeed, the WEO details the contribution of electricity access to the achievement of each of the eight MDGs.<sup>297</sup> From this perspective, access to electricity and other modern sources of energy may be viewed as a meta-goal – tending to underpin and ensure each of the other goals. In the same vein, access to electricity might also be thought of as a meta-right – a *sine qua non* for the effective fulfillment of a range of human rights. From this perspective, one might consider a right to electricity or modern energy as derivative – a right that is necessarily assumed and extrapolated from existing treaty-based human rights.

A similar approach is taken by the GDR framework developed by EcoEquity and the Stockholm Environment Institute (SEI).<sup>298</sup> By GDRs, the authors refer to those fundamental public goods (such as energy access) vital to the achievement of basic human rights – viewed as a composite of development needs in the context of climate constraints. While the authors refer to this meta-right as the “right to development”, the point here is not to open up a debate over the existence in law of a development obligation with rights and duty-bearers; it is, rather, to redirect this set of macro-issues to their necessary source of ultimate significance and effect: the human person.

Human rights are central to this set of issues, albeit often in the background (they are not mentioned, for example, in either the AGECC or the WEO). While bearing their centrality in mind, we will leave them in the background for now as we flesh out the implications of the GDR framework and the various calls for universalisation of electricity access – and return to them presently.

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294 AGECC, 7, 10.

295 WHO (World Health Organization), “Indoor Smoke from Solid Fuel Use: Assessing the Environmental Burden of Disease”, Environmental Burden of Disease Series, No. 4, WHO (2004). WHO, “The Global Burden of Disease: 2004 Update”, WHO (2004).

296 WEO 2010, 243.

297 WEO 2010, 245–246.

298 See Paul Baer et al. (2008); Tom Athanasiou, Paul Baer, Sivan Kartha, Eric Kemp-Benedict, *The Right to Development in a Climate Constrained world: The Greenhouse Development Rights Framework* (April 2009) (on file with the ICHRP).

## 1. The Greenhouse Development Rights framework

The GDR framework begins from the premise that climate change imposes bounds on development. Henceforth, there are inherent limits on the means and even the extent of expansion of the global economy and of national economies. At the same time, the limits on national economic activities can only be understood by reference to the global limits. At some level, then, it becomes necessary to acquire a perspective of what those limits are and how they function for individual economies. In what is henceforth roughly a zero-sum game, what are the minimum expectations we must have for each national economy and what implications do those expectations have for other economies?

A first point the GDR authors note is that, even if wealthy countries take much more aggressive steps than they currently propose, “the atmospheric space remaining for developing countries would [still] be extremely constrained. Developing country emissions would have to peak only a few years later than those in the North – still before 2020 – and then decline by more than 5% annually through 2050”.<sup>299</sup> In consequence, “the South’s negotiators have to face the very real possibility that the imperatives of climate stabilization will deprive their countries of access to the cheap fossil energy sources that helped make the wealthy countries wealthy in the first place”.<sup>300</sup>

Given the evident need for development in the South, the fact that current proven paths to development are emissions-intensive, and of course the inescapable fact that wealthy countries are primarily responsible for the mess, there is, understandably very little incentive for these countries to take on the burden. This explains in part, say the authors, the very real threat that climate change talks will fail. However, as has already been intimated in earlier sections of this report, part of the problem is precisely a blanket view of the South, in which all non-Annex 1 countries might be seen as freed from obligation. This view has not proved politically sustainable, is difficult to align with ordinary notions of justice, and is inattentive to the very real exigencies of extreme human rights threats that are not evenly distributed everywhere. How then to differentiate between countries?

The authors’ response is to attempt to allocate the burden of climate transition in ways that will be manageable for and fair to all countries. They do so by approaching the problem from two perspectives: from that of minimal national development needs, on one hand, and minimal global climate responsibilities, on the other. From the perspective of development needs, the authors propose the notion of a development

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299 Athanasiou et al. (2009), 4.

