



Tick Tech Tick Tech: Coming to Agreement on Technology in the Countdown to Copenhagen

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Technology is one of the four “pillars” of a post-2012 climate policy laid out in the Bali Action Plan (BAP). In practice a multilateral climate agreement will not be the primary driver of clean technology development, deployment, and transfer. But given the central importance of this issue in the BAP, the provisions for technology in the evolving climate agreement will have a major bearing on the success of negotiations. Designed correctly, they may also play an important complementary role in facilitating the adoption of clean technologies.

This paper reviews Party submissions to the UNFCCC and identifies emerging areas of consensus and debate that may offer constructive grounds for negotiations going forward. The paper explores how an international agreement might facilitate and encourage a range of technology cooperation efforts by channeling funding, providing a forum for capacity building and learning exchange, and creating a framework for measuring, reporting, and verifying support and actions.

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Executive Summary

Financial and technical support for deploying advanced clean technologies in key developing countries is an important component of the post-2012 climate negotiations. A multilateral climate agreement will not be the primary driver of clean technology development, deployment, and transfer as innovation and diffusion will take place outside of the UNFCCC structure, regardless of what the agreement contains. Investment in technology will be largely a function of domestic-level policies and measures that create conditions conducive to the flow of private capital. However, given the central importance of this issue in the Bali Action Plan (BAP), the provisions for technology in the evolving climate agreement will have a major bearing on the success of negotiations. Designed correctly, they can also play an important complementary role in facilitating the adoption of clean technologies.

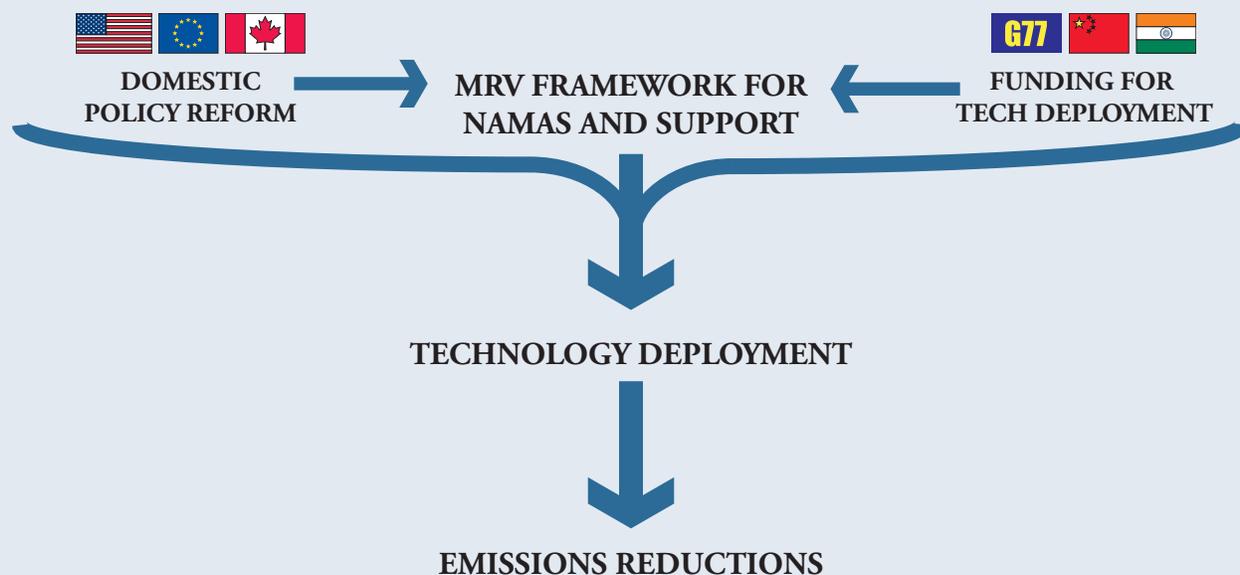
What, therefore, can the UNFCCC agreement say on technology that will facilitate a deal and help accelerate technology development and deployment? Building on previous WRI work and the papers put out by the Chair of the Ad-hoc Working Group on Long-term Cooperative Action, this paper reviews Party submissions to the UNFCCC and identifies emerging areas of consensus and debate that may offer constructive grounds for negotiations going forward. The authors do not intend to take a normative approach, outlining the optimal structure of international technology support programs, but rather they draw out proposals that are consistent with areas of emerging consensus among Parties and seem to provide constructive paths forward.

Points of consensus and disagreement on key issues are highlighted in the table below. Developing country submissions primarily focus on securing financial flows to help technology deployment. Annex I Parties are interested in policy reform, primarily at the national level, but also including reform and enhancement of existing multilateral institutions for technology. There are, however, emerging areas of consensus within the post-2012 negotiations that offer constructive options for bridging this gap.

In particular, the emerging framework for measuring, reporting, and verifying developed country support and developing country mitigation actions (NAMAs) is a positive development. NAMAs can promote the deployment of greenhouse gas-reducing technologies by facilitating and supporting the implementation of national policies and measures that enhance the enabling environment for private investment in clean technologies. Such measures will accelerate technology deployment, mobilizing a greater scale of financial resources than public institutions alone will be able to provide.

This framework will be a significant contribution to facilitating technology development and deployment, incorporating incentives for public R&D and enhanced domestic policy frameworks, and providing a structure for measuring, reporting, and verifying financial and other forms of technology transfer support.

An MRV Framework for NAMAs and Support Can Facilitate Technology Deployment



Summary Table

	Convergence	Divergence	Recommendations
International Structure	<p>Nearly all Parties recognize the need to use public finance to leverage private finance and investment.</p> <p>Parties recognize the emerging framework for NAMAs and support, and many acknowledge the value this framework will have for accelerating technology transfer.</p> <p>Many Parties support the idea of regional or national centers of excellence to promote technology development and transfer.</p>	<p>G77 countries generally support the creation of a new executive body and fund under the UNFCCC for technology transfer. The G77 proposal outlines an elaborate structure for a new technology mechanism, including a new body under the COP to manage the Multilateral Clean Technology Fund.</p> <p>Annex I countries tend to prefer to address the perceived problems of existing institutions and funds. They also stress the importance of in-country policy and enabling environments.</p>	<p>A strong framework for NAMAs and support incorporates the necessary components for the UNFCCC to facilitate accelerated technology development and deployment: providing incentives for public R&D and domestic policy frameworks, and providing a space for measuring, reporting, and verifying financial and other forms of technology transfer support.</p> <p>If a dedicated technology institution is needed to reach a deal, the COP could establish it and task the EGTT with determining what specifically the most appropriate mandate and structure would be.</p>
Funding	<p>Additional financial resources are required.</p> <p>Public finance must leverage private capital.</p>	<p>G77 Parties propose a technology fund with new, additional, predictable financial resources for technology transfer support.</p> <p>While acknowledging the need for new financial resources, Annex I Parties have not proposed such a centralized structure. Rather they support a broad framework that includes activities outside of the Convention, including bilateral assistance, support for technology agreements in regional accords or in sectoral public-private partnerships (e.g., those in the Carbon Sequestration Leadership Forum, or the Asia Pacific Partnership).</p>	<p>Some level of funding could be channeled through the UNFCCC to assist countries in the preparation of TNAs and other critical capacity building questions. Additional roles that this fund could play, depending on levels of funding available, could include a revolving public venture capital fund to help clean technology entrepreneurs bridge the “valley of death.”</p> <p>Contributions through non-UNFCCC channels would be counted within this framework as well, provided that they are measured, reported and verified under the UNFCCC according to internationally agreed standards.</p>
Innovation	<p>Collaborative R&D is generally regarded as an attractive concept, but there is little convergence around the details.</p>	<p>There is significant interest in funding models based on venture capital style investments, particularly for demonstration projects.</p> <p>Several Parties have expressed interest in increasing international collaborative research and roadmaps or plans, provided by developed countries or outlined by the executive body or an expert panel.</p> <p>Many Parties that advocate the network structure described above see this as a network of R&D centers.</p>	<p>A strong framework for NAMAs and support can promote greater public R&D. Measuring, reporting and verifying commitments to collaborative R&D efforts, both within and outside of the UNFCCC framework, incentivizes participation.</p>
Intellectual Property Rights (IPRs)		<p>G77 country proposals emphasize IPRs as a barrier to technology deployment and call for UNFCCC measures to address the issue. Several Parties call for UNFCCC funding to cover the cost of licensing technologies, while others propose that joint R&D and IPR sharing arrangements might overcome the deficits in the current IPR framework. Annex I submissions largely ignore these proposals.</p>	<p>In the context of an eligible NAMA, Annex I support should cover any incremental costs associated with IPRs for a suitable technology, thereby addressing any IPR cost barriers.</p> <p>UNFCCC should make a recommendation to the World Trade Organization (WTO) to look at how to address barriers to diffusion of critical climate mitigation and adaptation technologies.</p>
National Policy	<p>Parties agree on the need for enabling environments and policy frameworks at the national level that favor investment and support technology innovation, development, and diffusion.</p>	<p>While many Parties recognize the importance of national policy frameworks for technology deployment, several Non-Annex I Parties emphasize the need for technology supplier countries to take measures to facilitate technology transfer as well.</p>	<p>Based on gaps identified in TNAs and other processes, developing countries could come forward with and receive support for nationally-developed policies and measures, which would include technology deployment measures and those aimed at building an environment more conducive to attracting private investment in clean energy technologies.</p>