300 Athanasiou et al. (2009), 5.

threshold, defined as “a level of welfare below which people are not expected to share the costs of the climate transition”.<sup>301</sup>

*People below this threshold have survival and development as their proper priorities. As they struggle for better lives, they are not obligated to expend their limited resources to keep society as a whole within its sharply limited global carbon budget. They have, in any case, little responsibility for the climate problem and little capacity to invest in solving it.*<sup>302</sup>

The GDR framework puts the “development threshold” at a per capita income of \$20 per day. This is significantly above the generally agreed global poverty line of \$1–\$2 per day (which amounts to a “destitution line” as the authors put it). Instead, they choose a threshold that “must reflect a level of welfare that is beyond basic needs, though well short of today’s levels of ‘affluent’ consumption”. The GDR figure is based on research that finds that only at a level of \$16 per person per day do “the classic plagues of poverty – malnutrition, high infant mortality, low educational attainment, high relative food expenditures – begin to disappear”.<sup>303</sup> Pitching 25% above this figure, with a view to rising above poverty, countries with per capita incomes of about \$7,500 purchasing power parity would be considered above the development threshold and so might be expected to begin to contribute to addressing climate change.<sup>304</sup>

Obviously, while useful, the development threshold is a blunt tool – income distribution can vary dramatically within country, and this variation is itself an indicator of human rights security. Nevertheless, per capita income tends to correlate highly with access to electricity and reliance on biomass for cooking, and therefore provides a useful means of determining which countries are “developing” in the sense of beneficiaries of technology transfer.

From the second perspective – the allocation of responsibility – the

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301 Athanasiou et al. (2009), 5.

302 Baer et al. (2008), 16. The authors note: “the approximately 70 percent of the population that lives below the development threshold is responsible for only about 15 percent of all cumulative emissions”.

303 Baer et al. (2008), 16, citing Lant Pritchett, “Who is Not Poor? Proposing a Higher International Standard for Poverty” *The Center for Global Development* 21(1): 1–23 (2003). At: [www.cgdev.org/content/publications/detail/2758](http://www.cgdev.org/content/publications/detail/2758).

304 The authors add that “[This] figure was found, after further research, to be more closely consistent with national estimates (in China and India specifically) of the income level where poor people begin to enter the lower levels of the global consuming class. Which is to say, the level where they begin to have some small amount of discretionary income.” Baer et al. (2008), 10.

authors initially assess responsibility by reference to contribution to (“responsibility for”) the climate change problem and capacity to deal with it. These criteria are based in the UNFCCC which speaks of “common but differentiated responsibilities and respective capacities.” Responsibility is measured in terms of per capita emissions; capacity in terms of per capita income. High-income, high-emission countries have a high responsibility–capacity index (RCI) on this schema. Low-income, low-emissions countries have a low RCI score.

A partial list extracted from the GDR report is shown in Table 3, below. The point here is not to rank countries or apportion blame, but merely to get a sense of the cut-off point at which countries might be exempted from having an obligation to themselves address climate change in the near-term. Among the interesting findings in this endeavour is that the list of such countries is not quite the same as the list of non-Annex 1 countries: Brazil and Mexico, for example, cross the threshold (and China is predicted to do so soon). Again, while blunt, this table provides a basic indicator of what “fair play” might look like in sharing climate burdens.

At the same time, the RCI index provides a rough sense of the degree to which individual countries might be expected to contribute to the global effort to mitigate climate change: what degree of the burden they might be expected to carry. How it is carried would be a next step. A country’s RCI score might indicate what amount it should contribute to total global emissions cuts as a percentage. Certain high-RCI countries would, on this basis, take on extensive emission-cutting burdens, but the burden might also be addressed otherwise. Financial transfers, including towards technology, for example, might use the RCI to indicate the amount of funding a given country would be expected to contribute to a global fund, were such a thing brought into being.<sup>305</sup>

*Distributing the global mitigation requirement in this way yields some striking results. For one thing, it demonstrates that a major commitment to North–South cooperation – including financial and technological transfers – is an inevitable part of any viable climate stabilization architecture. This is because the national mitigation obligations of the high-RCI countries of the North vastly exceed the reductions they could conceivably make at home. In fact, by 2030, their mitigation obligations will typically come to exceed even their total domestic emissions!*

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305 Baer et al. (2008), 20–21.