Introduction

A successful international effort to confront climate change will inevitably require accelerated deployment of low-carbon technologies around the world. Recognizing this, Parties have long placed technology development and transfer at the center of the climate negotiations.

Technology features in the Bali Action Plan (BAP), the roadmap for the negotiation of the post-2012 international climate framework, in two ways. First, technology is a component of developed country support for nationally appropriate mitigation actions (NAMAs) by developing countries. NAMAs are to be “supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner”.¹ Second, technology is itself one of the four “pillars” of the BAP,² including a broader set of activities to enhance “action on technology development and transfer to support action on mitigation and adaptation.”³

In practice, a multilateral climate agreement will not be the primary driver of clean technology development, deployment, and transfer. Innovation, deployment, and diffusion will take place outside of the UNFCCC structure, regardless of what the agreement contains. Private sector investment in technology will be largely a function of domestic-level policies and measures that create economic and political conditions conducive to the flow of private capital.

However, given the central importance of this issue in the BAP, the provisions for technology in the evolving climate agreement will have a major bearing on the success of negotiations. Designed correctly, they can also play an important complementary role in facilitating the adoption of clean technologies.

What, therefore, can the UNFCCC agreement say on technology that will facilitate a deal and help accelerate technology development and deployment? Building on the WRI working paper, *From Positions to Agreement: Technology and Financing at the UNFCCC*⁴ and the papers⁵ put out by the Chair of the Ad-hoc Working Group on Long-term Cooperative Action (AWG-LCA), this paper explores the components of this question and outlines a possible solution based on common elements across Party submissions.

The intent of this paper is to examine the landscape of Party proposals to the UNFCCC and identify possible avenues toward a deal. The authors do not intend to take a normative approach to outlining the optimal structure of international technology support programs. Rather, the final section attempts to draw out proposals that are consistent with areas of emerging consensus among Parties and seem to provide constructive paths forward for negotiation.

Technology is merely a means to the end goals of mitigation and adaptation rather than an end in itself. Climate-related policies and measures may frequently involve widgets and gadgets. However, as the ultimate goal at the UNFCCC is addressing climate change and its impacts, “technology” should be broadly conceived and defined.

Section I: Definitions

The first challenge in technology discussions is one of definitions. “Technology development and transfer” is the commonly used phrase within the UNFCCC context, and under the Bali Action Plan, Parties agreed that “enhanced action on technology development and transfer” is needed to support mitigation and adaptation actions. Technology is therefore one of the key building blocks for the post-2012 negotiations.⁶

What Parties (and others) mean when they invoke the phrase varies. In order to arrive at agreement that includes significant financial support for technology deployment, it will be important to recognize the differences between Parties’ understandings of “technology transfer” and what “support” for development and transfer of technology should entail and try to bridge these understandings.

The concept of support for technology transfer is enshrined in the UNFCCC agreement, ratified in 1992. Article 4.5 of the Convention states that:

The developed country Parties... shall take all practical steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, 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.

As Parties and observers have sought to articulate solutions for the implementation this article of the UNFCCC, the article’s language has been reiterated, emphasizing the need to transfer knowledge and capacity, not just hardware. Intergovernmental Panel on Climate Change for instance defines technology transfer as “a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change,” including learning to understand, use, and adapt the technology to local conditions.⁷ The Expert Group on Technology Transfer (EGTT) reaffirms this definition stressing that technology transfer includes transfer of information, best practice, and building human capital.⁸ In the Marrakesh Accords in 2001, Parties articulated several requirements for successful technology development and transfer, stressing the need for a “country driven, integrated approach, at a national and sectoral level.”⁹

All Parties as well as researchers and practitioners recognize the important distinction in the discussion of technology development and deployment between innovation of new technologies, and deployment and diffusion of existing technologies. The World Bank articulates this distinction recognizing that “technological progress can take place through scientific innovation and invention, through the adoption and adaptation of pre-existing but new-to-the-market technologies, and through the spread of technologies across firms, individuals, and the public sector.”¹⁰

As Parties negotiate the technology component of the post-2012 agreement, it is important for them to bear in mind that technology is merely a means to the end goals of mitigation and adaptation rather than an end in itself. Climate-related policies and measures may frequently involve widgets and gadgets. However, as the ultimate goal at the UNFCCC is addressing climate change and its impacts, “technology” should be broadly conceived and defined so as to ensure adequate space to incentivize and implement important measures like “Snow White” (see Box 1) that are actually fairly “low-tech” solutions, but which yield very high improvements in fuel savings and carbon reductions.

Another aspect of technology negotiations concerns adaptation. As the science of climate change becomes clearer, and it becomes increasingly evident that certain impacts of climate change are now inevitable, adaptation is without a doubt a critical issue that needs to be addressed in the post-2012 agreement. Questions around the promotion of adaptation technologies are often raised in technology discussions. However, it is not evident that the barriers to effective adaptation in vulnerable communities today are primarily technology questions. In fact, while technology clearly plays a role in certain adaptation approaches (e.g., improving communications technology for monitoring and early warning systems), integrated development strategies that can reduce overall vulnerability, including building effective institutions and decision-making processes, will play a central role in adaptation, particularly in the near term while there remains a great deal of uncertainty surrounding the precise impacts of climate change.¹¹ As such, this paper chooses to focus on frameworks for mitigation technologies.

Box 1. “Snow White and the Seven Dwarfs”

Researchers at EMBARQ, WRI’s Center for Sustainable Transport, conducted a study of changes in the bus system in Queretaro that could reduce fuel consumption and CO₂ emissions.ⁱ They assessed the emissions reductions possible from optimizing the bus system and the routes, reducing the number of buses and bus-kilometers traveled, from replacing the oldest buses with newer, more efficient ones, by then introducing Bus Rapid Transit (BRT) on one corridor and finally, comparing emissions from using seven different technology options for the BRT buses (see Figure 1).

Fuel savings and CO₂ reductions would occur in three steps. From business as usual, indicated by the first bar, almost two-thirds of the possible reductions are achievable by optimizing bus routes to reduce excess buses-kilometers run, as indicated by the second bar. The drop to the third bar shows what happens when the dirtiest and least efficient buses are retired from the system. These two steps—which require no new technology, per se, are what we call “Snow White”—after the fairy tale character who was so beautiful. The potential to go from 160,000 tons per year of CO₂ to 20,000 with system changes is a beautiful thing.