**Table 3. Percentage Shares of Global Population, GDP, Capacity, Responsibility and RCI for Select Groups of Countries**

	2010*					2020*	2030*
	POPULATION (% OF GLOBAL)	GDP PER CAPITA (USD PPP)	CAPACITY (% OF GLOBAL)	RESPONSIBILITY (% OF GLOBAL)	RCI (% OF GLOBAL)	RCI (% OF GLOBAL)	RCI (% OF GLOBAL)
<b>EU 27</b>	7.3	30,472	28.8	22.6	25.7	22.9	19.6
<b>EU 15</b>	5.8	33,754	26.1	19.8	22.9	19.9	16.7
<b>EU +12</b>	1.5	17,708	2.7	2.8	2.7	3.0	3.0
<b>UNITED STATES</b>	4.5	45,640	29.7	36.4	33.1	29.1	25.5
<b>JAPAN</b>	1.9	33,422	8.3	7.3	7.8	6.6	5.5
<b>RUSSIA</b>	2.0	15,031	2.7	4.9	3.8	4.3	4.6
<b>CHINA</b>	19.7	5,899	5.8	5.2	5.5	10.4	15.2
<b>INDIA</b>	17.2	2,818	0.7	0.3	0.5	1.2	2.3
<b>BRAZIL</b>	2.9	9,442	2.3	1.1	1.7	1.7	1.7
<b>SOUTH AFRICA</b>	0.7	10,117	0.6	1.3	1.0	1.1	1.2
<b>MEXICO</b>	1.6	12,408	1.8	1.4	1.6	1.5	1.5
<b>LDCs</b>	11.7	1,274	0.1	0.04	0.1	0.1	0.1
<b>ANNEX 1</b>	18.7	30,924	75.8	78.0	77	69	61
<b>NON-ANNEX 1</b>	81.3	5,096	24.2	22.0	23	31	39
<b>HIGH-INCOME**</b>	15.5	36,488	76.9	77.9	77	69	61
<b>MIDDLE-INCOME**</b>	63.3	6,226	22.9	21.9	22	30	38
<b>LOW-INCOME**</b>	21.1	1,599	0.2	0.2	0.2	0.3	0.5
<b>WORLD</b>	100	9,929	100	100	100	100	100

Note: GDP = gross domestic product; USD = United States dollars; PPP = purchasing power parity.

\*Emissions and income projections based on *WEO 2007*.

\*\*Based on World Bank definitions as of 2006.

This relative distribution of the burden of climate mitigation fits well with the scenarios laid out in the WEO – where, as we saw, energy demand is projected to rise almost exclusively in non-OECD countries, and fossil fuel consumption must fall precipitously in OECD countries even as it rises in developing countries. The GDR framework shows us where and how these redistributions might fall.

## **2. The role of technology transfer in achieving universal access to electricity**

Although the various perspectives canvassed above do not all agree on the precise action to be taken to address climate change (notably, the authors of the GDR report doubt that 450 ppm CO<sub>2</sub>-eq is an adequate goal, preferring 420), they are all agreed on a number of the basic principles that go to the heart of the present report:

- (1) The imperative to ensure universal access to modern energies is all the more urgent given the climate challenge;
- (2) It involves action on the part of the wealthy world;
- (3) Failure to do so will be catastrophic;
- (4) Doing so requires combined international effort and innovation.