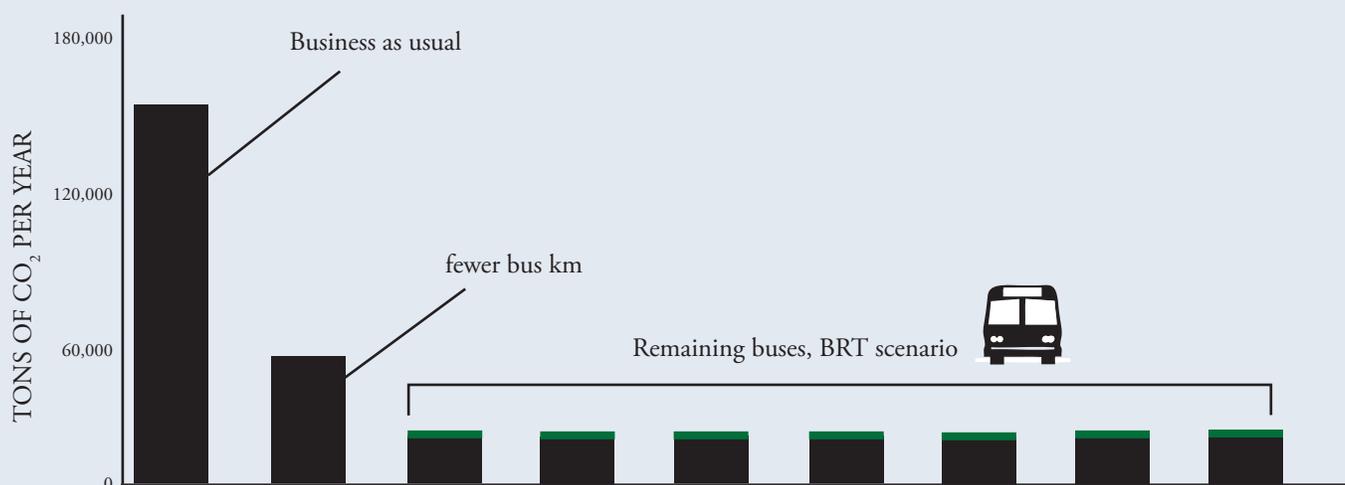
The remaining bars (the seven dwarfs) represent pure “technology” solutions. The white part of the remaining bars illustrates the emissions remaining after replacing the oldest remaining conventional buses with new, more efficient ones. The very small green segment illustrates the slight emissions reductions (less than 2% of total emissions) from the seven BRT bus technology options assessed. These included clean diesel of different sulfur contents and with and without emission control technology, diesel hybrids with and without emission control technology, and natural gas. There was a range of about 4,000 tons per year in CO₂ emissions from the highest to lowest performing of these options.ⁱⁱ Compared to the system changes, the CO₂ reduction potential from introducing expensive new technology seems small – rather dwarf like.

The scale of the difference between the system optimization solution and the technology solutions illustrates the importance of including system optimization and other efficiency solutions as mitigation. The story of “Snow White and Seven Dwarfs” shows the real beauty lies in not defining technology too narrowly.

ⁱ Cordeiro, Maria, Lee Schipper and Diana Noriega. 2008. Measuring the Invisible: Quantifying Emissions Reductions from Transport Solutions – Querétaro Case Study. EMBARQ, World Resources Institute. Available online at: http://www.embarq.org/sites/default/files/EMBARQ_Measuring_the_Invisible_Quetaro.pdf.

ⁱⁱ Cordeiro et. al. 2008.

Figure 1. Snow White and the Seven Dwarfs: Emissions from Queretaro Bus System



Source: EMBARQ, 2008

Section II: Party positions

Given the significance of technology issues to a deal, it is important to understand where Parties stand. WRI analysis of Party submissions to the Ad-hoc Working Group on Long-term Cooperative Action (AWG-LCA) indicates some of the key issues, and identifies key areas of common ground and gaps that negotiators must prioritize as they work toward agreement to support mitigation (See Table 1 and Figure 2).¹² The AWG-LCA Chair's "Convergence and Divergence" paper identifies institutional structures and their governance, delivery of financial support, and technology cooperation and cooperative research and development as key issues reflected in Party submissions. Within these broad categories, several key priorities emerge. While there is clearly overlap among these items, priorities for Parties include:

- *Institutional structure:* New body(ies) or institution(s) whose mandate would be to ensure that technology commitments (actions and support) are fulfilled. Proposals cover all stages of the technology development timeline from innovation through commercialization/diffusion.
- *Finance:* New public financial resources and mechanisms designed to leverage private investment in technology deployment and to cover the incremental or full cost of mitigation actions and technology deployment in Non-Annex I countries.
- *Innovation:* Mechanisms to incentivize innovation and to accelerate the process by which technologies graduate from the laboratory into the marketplace.
- *Diffusion:* Mechanisms for accelerating the diffusion of existing technologies, including public-private partnerships, low-carbon development strategies, and sectoral approaches.
- *Intellectual Property Rights:* Mechanisms or processes for managing patents and intellectual property to ensure access to critical mitigation and adaptation technologies while maintaining adequate incentives for innovation.

The Chair's paper correctly points out that there is general convergence among Party positions on many of the overarching principles for technology and finance for the issues above, but there is little agreement on the specifics.¹³ For instance, the Chair's text points out that while there is agreement among the Parties on the need for a financial framework "to support enhanced action on mitigation, adaptation, and technology cooperation," there is currently little consensus yet regarding the form and function for such a framework.¹⁴

Convergence

There are several key areas of emerging consensus in Party positions. These areas will require further elaboration before they can be adopted or implemented, but they do provide common ground for the negotiations:

- **NAMAs.** As noted in the Chair's text, key Parties do seem to be reaching consensus around the usefulness of an emerging NAMAs framework for technology transfer. Indeed, Parties agree on the need for policy frameworks at the national level that favor investment and support technology innovation, development, and diffusion. Given the importance of national policy in steering private investment into clean technology, the UN-FCCC framework should ensure that NAMAs can "mainstream incentives for clean development into...policy frameworks to guide private investment to green technology and practices over time."¹⁵ Actions aimed at building enabling environments for technology diffusion through such policy frameworks could be internationally recognized and supported as NAMAs.
- **Innovation.** There are several emerging areas of consensus around what mechanisms for innovation might look like. First, there is significant interest in funding models based on venture capital style investments, particularly for demonstration projects and bridging the "valley of death" where technology ventures often stumble and fail in the transition from primarily publicly funded research to privately funded commercial deployment.¹⁶ Second, many Parties have expressed interest in increasing international collaborative research and development initiatives on key technologies, based on technology roadmaps or plans outlined by the executive body or an expert panel. Finally, another idea that seems to have been gaining momentum is the concept of regional or national centers of excellence for technology development and transfer. However, this concept has yet to be elaborated in depth by Parties.
- **Public Private Partnerships.** Nearly all Parties recognize the need to use public finance to leverage private finance and investment, given that the cost of mitigation is on the order of hundreds of billions or even trillions of dollars.¹⁷ The G77 and China request continued emphasis on "financing that leverages private sector financial resources."¹⁸ The proposal by China emphasizes public private partnership and directly suggests that "the basic idea of the financial mechanism ... is to develop public private partnership by linking public finance with carbon market, capital market, and technology market and, leveraging larger amount of private finance by smaller amount of public finance [sic]."¹⁹ Parties seem keen to explore different models for creating innovative financing mechanisms and public private partnerships to accelerate technology penetration around the world, but as of yet, few concrete specifics for how to design these have emerged. European development banks such as KfW may provide useful examples for designing this kind of venture.

Divergence

Creating Bodies and Institutions

G77 countries generally support the creation of a new executive body and fund under the UNFCCC for technology transfer and finance, while Annex I countries thus far prefer to use or modify existing institutions. The G77 proposal, supported in other submissions by G77 countries, outlines an elaborate structure for a new technology mechanism, including a new body under the COP, responsible for the implementation of Parties' technology transfer commitments under the convention, including managing the Multilateral Clean Technology Fund (Antigua for G77, China, Ghana, and Brazil).

Annex I countries on the other hand have stressed the importance of in-country enabling environments and conducive policy frameworks (Japan, EU, U.S.). They also have tended to prefer to address the perceived problems of the existing institutions and funds and to articulate what they need to achieve before creating new ones (New Zealand, EU). However, recently key Annex I Parties have indicated openness to the possibility of creating new bodies. The EU Communication includes a proposal for a coordinating mechanism to assess NAMAs and match them with support,²⁰ while the U.S. seems to hint at the possibility of a new financial mechanism in their submission.²¹

Annex I Parties also support a broad framework that includes activities outside of the Convention, including bilateral assistance, support for technology agreements in regional accords or in sectoral public-private partnerships (e.g., those in the Carbon Sequestration Leadership Forum, or the Asia Pacific Partnership), having backed (and committed funds to) the Clean Technology Fund managed by the World Bank, and other bilateral and multilateral initiatives.

Parties and observer organizations have proposed a range of functions for a new institutional arrangement. Proposals include developing and carrying out technology action plans, programs, or roadmaps, facilitating information sharing, assisting with Technology Needs Assessments (TNAs), managing the measurement, reporting, verification of technology support and NAMAs, and/or guiding "overall technology development and transfer activities under the Convention."²²

Addressing Intellectual Property Rights

Finally, several countries' submissions address intellectual property rights (IPRs). Today's intellectual property rights regime is designed to protect incentives for private innovation, but a debate rages as to the efficacy or even desirability of this regime and in particular its applicability to issues of urgent global concern like public health and climate change.

G77 country proposals in particular emphasize IPRs as a barrier to technology deployment, and call for UNFCCC funding to cover the cost of licensing technologies. India and China have called for compulsory licensing of certain clean technologies, and Brazil cites the World Trade Organization's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) as a model for climate mitigation technologies.

China appears to have softened its stance on IPR issues recently, perhaps in recognition of the growing role of Chinese companies in the ownership of some of these technologies. Comparing the IPR-related language in China's February submission with that of its April submission indicates that while China does not believe that the current IPR system is appropriate for the climate challenge, some of the more aggressive language concerning compulsory licensing and IPR sharing arrangements does not appear in the more recent submission.²³

Conversely, Annex I submissions largely ignore these proposals, and those that do address IPRs make a different case. Australia, for example, points out that governments actually hold very little intellectual property relevant to the Convention (implying that compulsory licensing is not a viable option). The EU Communication asserts that strong IPR protection is necessary to "encourage research, technology development and demonstration, as well as large-scale deployment" and that today's IPR regime, rather than being a barrier, actually helps technology transfer.²⁴

Many Parties include rhetoric about the current IPR regime, but it is important to note that IPRs are not central to any country proposals, and many Parties do not mention them at all.

Priorities

Some concepts are emerging as core priorities for Parties or negotiating blocks. Understanding what these key priorities are will be important to arriving at a deal that will be acceptable to all Parties. Essentially Annex I Parties and Non-Annex I Parties all need to be able to trust that the other Parties will deliver concrete results, in terms of financial, technology, and capacity building support, or in terms of mitigation actions.

The bottom line for Annex I Parties, particularly the U.S., is the need for a deal to include some form of mitigation actions by key emerging economies. As agreed in the BAP, this will be accompanied by new and additional financial, technology, and capacity building support. So what technology provisions are needed in order to arrive at agreement?

The G77 position emphasizes the importance of establishing a new fund (Multilateral Clean Technology Fund) and an institutional structure to support, guide, and manage international technology cooperation activities. The G77 emphasizes the need to secure some kind of financial and institutional structure to “guarantee delivery” of Annex I commitments for financial and technical support. Several Parties, including Ghana and India, proposed a public sector venture capital fund for technology, particularly for technologies at the demonstration phase. In addition to funding and an institutional structure, a deal will likely also need to include something on intellectual property rights, given the prominence of the issue in technology transfer discussions.

China knows it is likely to continue to be the partner for Annex I Parties seeking to establish bilateral R&D initiatives with Non-Annex I countries. Therefore creating an institution(s) for multilateral international collaborative R&D may not be as critical of a priority for the Chinese as it may be for India.

For many developing countries, a deal which re-emphasizes developing country enabling environments for technology transfer and diffusion will not offer something new:

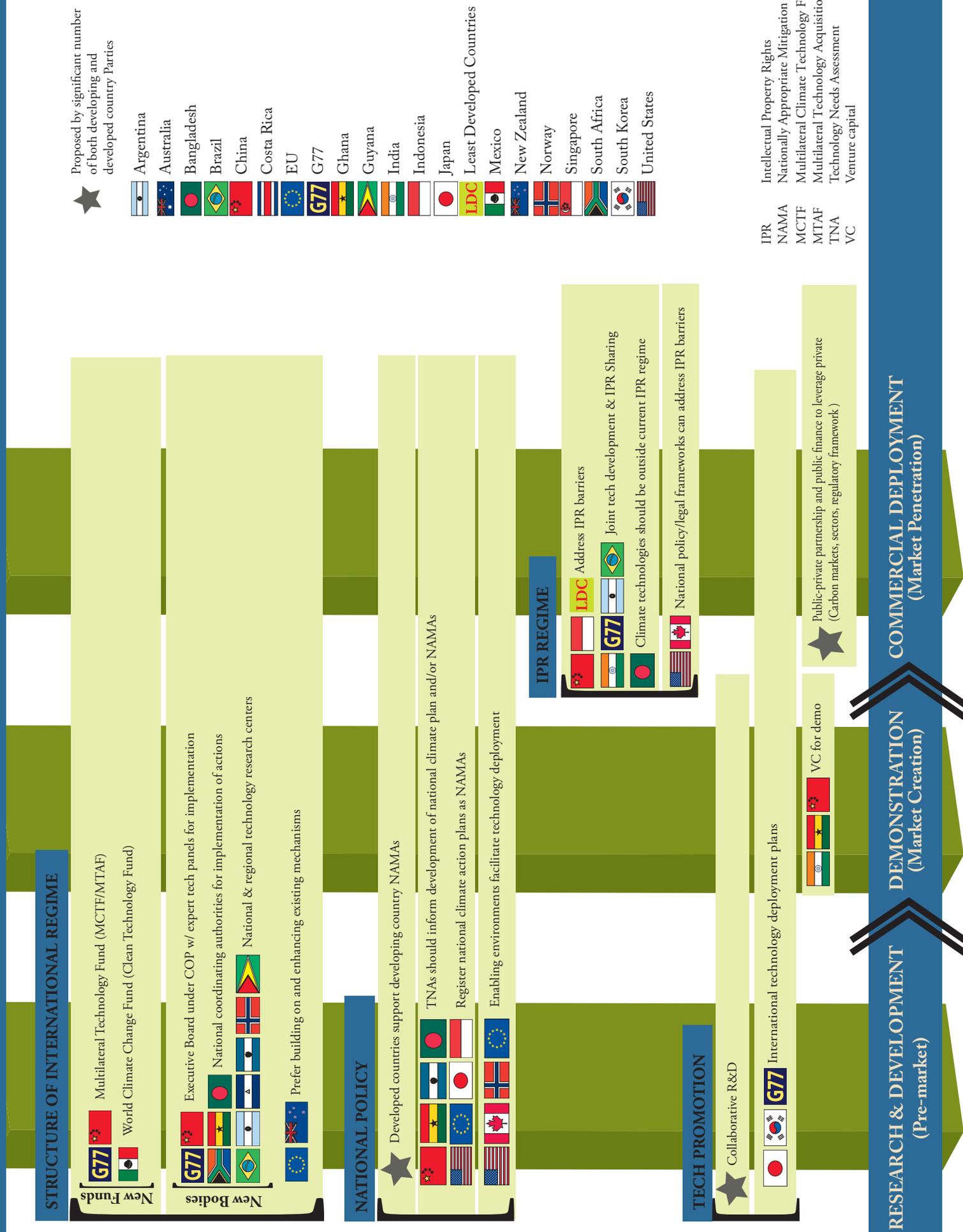
While UNFCCC agreements contain many references to technology transfer to developing countries, the focus of implementation has generally been on creating conditions in developing countries conducive to foreign investment and building capabilities to absorb and utilize imported technologies. Less emphasis has been placed on measures which governments of technology supplier countries can and should take to facilitate and accelerate technology transfer. Nor, until now, have there been effective methods of measuring and verifying the extent of environmentally sound technology transfer.²⁵