These principles hold regardless of whether we view the imperative in terms of development, the MDGs, GDRs, or basic human rights. The WEO puts the case as follows:<sup>306</sup>

*To meet the ... goal of achieving universal access to modern energy services by 2030 ... the international community needs to recognise that the projected situation is intolerable, commit itself to effect the necessary change and set targets and indicators to monitor progress. **A new financial, institutional and technological framework is required**, as is capacity building at the local and regional levels. Words are not enough – real action is needed now.*

In terms of specific measures that wealthy countries must take with regard to poorer countries, all three sources used here again converge, focusing on financing and technology. This is entirely in line with the obligation found in UNFCCC Art. 4.5 and discussed above: to “promote, facilitate, and finance the transfer of environmentally sound technologies”. But what does this mean in practice?

The AGECC proposes “more focused commitments [by high-income countries] to support developing countries in helping to achieve their goals in the areas of both energy access and efficiency” and “trade-related measures that would support market expansion for products that increase energy efficiency or enhance access”. Above all “[f]inance, including innovative financial mechanisms and climate finance,

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306 WEO 2010, 56. Emphasis added.

should be made available by the international community.”<sup>307</sup> In this regard, according to the WEO:<sup>308</sup>

*[A]dditional spending of \$36 billion per year would be required. This is equal to less than 3% of the global investment in energy-supply infrastructure projected in the New Policies Scenario to 2030. The resulting increase in energy demand and CO<sub>2</sub> emissions would be modest: in 2030, global oil demand would be less than 1% higher and CO<sub>2</sub> emissions a mere 0.8% higher compared with the New Policies Scenario.*

The AGECC further lays out a financial case beyond the WEO's bare minimum:<sup>309</sup>

*For **universal access to modern energy services** to meet basic needs, it is estimated that \$35–\$40 billion of capital will be required on average per year to achieve basic universal access by 2030. We estimate that around \$15 billion of grants would need to be made available, mainly to cover the capital investment and capacity building required in least developed countries, where national energy investments are likely to focus on overcoming infrastructure backlogs and meeting suppressed demand in productive sectors. In addition, \$20–\$25 billion of loan capital will be required ... above business-as-usual.*

*For **energy efficiency**, our estimate is that on average \$30–\$35 billion of capital is required for low-income countries and \$140–\$170 billion for middle-income countries annually until 2030 ...*

In this context it is worth comparing the funding commitment contained in the Copenhagen Accord and subsequently endorsed at Cancún:<sup>310</sup>

*[D]eveloped country Parties commit, in the context of meaningful mitigation actions and transparency on implementation, to a goal of mobilizing jointly USD 100 billion per year by 2020 to address the needs of developing countries.*

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307 AGECC, 10.

308 WEO 2010, 56.

309 AGECC, 10–11.

310 COP 16, para. 98.

Even were all of this funding to be spent on universalising access to modern energy services and improving energy efficiency (which is not the stated position), it would still fall far short of the total AGECC estimate of \$205–\$240 billion per year to those ends.<sup>311</sup> However, even these latter figures are likely optimistic given the scale of the energy challenge climate change represents.

#### **D. RESPECTING HUMAN RIGHTS IN TECHNOLOGY TRANSFER FOR MITIGATION**

In Chapter 1, above, we outlined John Barton's description of the process of technology transfer.<sup>312</sup> Because, in Barton's assessment, markets in climate mitigation technologies are "quite competitive" (unlike, for examples, pharmaceuticals), royalties are unlikely to pose a significant barrier to technology transfer in this domain.<sup>313</sup> Hence, he writes, "the human rights issues associated with technology transfer in the climate change area do not, in general, arise from allocating the cost of the technology involved in the transfer but from allocating the cost of the capital goods embodying the technology."<sup>314</sup> While this assessment may not be correct across the spectrum of GHG mitigation technologies, it is a useful corrective to the common perception that IP is necessarily a substantive barrier in these cases: it is rather the costs of actually building, importing, and installing technological apparatuses, installing distribution networks, training in personnel, ensuring a basis for long-term maintenance and sustainability, and so on, that pose the greater costs.