This echoes the position of the G77. Non-Annex I Parties would like to see some way of verifying the implementation of Annex I Parties’ commitments to support.²⁶

Table 1: Summary of convergence and divergence of Party positions on technology

	CONVERGENCE	DIVERGENCE
International Structure	<p>Nearly all Parties recognize the need to use public finance to leverage private finance and investment.</p> <p>Parties recognize the emerging framework for NAMAs and support, and many acknowledge the value this framework will have for accelerating technology transfer.</p> <p>Many Parties support the idea of regional or national centers of excellence to promote technology development and transfer.</p>	<p>G77 countries generally support the creation of a new executive body and fund under the UNFCCC for technology transfer. The G77 proposal outlines an elaborate structure for a new technology mechanism, including a new body under the COP to manage the Multilateral Clean Technology Fund.</p> <p>Annex I countries tend to prefer to address the perceived problems of existing institutions and funds. They also stress the importance of in-country policy and enabling environments.</p>
Funding	<p>Additional financial resources are required.</p> <p>Public finance must leverage private capital.</p>	<p>G77 Parties propose a technology fund with new, additional, predictable financial resources for technology transfer support.</p> <p>While acknowledging the need for new financial resources, Annex I Parties have not proposed such a centralized structure. Rather they support a broad framework that includes activities outside of the Convention, including bilateral assistance, support for technology agreements in regional accords or in sectoral public-private partnerships (e.g., those in the Carbon Sequestration Leadership Forum, or the Asia Pacific Partnership).</p>
Innovation	<p>Collaborative R&D is generally regarded as an attractive concept, but there is little convergence around the details.</p>	<p>There is significant interest in funding models based on venture capital style investments, particularly for demonstration projects.</p> <p>Several Parties have expressed interest in increasing international collaborative research and roadmaps or plans, provided by developed countries or outlined by the executive body or an expert panel.</p> <p>Many Parties that advocate the network structure described above see this as a network of R&D centers.</p>
Intellectual Property Rights (IPRs)		<p>G77 country proposals emphasize IPRs as a barrier to technology deployment and call for UNFCCC measures to address the issue. Several Parties call for UNFCCC funding to cover the cost of licensing technologies, while others propose that joint R&D and IPR sharing arrangements might overcome the deficits in the current IPR framework. Annex I submissions largely ignore these proposals.</p>
National Policy	<p>Parties agree on the need for enabling environments and policy frameworks at the national level that favor investment and support technology innovation, development, and diffusion.</p>	<p>While many Parties recognize the importance of national policy frameworks for technology deployment, several Non-Annex I Parties emphasize the need for technology supplier countries to take measures to facilitate technology transfer as well.</p>

Figure 2. Convergence and Divergence in Party Submissions to the UNFCCC on Technology



Section III: Lessons from experience to date

There are numerous institutions, processes, and initiatives in place already aimed at addressing barriers to technology development, deployment, and transfer. As the international community designs structures for technology development and transfer, it is important to try to build on these existing structures and institutions where possible and where there are shortcomings to identify them clearly and to draw lessons from them.

Technology Needs Assessments

A Technology Needs Assessment (TNA) is a process established within the UNFCCC and supported by the Global Environment Facility (GEF) whereby developing country Parties identify and determine their mitigation and adaptation technology needs and priorities. In undertaking a TNA, developing country Parties conduct a consultative stakeholder process to identify and prioritize sectors and technologies that could simultaneously contribute to their sustainable development priorities and global climate change mitigation. They articulate technology and data needs and proposals that include both projects and policy options to address the barriers identified during the process.²⁷

More than fifty Parties have completed TNAs since 1998. Though the process has thus far been largely unsuccessful at increasing technology transfer to developing countries, it has served to identify in-country capacity gaps, and efforts have been undertaken to identify and correct weaknesses in the process. Assessment studies found that some of the major problems with the process include varying levels of in-country technical skills and capacity to effectively engage stakeholders as well as insufficient guidance on methodology for identifying key sectors and appropriate technologies.²⁸ Countries have had particular difficulty with implementing the projects articulated in their TNAs, as there is no clear link between the TNA process and national planning processes. One of the major recommendations from the assessments was greater focus on identifying enabling environments and on increasing the TNA findings into national policy.²⁹

In formal submissions to the UNFCCC, several developing country Parties³⁰ have suggested that the TNA process should inform the NAMAs framework and/or other national development, adaptation, or mitigation strategies.³¹ They point out, however, that the process needs more financial and technical support.³² TNAs could serve as the bottom-up process by which countries identify their technological, capacity, and funding gaps in designing their nationally appropriate mitigation actions.

Clean Development Mechanism

The Clean Development Mechanism (CDM) of the Kyoto Protocol established a system through which developed countries can meet part of their domestic targets, while containing abatement costs, by implementing mitigation projects in Non-Annex I countries. Occasionally these projects yield “technology transfer” – according to the UNFCCC, 36% of CDM projects (or 59% of the annual emissions reduction benefit), particularly larger projects with foreign participants, claim to involve technology transfer.³³

However, shortcomings of the mechanism from the perspective of technology transfer have been noted. CDM’s “one-off, project specific nature... raises questions about how much cumulative technological learning it can promote.”³⁴

Global Environment Facility (GEF)

The GEF, the financial mechanism of the UNFCCC, has been in operation since 1991 and has provided more than \$2 billion in grants and leveraged \$14 billion in co-financing for over 600 projects as of May 2009.³⁵

As part of its climate change portfolio, the GEF promotes GHG-reducing technologies. In its Operational Program 7 the GEF promotes deployment of newer low-emission technologies whose costs remain above competitive levels, because “through learning and economies of scale, the levelized energy costs will decline to commercially competitive levels.”³⁶ Concentrating solar thermal (CST) power has received the most significant investment.³⁷

Studies evaluating the experience of the GEF to date with deploying concentrating solar thermal power in developing countries have reached several important conclusions:

- Efforts to deploy new technologies internationally must take into account the full range of market barriers, including transactional, informational, and capacity barriers, rather than focusing on simply technological and cost barriers.³⁸
- Supportive regulatory environments are more important to successful technology deployment than cost buy-downs.³⁹ Subsidized finance alone is not enough to promote the introduction of new technologies.⁴⁰
- If international technology deployment efforts are not country-driven, lack the engagement of the host country, or do not bring benefits or synergies with local development goals, they will not be successful.⁴¹
- A simultaneous global push for deployment of the technology is necessary for successful developing country deployment.⁴²

Section IV: Building on Consensus to accelerate technology development and deployment

NAMAs: a framework for exchange of actions and support for technology

As articulated above, the intent of this paper is to draw out proposals that are consistent with areas of emerging consensus among Parties and may provide constructive paths forward for negotiation.

Building on emerging areas of consensus in Party positions, and addressing the “make or break” needs of key negotiating Parties outlined above, a possible technology solution to accelerate diffusion of existing technologies and incentivize innovation of new ones could be framed around a NAMAs/support framework that accounts for activities both within and outside of the UNFCCC.

Nationally Appropriate...

One important aspect of the emerging NAMAs framework is the concept that the actions must be “nationally appropriate.” This “nationally appropriate” nature of the actions ensures that mitigation actions are elaborated in a bottom-up fashion by all countries in a way that reflects countries’ varying levels of economic development and capabilities. This provides a role for all countries, in every region and at every stage of economic development. Countries will design their own actions based on national circumstances, including social and economic needs, stage of development, national resource endowment, and competitive advantages. Non-Annex I Parties will be able to articulate their needs in terms of technology, capacity building, and financing support from Annex I Parties at the UNFCCC, perhaps through the existing TNA process.

Moreover, the NAMAs framework is a country-driven approach to mitigation actions in and by Non-Annex I countries. The Marrakesh Accords, a set of agreements reached by Parties in 2001 outlining the rules for achieving the Kyoto Protocol targets, states that in order for developing countries “to participate fully in, and to implement effectively their commitments under, the Convention... activities undertaken within this framework are to be country-driven and implemented primarily at the country level.”⁴³ This bottom up approach could help ensure the sustainability of actions taken and improve implementation by helping to identify capacity gaps. Further, a bottom up approach will be instrumental in gaining the political buy-in that is needed from Non-Annex I Parties.

...Mitigation Actions

What is meant by “nationally appropriate mitigation actions” in the context of the Bali Action Plan and subsequent agreements remains open to interpretation and negotiation. NAMAs could include a range of actions, including those “targeting specific sectors, such as power generation and consumption (e.g., efficiency standards), agriculture (e.g., conservation tillage), and transport (e.g., incentives for efficient vehicles), as well as those that transcend sectors, such as carbon taxes, which seek to incentivize mitigation across sectors, or GHG registries, which build the capacity for GHG management.”⁴⁴ A survey of the range of existing policies and measures that could be included in such a framework indicates that many of these initiatives already underway are technology-relevant; they support the promotion of technologies that will help achieve mitigation objectives.⁴⁵

Diffusion

Technology deployment requires accelerating the flow of private capital to the deployment of these clean energy technologies. The scale of global mitigation needs greatly outstrips the amount of public funding available. There is a clear need for Annex II countries to come forward with more support for mitigation, including technology. But any public monies raised for mitigation will need to efficiently leverage private capital. The UNFCCC estimates that US\$200 billion annually will be required by 2030 for mitigation,⁴⁶ while G77 Parties are asking for 0.5-1% of GDP of Annex I Parties in funding. Today’s public funds for technology deployment are nowhere near the scale of funding required or requested. Other available sources of funding do not reach this scale either, including Official Development Assistance (ODA) or global investment in sustainable energy. The Clean Development Mechanism of the Kyoto Protocol, a mechanism established expressly for the purpose of leveraging private capital for mitigation and development will not scale either. Based on recent bills in the U.S. Congress, proposed U.S. contributions, while important, will be relatively small. Parties recognize that the most likely way to reach the scale of financial flows that mitigation will require and that Non-Annex I countries expect is to capture existing private financial flows and to create appropriate incentives to steer these flows (see Figure 3) toward low-carbon technologies. Capturing and steering these private financial flows require, first and foremost, supportive domestic enabling environments (see Box 2).

The Marrakesh Accords “urge” all Parties to promote enabling environments and “encourage” developed country Parties to support and facilitate technology transfer.⁴⁷ More recently, both Annex I and Non-Annex I Parties have emphasized the need to make investments in clean energy technologies more appealing to private investors,⁴⁸ and the importance of a country’s ‘enabling environment’ is increasingly recognized.⁴⁹

Box 2. Enabling Environments

There are different perspectives on what constitutes an “enabling environment,” but generally it refers to government policies, services, and actions which create an environment conducive to investment and technology transfer. IPCC 2000 identifies a number of dimensions of enabling environments, including institutional and organizational structures which support technological development and innovation, including scientific and technical educational institutions and research laboratories; human and institutional capacities to select, manage, adapt, and finance appropriate technologies; macroeconomic policy frameworks; and strong and transparent legal institutions.ⁱ

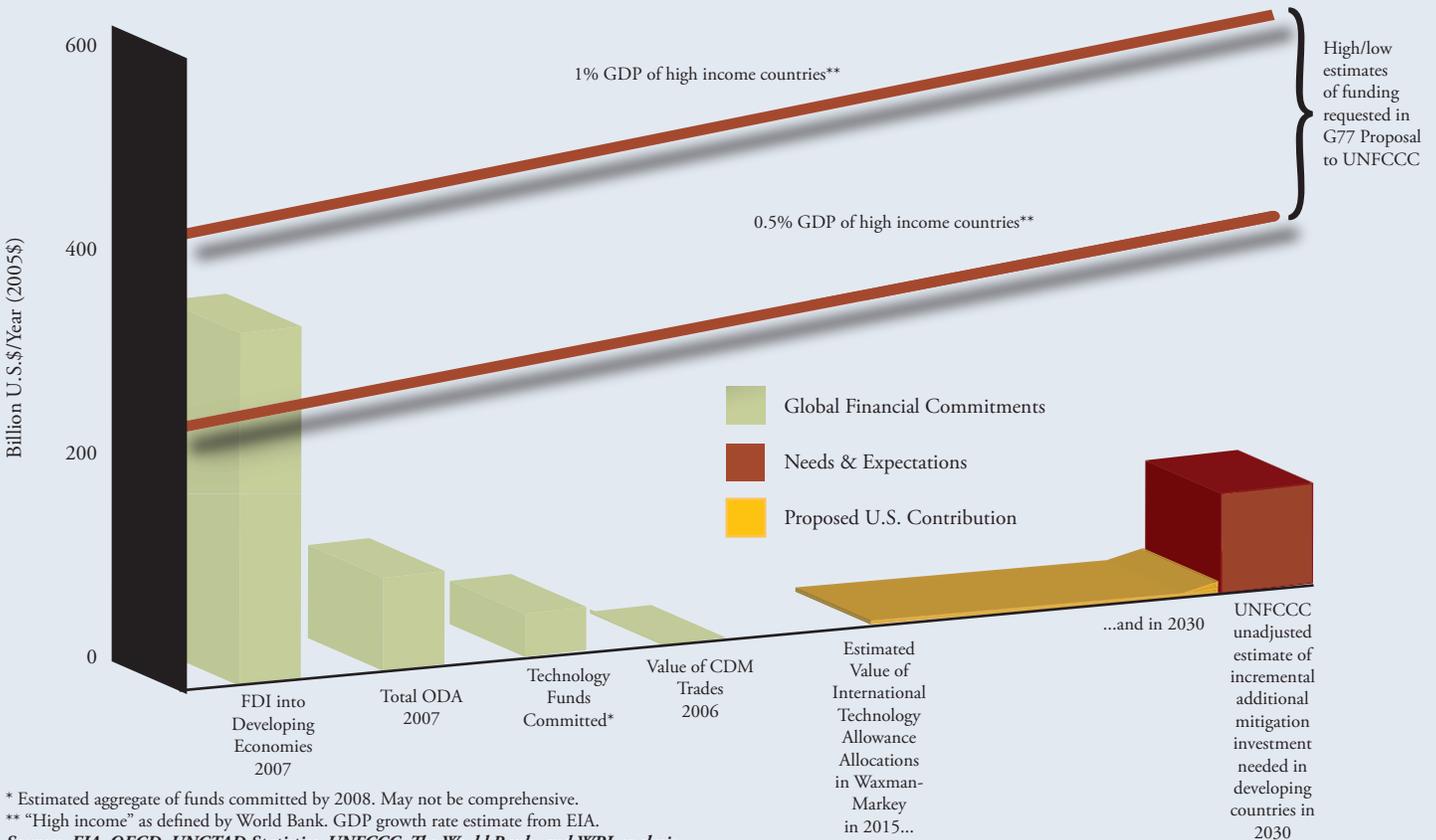
Under the Marrakesh Accords, Parties are urged to support technology transfer by improving the enabling environment through “strengthening environmental regulatory frameworks, enhancing legal systems, ensuring fair trade policies, utilizing tax preferences, protecting intellectual property rights and improving access to publicly funded technologies and other programmes.” Parties are also encouraged to “explore, as appropriate, opportunities for providing positive incentives, such as preferential government procurement and transparent and efficient approval procedures for technology transfer projects.”ⁱⁱ

ⁱ Paraphrased from IPCC 2000 <http://www.ipcc.ch/ipccreports/sres/tectran/052.htm>
ⁱⁱ UNFCCC. 2001. The Marrakesh Accords and the Marrakesh Declaration. Available online at: http://unfccc.int/cop7/documents/accords_draft.pdf.

The EGTT outlines a set of strategies for building or strengthening enabling environments for technology transfer and investment. Support for building enabling environments is one of the four key elements of their technology transfer objective program. In their assessment of interventions, support for national policy development and strengthening national institutions rank highly, based on scale of impact and ease and cost of implementation.⁵⁰ Under the emerging framework for NAMAs, countries could come forward with and receive support for nationally-developed policies and measures that have mitigation benefits, which would include measures aimed at building an environment more conducive to attracting private investment in clean energy technologies.