As to how these costs are allocated, Barton reminds us that a principal technique available (in addition to the CDM or variants on it), "is through the payment of subsidies or enactment of regulatory incentives within the developing nation to encourage the deployment of technologies that are not currently economical (at least unless environmental costs are taken into account)." Barton continues:

*Clearly someone has to pay these costs; that payer will, depending on the economic and international agreement*

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311 Moreover, the terms "goal" and "mobilised" raise questions about the degree to which even this target amounts to a pledge.

312 See text at note 24, above.

313 See John Barton, "Mitigating Climate Change Through Technology Transfer: Addressing the Needs of Developing Countries", Chatham House, Programme Paper, October 2008.

314 Barton (2009), 4. *Supra* at note 24.

*details, be a combination of the regulated industry (perhaps electricity or automobiles), its customers (electricity users or automobile drivers), the national government and its taxpayers, or international donors and their taxpayers. The international agreements will almost certainly create some mechanism for international support of and technical assistance for such subsidies or programs.*

Barton examines these issues with regard to three technologies: renewable electricity production, CCS and biofuels. In each case he considers three types of human rights concern that may arise: which he terms “equity” concerns (that is, as to whether processes have been conducted fairly with regard to all relevant parties); treaty rights (he focuses on food, land, environment and labour rights); and process rights of the kind entrenched in the Aarhus Convention on public participation in decision-making on environmental matters.<sup>315</sup>

With regard to renewable electricity technologies, such as wind-power or photovoltaic, Barton notes that – assuming they do not immediately become economically more attractive than fossil fuels – a shift to renewables will likely be achieved in one of three ways: regulation, subsidies, or cap and trade. In each case, fairness issues arise with regard to the structuring of regulatory regimes and the allocations of costs and benefits between the different partners (including developed and developing country partners). Where technology transfer involves taking steps in developing countries to reduce the global carbon budget, wealthier countries must necessarily front some of the costs: deciding how much is the key equity issue. The issues are magnified if energy is generated in poor countries for export to the developed world. Striking the right balance requires not only transparency in negotiations but also attention to substantive and distributive questions.

Barton finds similar issues regarding CCS, a still unproven technology involving stripping CO<sub>2</sub> from coal- and gas-fired electricity plants and burying it. This technology is being pursued in prototype form by a number of multinational consortia.<sup>316</sup> If there is insufficient competition to keep royalties low, there must be a commitment on the part of those governments undertaking research to encourage access to the technologies for developing nations. The operational data obtained

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315 See above, note 4.

316 Barton (2009), 11–12; P. Fairley, Carbon Dioxide for Sale, Technology Review (July 2005); Commission of the European Communities; Proposal for a Directive of the European Parliament and of the Council on the geological storage of carbon dioxide. Brussels 23.1.2008; 2008/0015 (COD).

from the prototypes should also be available to developing nations. As CCS electricity will be more expensive than traditional coal-plants, these extra costs too must be fairly allocated wherever poor countries take them on. Finally, questions arise surrounding the locations for carbon sequestration. There is a long history in many countries of choosing poorer neighbourhoods as sites for hazardous wastes (which sequestered CO<sub>2</sub> essentially will become), which would need to be monitored.

Biofuel technology raises several special issues quite different from those involved in the other examples. These include special environmental concerns, regarding crop and species displacement in plantation sites; rules governing the treatment of those who are displaced, either literally or through market forces, by the spread of new biofuel plantations; and rules ensuring that labour standards on plantations are adequate. There will also need to be mechanisms to monitor the food–fuel balance both in countries that produce biofuels and at the level of international markets (to avoid price spikes similar to 2008). It will make sense to produce biofuels in places where they are least harmful to food production. Added to this, the question of land acquisition for biofuel production is of increasing importance: certain countries and companies are acquiring large tracts of land in developing countries to that end. This raises significant concerns about equity and the rights of persons connected to those lands.

## **E. CONCLUSION**

This chapter has drawn links between a number of broadly recognised trends and imperatives in international policy today: the close link between energy access and human rights fulfilment; the degree to which climate mitigation also poses a challenge to human rights; the broad support for universalising access to energy; and the possible human rights pitfalls involved in the practice of technology transfer. The transfer of clean energy-generating and energy efficiency technologies, including know how, within a non-prohibitive IP regime must be seen as indispensable to the satisfaction of basic human rights in a climate-constrained future.