Many countries are already developing or implementing the kinds of initiatives that tend to support energy sector investments that both reduce greenhouse gas emissions and yield development benefits, including implementing policies and regulations to incentivize energy efficiency or renewable energy; reforming subsidies to reveal true costs of fossil fuels and to help alternative energy options to compete on a more level playing field; and building agency and utility capacity to design and implement long term, integrated energy planning and account for GHG emissions.⁵¹ For instance, increasing energy efficiency is a national priority in China, where the government announced ambitious plans to curb energy consumption growth in 2005 (see Box 3). The emerging international framework represents an opportunity to build on these kinds of efforts and scale up their ambition.

Figure 3. Estimated Financial Flows vs. Mitigation Needs & Expectations



* Estimated aggregate of funds committed by 2008. May not be comprehensive.
 ** “High income” as defined by World Bank. GDP growth rate estimate from EIA.
 Sources: EIA, OECD, UNCTAD Statistics, UNFCCC, The World Bank, and WRI analysis

Innovation

Given the urgency of the mitigation challenge, the accelerated diffusion of existing technologies is critical in the near term, particularly to 2020. However, innovation of the next generation of clean energy technologies, which will be important in 2050 and beyond, should not be ignored. As energy demand will continue to grow, new and advanced generation, transmission, and demand-side (residential consumption and industrial production) efficiency technologies will be required. Moreover, this next generation of technological development is widely recognized as an important economic opportunity for those countries whose industries can be on the cutting edge of this technological development and commercialization. Several Parties have proposed models for a framework for innovation and international collaboration on research and development of the next generation of technologies. In practice, innovation is likely to derive from a range of domestic, bilateral, and multilateral partnerships and initiatives. The role of the UNFCCC in fostering such R&D partnerships may need further exploration and elaboration.

Recognizing these various sources of innovation, the Marrakesh Accords urge Parties to promote multilateral and bilateral research and development. The UNFCCC's hortatory language, however, has not yielded a level of support or action commensurate to the scale of the global climate challenge. The structure emerging from the BAP, whereby Non-Annex I and Annex I Parties commit and exchange domestic actions and international support for those actions in "measurable, reportable, and verifiable manner", provides an opportunity to create the necessary incentives to actually implement the suggestions articulated in the Marrakesh Accords. As Parties carry out enhanced actions under this framework, a greater sense of global public commitment to addressing climate change may emerge. This prospect of sustained, long-term public commitment to reducing emissions can incentivize additional technology R&D. Moreover, if the framework is flexible enough to allow Annex I Parties to "count" financial transfers, capacity building support, and other contributions to bilateral or multilateral R&D initiatives toward their UNFCCC commitments, there may be at the margin an increased incentive to undertake such efforts (see Box 4).

Box 3: Energy Efficiency in China

China's 11th Five Year Plan includes an energy efficiency target that would reduce China's energy intensity per unit of GDP by 20 percent from 2005 to 2010.ⁱ The National Climate Change Program from June 2007 reiterates this target and includes new financing mechanisms and tax policies to promote energy savings.ⁱⁱ These national framework policies to promote energy efficiency are complemented (or implemented) by a suite of provincial, local, and municipal level measures aimed at improving energy efficiency, and by increases in the price of power set by the National Development Reform Commission. While hurdles remainⁱⁱⁱ, these measures have contributed significantly to the emergence of an environment which fosters the growth of energy efficiency companies in China and can yield energy intensity reductions.^{iv}

ⁱ National Development and Reform Commission (NDRC), "Overview of the 11th Five Year Plan for National Economic and Social Development," 2006.

ⁱⁱ National Development and Reform Commission, 2007. China's National Climate Change Program, China.

ⁱⁱⁱ Chandler, William, and Holly Gwin. 2008. Financing Energy Efficiency in China. Washington DC: Carnegie Endowment for International Peace. Available online at: www.CarnegieEndowment.org/pubs.

^{iv} Cheung, Ray, and Aram Kang. China's Booming Energy Efficiency Industry. New Ventures Feature #1. May 2008. Washington DC: World Resources Institute. Available online at: http://pdf.wri.org/chinas_booming_energy_efficiency_industry.pdf

Box 4: International collaboration on carbon capture and storage (CCS): Can the UNFCCC help?

There are several major CCS demonstration and deployment initiatives underway today. One major international initiative, FutureGen, is a public private partnership led by the U.S. Department of Energy with international partners to build a first-of-its-kind coal-fueled, near-zero emissions power plant. The project was announced in 2003, and China, India, Australia, Japan and South Korea pledged funding. The project is now undergoing a "restructuring" after the Bush Administration canceled federal support for the project in early 2008.

FutureGen and other similar CCS initiatives were in anticipation of domestic carbon constraints or policy mandates for the use of CCS. The anticipation of these policy frameworks is driving significant interest in CCS technologies around the world. As more countries commit to taking serious action on climate change mitigation, the prospects for clean energy technology, CCS in particular, look better and better.

But would the U.S. or other countries be more inclined to initiate, participate, or follow-through on these kinds of international undertakings if they were getting "credit" internationally? At a minimum they may hesitate about cancelling projects that are already committed and internationally verified. Policymakers may have to weigh more seriously the consequences of budget cuts that eliminate such programs if they are a recognized part of a suite of undertakings previously committed internationally.

Possible Additional Elements for Technology Support

A comprehensive and flexible framework enabling Parties to propose NAMAs and pledge support will be a critical step forward in promoting the kinds of national policy frameworks that are conducive to private investment in clean energy technologies, enabling accelerated technology development, deployment, and diffusion. However, this framework is not likely to satisfy those Parties that have prioritized the technology-specific elements of a post-2012 deal. For these Parties, additional elements will be required, including an institutional structure, funding, and provisions to address IPRs.

Institutional structure

The primary institutional arrangement will be the evolving framework for NAMAs and support. This framework will, as discussed above, incorporate many of the necessary components for the UNFCCC to facilitate accelerated technology development and deployment. The framework will provide incentives for countries to participate in bilateral and multilateral R&D efforts and to promote domestic policy frameworks conducive to attracting private investment in clean energy technologies for instance. Furthermore, it will provide a space for measuring, reporting, and verifying financial and other forms of technology transfer support (including for instance programs outlined in the EGTT's strategy paper⁵²).

However, given the strong desire from key Non-Annex I Parties to set up an institutional structure specifically for technology, this NAMAs framework may not be adequate to secure a deal. Insofar as a technology body or bodies may be a necessary part of the deal, they should be based, to the extent possible, on existing structures and models for accelerating technology deployment, rather than recreating institutions with the same mandate as those that already exist. For instance, there are numerous existing technology initiatives that are currently under-funded. Establishing a process to secure financing for these initiatives and expanding their scope and impact with additional funding may be more effective than attempting to create new institutional structures.

While the proposed institution(s) could be massive in scope and scale, a new body should have a limited mandate at first, with the potential to add capacities and responsibilities as the body demonstrates competence. There are clearly many services that such a body could provide, including "applied research and development; technology demonstration through field trials; business incubator services; enterprise creation; early-stage funding for low-carbon technology ventures; technical advice and finance for the deployment of existing energy efficiency technologies; skills training and capacity building; policy and market analysis."⁵³ The UNFCCC context may be a more appropriate forum for some of these functions than others, and the institution should be tasked, initially, with a discrete and manageable sub-set of undertakings.

Its mission should be aimed at addressing some of the most critical barriers to technology diffusion, and should be designed in such a way as to engage the interest of Annex I governments and private sector stakeholders.

The scope of the initial mandate may require further investigation, but a viable proposal could be to start with a body to enhance capacity to absorb future technology support. Possible activities for the body could include conducting personnel training and workforce development activities for technology installers and operators and other capacity building activities or provide business advisory services⁵⁴ or policy development support. This could be arranged as a centralized body or as a network of internationally coordinated national or regional organizations, as proposed by several Parties and under discussion within World Bank. In the Copenhagen agreement the COP could establish such a body and task the EGTT with determining what specifically the most appropriate mandate and structure would be.