## VII. CONCLUSION AND RECOMMENDATIONS

### A. CONCLUSION

This report has made the human rights case for a proactive turn to technology transfer in addressing climate change. Movement of technology is vital in order to retain the possibility of conserving and improving human rights in a climate-constrained future. Technology transfer is key to ensuring that vulnerable populations can adapt to climate-related hardships that they have not, for the most part, caused. It is key to ensuring that the mitigation burden of wealthy countries can be met without compromising the development aspirations of poorer countries. It is key to ensuring a minimal degree of global security in a world undergoing increasing resource stress due to climate damage. The report has argued for a number of things. It has argued for a number of general objectives:

- The application of human rights principles to guide technology transfer in both adaptation and mitigation;
- Proactive technology policy in Annex 2 countries taking account of the needs of technology recipient countries;
- Prioritisation of the LDCs as beneficiaries of technology policy;
- Focus on the most vulnerable populations in all countries;
- The introduction of human rights standards and indicators into TNAs;
- General reorientation of development policy around the goal of improving human rights while mitigating GHG emissions;
- A targeted effort to universalise modern energy sources;
- Respect for human rights in all technology-related endeavours.

As included in the Executive Summary, recommendations to governments, UN and other international bodies and civil society groups are repeated below:

## **B. RECOMMENDATIONS**

### **1. To All Governments**

Despite almost 20 years of negotiation and accumulating evidence of climate harms, there is as yet no actionable international policy on technology transfer. Without access to a variety of technologies, the human rights of hundreds of millions are at risk from climate change. Mobilising technology transfer policy is therefore crucial to the future security of human rights and, more broadly, to global security generally. Agreement on an international technology regime is of fundamental importance to the success of climate change policy and must be prioritised. It need not wait for prior agreement on binding targets. Future rounds of negotiations must attend to the construction of a robust technology regime, drawing on the considerable work carried out by the EGTT and others.

- The decision at Cancún to create a Technology Mechanism, consisting of a technology executive committee and technology centre and network, is an important step in actualising technology policy. The Mechanism must build on the work of the EGTT, but it will nevertheless be uniquely positioned to bypass the long-running obstacles in this area and focus on a vision of technology transfer that will do justice to the longstanding hope invested in it.
- A working and coherent definition of “technology transfer” is vital. The definition must recognise that “technology” is not limited to hardware, but also involves know-how and IP, and that “transfer” is not limited to facilitation of trade and markets but involves proactive public policy measures to ensure technologies move between countries to those who need them most and are deployed in a manner that does not pose undue risks to human rights, security, the environment or livelihoods.
- Human rights standards can fulfil a number of roles in moving climate technology policy forward:
  - (i) They can serve as indicators for identifying technologies needed in specific locations.
  - (ii) They can provide a means of coordinating international policy on priority technologies, priority destinations and technological risks.
  - (iii) They can serve as a basis to guide and monitor the manner in which technologies are transferred and deployed in practice.
  - (iv) They can provide an effective moral, legal and rhetorical impetus for more clearly defining the rights and obligations with respect to technology transfer.

- IP rights have long posed a significant obstacle to progress in technology transfer. It is time to move on from this debate, as the increasingly pressing human rights concerns make clear:
  - (i) IP rights may not pose a practical obstacle for all relevant technologies. Policy can move forward swiftly, for example, on the transfer of energy-efficiency techniques, established adaptation measures, and some renewable energy technologies that do not incur prohibitive royalties.
  - (ii) Governments can move forward proactively with incentives and subsidies to promote patent pools and open licensing in the development of technologies for both adaptation and mitigation.
  - (iii) Multilateral agreements and programmes, including public–private partnerships and partnering between developed and developing countries, will be increasingly vital.
  - (iv) In extreme cases, where human rights emergencies arise due to climate change, states can lawfully turn to compulsory licensing to ensure that technologies reach those most in need, should IP rights pose an obstacle.

## **2. To Annex 2 Country Governments**

In its provisions on technology transfer, the UNFCCC speaks of “Annex 2 and other developed country parties”. Although this does not constitute a clearly defined duty-bearer, the specific countries named in Annex 2 nevertheless have legal obligations in this domain. The following recommendations are directed at Annex 2 and other “developed” countries, individually and collectively.

- Annex 2 countries are explicitly obliged under the UNFCCC to facilitate, finance and promote the transfer of environmentally sound technologies to non-Annex 1 and developing countries. Annex 2 country governments are also well-placed to mobilise technology transfer and generate economies of scale for technology developers and producers worldwide. To date, however, Annex 2 countries have done little to fulfil this obligation. It is now urgent that they take the lead.
- Given the threat climate change poses to human rights in vulnerable countries, Annex 2 country Governments must now take proactive steps to mobilise climate-relevant technologies between countries. A constructive approach will resist casting technology transfer solely in narrow terms of open markets, IP rights and enabling environments. It will recognise that without decisive action by and agreement among states, technology movements will be too few and too late.

- Annex 2 Governments are well-placed to contribute technological expertise and financial support, including through multilateral mechanisms for the effective transfer of technologies. The creation of mechanisms such as technology pools, including patent pools, will involve agreements on subsidies, investment incentives, R&D, IP rights, open licensing and technology dissemination.
- All Annex 2 measures must necessarily be responsive to the goals outlined in recipient country TNAs, National Adaptation Plans of Action and Nationally Appropriate Mitigation Activities, as well as to the instructions of the COPs to the UNFCCC and to the human rights obligations of all parties.
- Annex 2 countries should incorporate their UNFCCC technology obligations into their development policies and into those of the international financial institutions. Human rights provide a means of assessing and orienting development policy with regard to climate technologies for adaptation and mitigation. The Aarhus Convention is among the relevant treaties in this regard.

### **3. To Non-Annex 1 Country Governments**

Although named in the UNFCCC as the beneficiaries of its provisions on technology transfer, non-Annex 1 countries do not constitute a bloc or shared set of interests, economically, legally or politically. The following recommendations are thus aimed at the various groupings that comprise non-Annex 1 countries, and in particular the LDCs.

- Non-Annex 1 Governments would benefit from an assessment of the degree to which expected climate harms will have human rights impacts in their countries. These evaluations should inform the identification of technologies in country TNAs, NAPAs, NAMAs and NTPs, with a view to providing clear recommendations to the international community, and to donors and financial institutions, on the prioritisation of adaptation and mitigation technologies for addressing climate change.
- South–South technology transfer, as practiced notably by Brazil, is an invaluable resource and may have a demonstration effect in showing how best to construct successful models of technology transfer. It is not, however, a substitute for the technology transfer provisions of the UNFCCC.
- LDCs and other recipients of development aid are well-placed to negotiate the deployment of aid towards the fulfilment of human rights by virtue of Article 2.1 of the ICESCR. Climate change-related aid in particular will be well targeted where it is

oriented towards current or predicted human rights threats to food, water, health, housing and livelihoods, in particular, or to ward off forced migration.

- Non-Annex 1 countries that are not LDCs may be well placed to take the lead on demonstrating climate-constrained developmental paths that can successfully incorporate human rights obligations, in part through investment in, and R&D of, indigenous technologies.

#### **4. To Civil Society Organisations**

- Legal advocacy groups dealing with human rights or environmental law (or both) could explore the degree to which obligations undertaken through the UNFCCC, human rights treaties, or elsewhere may leave states or private entities liable for actions that have blocked or failed to facilitate technological transfer with human rights consequences.
- Environmental organisations and especially climate change groups may benefit from incorporating human rights goals and standards into their work on climate change technology.
- Human rights organisations must take seriously the threat of climate change and show an openness to public policy positions that might not fit easily within classical human rights discourse.
- Social science and research institutions must forge a road ahead for technology transfer, by demonstrating where technologies can most usefully be adapted to different contexts and how they can most efficiently contribute to the twin goals of furthering human rights and development in the face of climate change. Research must also be undertaken into the legal and practical obstacles to climate change technology transfer.

#### **5. To UN and Other International Agencies and Bodies**

- The UNFCCC Secretariat should consider the creation of a working group on human rights and climate change with a view to informing the construction of the Technology Mechanism and other relevant bodies. It should further empower the existing human rights liaison at the Secretariat.
- The UN Human Rights Council should continue to remain apprised of developments at the UNFCCC, to undertake its own investigations in this area, and to ensure that the human rights consequences of climate change are closely monitored and addressed. The Council should consider the appointment of a Special Procedure on climate change and human rights.

- As the principal formal locus of research into the human rights effects of climate change, it is vital that the Office of the High Commissioner of Human Rights retain a presence in this research domain and continue to influence policy.
- A number of UN Special Procedures have been following climate change developments, integrating it into their mandates and making valuable recommendations. These include the Special Rapporteurs on the Right to Adequate Food; on the Right to Housing; on the Right to Health; on Extreme Poverty and Human Rights; and the Independent Expert on the Right to Water and Sanitation. In each of these areas, and where other Special Procedures are touched by climate change, it would be valuable to undertake investigations into the role of technology in exacerbating or addressing the human rights harms of climate change and recommending policy orientations to governments.
- The Committee on Economic, Social and Cultural Rights is ideally placed to seek information from countries on the degree to which their technology policies meet their human rights obligations with regard to the impacts of climate change or the manner in which the inappropriate deployment of risky technologies might compromise human rights.
- Other UN bodies – principal among them UNEP, UNDP, UNCTAD and the WHO – will find it fruitful to integrate the technology–human rights nexus into their work. Studies might be undertaken within each agency with a view to making recommendations on the optimal mode of integrating climate technology exigencies in their particular mandates.
- Technologies relevant to disaster preparation and early warning systems will be vital to humanitarian agencies such as the ICRC, IFRC and UNHCR. In each case, human rights language may provide a useful motivator for mobilising funding and energy towards creating the technological infrastructure to manage climate harms before they become catastrophic.
- There is a role for agencies dealing with trade and IP, notably at the WTO and WIPO, to investigate the existing legal architecture in order to determine whether it helps or hinders the transfer of technologies necessary to mitigate the human rights impacts of climate change. Given its mandate, WIPO is particularly well-placed to explore multilateral approaches to options of patent pooling and open licensing in the climate technology domain.

## ABOUT THE COUNCIL

The International Council on Human Rights Policy was established in 1998 following an international consultation that started after the 1993 World Conference on Human Rights in Vienna. It conducts practical research into problems and dilemmas that confront organisations working in the field of human rights.

The ICHRP starts from the principle that successful policy approaches will accommodate the diversity of human experience. It co-operates with all that share its human rights objectives, including voluntary and private bodies, national governments and international agencies.

The ICHRP research agenda is set by the Executive Board. Members of the International Council meet annually to advise on that agenda. Members help to make sure that the ICHRP programme reflects the diversity of disciplines, regional perspectives, country expertise and specialisations that are essential to maintain the quality of its research.

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As a follow-up to the June 2008 report, *Climate Change and Human Rights: A Rough Guide*, this latest report addresses issues central to technology policy at a critical time and aims to translate the concerns of environmental activists and of human rights advocates so common principles might be found and a common position forged. Technology transfer has generally been conceived as a means to address an injustice associated with climate change – that activities that have primarily benefitted the people of the world's richest states will disproportionately affect those living in the world's poorest states. It has long been recognised as an indispensable element of a stable future and a global deal. This report shows that it is more than that: it is also a principal means by which basic human rights standards might still be attainable for the world's most vulnerable people in a climate-constrained future.

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