Funding

The primary source of public funding for technology deployment will likely be in the form of support for NAMAs. Outlining the details of a framework for actions and support that will be at the core of the post-2012 agreement is beyond the scope of this paper. However, depending on how this framework evolves within the negotiations, there are several elements that will be important for technology, and several options for proceeding.

If support and actions are linked indirectly through a broad framework where all financial contributions are pooled to support a suite of all proposed Non-Annex I mitigation actions, then there will be a need for eligibility criteria for NAMAs to determine, for instance, whether policy support for nuclear power is eligible for international support as a NAMA. These criteria will ensure that Annex I Parties are comfortable with the measures they are supporting, which is essential for the politics of getting to a deal.

In an approach that more directly links actions and support, where Non-Annex I Parties propose actions and Annex I Parties select which actions to support and at what level, there would be less of a need for establishing such eligibility criteria. Parties would simply choose not to support those NAMAs that they do not feel are appropriate, on a country-by-country and case-by-case basis. This approach could introduce the problem of cherry picking of actions by donor countries, which has generated strong opposition among Non-Annex I Parties, but it may also lead to a higher level of support as some donor countries will be more inclined to transfer money in a system where they retain the authority for determining how it gets spent.

The agreement may also need to include the creation of a technology fund or a specific technology window within a broader financial mechanism. Paralleling the dynamics of the design of the overall financial framework, the management of financial flows for technology can follow a very loose and decentralized model, a very centralized model fully controlled by the UNFCCC or the COP, or some hybrid approach. There are significant differences in how these models would be managed and would operate, and in the benefits and drawbacks each offers.⁵⁵

A decentralized model for technology support would look similar to the way technology support is managed today, with a number of different funds of varying sizes, managed by multiple actors with different mandates, governance structures, and modes of operation. Currently, there are funds managed by multilateral development banks (MDBs), initiatives led by multilateral organizations, bilateral arrangements, private sector partnerships and private foundations – all designed to promote technology deployment.

The G77 has proposed an alternative to this framing, relying on a heavily centralized funding model. This model appeals to the G77 and China Parties because if support for clean technology is channeled through a single mechanism with clear obligations, this increases the likelihood that the funding is actually delivered. However, this bureaucratic, centralized approach is less appealing to the funder countries, which may limit the scale of financial resources they would ultimately be willing to commit.

As different as these two alternatives are, a compromise approach may be possible. A compromise framework could accommodate the variety of forms of and channels for technology support while retaining COP guidance. Some level of funding could be channeled through the UNFCCC. The UNFCCC managed portion of the funding could assist countries in the preparation of TNAs and other critical capacity building questions. Additional roles that this fund could play, depending on levels of funding available, could include a revolving public venture capital fund to help clean technology entrepreneurs bridge the “valley of death.” The fund would be designed to fill gaps left by existing financial institutions.

Contributions made through non-UNFCCC channels (such as World Bank CTF, or bilateral technology programs) would be captured within this framework as well, provided that they are measured, reported and verified under the UNFCCC according to internationally agreed standards. Annex I support would include all measured, reported, and verified funding for technology, as well as capacity building for institutional development or policy (NAMA) design, licensing IPRs, actual technology installations, trainings, etc. COP would provide guidance regarding what technology support will count under this framework.

Box 5: Global Experience with Biofuels

For Brazil, biofuel is a key technology, and in any technology discussion, Brazil is quick to nominate biofuels for consideration among the technology solutions to global climate mitigation. And indeed Brazil has a long and successful history with domestic biofuel production and consumption, dating back to the beginning of the 20th century, with positive climate implications.ⁱ

However, as biofuel markets grow worldwide, a better understanding of the social and environmental impacts of the production of biofuels, which at first may have seemed like a climate, energy security, job creation, and agricultural policy panacea, is emerging and calls into question some of the initial promise of biofuels. Today, it is clear that the term “biofuels” disguises a range of fuel options, with a range of environmental and social footprints.ⁱⁱ On balance, however, biofuels do not seem so climate-friendly once indirect emissions from land use changes are factored into the calculation.ⁱⁱⁱ Nor do they seem particularly “clean” or “sustainable” considering the agricultural processes often associated with the production of the feedstocks. For instance, in the U.S., high oil prices and strong policy support for biofuels precipitated a spike in biofuels production. Increased fertilizer application and erosion associated with the production of feedstock for biofuels (primarily corn and corn stover) will lead to greater nutrient losses from the field, exacerbating environmental problems like the “dead zone” in the Gulf of Mexico.^{iv}

Biofuels illustrate the importance of establishing parameters and methodologies to distinguish between technologies based on the full range of their environmental and social impacts so that international support does not promote environmentally or socially destructive technologies. The Inter-American Development Bank (IDB) has launched a Biofuels Sustainability Scorecard to assess the impacts and sustainability of proposed biofuels projects and screen out unsatisfactory projects that will not be funded.^v

ⁱ Bradley, Rob and Kevin A Baumert (Eds.). 2005. *Growing in the Greenhouse: Protecting the Climate by Putting Development First*. World Resources Institute. Available online at: <http://www.wri.org/publication/growing-in-the-greenhouse>.

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^{iv} Marshall, Liz and Zachary Sugg. 2008. *Finding Balance: Agricultural Residues, Ethanol, and the Environment*. Policy Note. World Resources Institute: Washington, DC. Available online at: http://pdf.wri.org/finding_balance.pdf.

^v Meerganz von Medeazza, Gregor. 2009. “IDB’s Sustainable Biofuels Scorecard.” Presentation at IDB – RSB

This guidance probably will not take the form of lists of approved and banned technology options, but rather would be a more flexible set of principles. There is a long history of attempts to compile lists of supported or prohibited technologies in these processes, but these have tended to be objectionable to G77 Parties on sovereignty grounds. The lists of technologies for “fast track” CDM approval or for trade liberalization, for instance, quickly get so over-stuffed with each Party’s favorite technologies so as to become essentially meaningless, while any effort to exclude or prohibit certain technologies is very challenging politically.

However, guidelines and criteria for technology support may be required. It is not always immediately clear how “clean”, “green” or otherwise “sustainable” a technology is (See Box 5). Although NAMAs will be driven by developing countries’ determination of what is “nationally appropriate,” international guidelines will be important to ensure that the technology deployment activities in question do indeed provide meaningful contributions to emissions reductions. The international framework should also include provisions for a periodic review of existing technologies and technology-related NAMAs and the extent to which they meet the internationally agreed criteria.

In order to qualify for support, technologies should:

- offer net GHG reductions, based on credible GHG accounting frameworks (e.g., the GHG Protocol);
- promote a transformative shift away from business as usual carbon-intensive fuel sources;
- produce only minimal and manageable social and environmental externalities or unintended consequences and appropriate steps should be taken to build capacity for national, regional, and local governments to mitigate any damaging impacts;
- be cost-effective, but need not be the least-marginal cost abatement options available. There may be high-cost technology options that are attractive because of other national priorities, such as energy security (see Box 6);
- require public intervention to address limitations that the private sector cannot or is not adequately tackling, including:
- the need for additional R&D. Research and development efforts must have a reasonable chance of yielding technology developments which qualify for the above principles;
 - high investment risk, which is delaying first demonstration projects;
 - the need for additional public sector infrastructure; and/or
 - regulatory barriers

Box 6: Reducing Oil in Transportation

Even significant efforts to reduce GHG emissions in the U.S. may not shift the transportation sector significantly from its reliance on oil as reductions are generally far cheaper in other sectorsⁱ. However, to the extent that policymakers see oil dependence as a key energy security concern, they may wish to implement policies to move the transportation sector away from oil more aggressively. Oil dependence is a major U.S. and global energy security issue. Promoting the deployment of plug-in hybrid electric vehicles (PHEVs), for instance, may not yet be the least marginal cost option from a mitigation perspective. However, PHEVs could offer synergies for two critical political priorities, energy security and climate change, by both reducing reliance on imported oil and reducing emissions.ⁱⁱ

ⁱ L. Clarke et al, CO2 Emissions Mitigation and Technological Advance: An Analysis of Advanced Technology Scenarios for Greenhouse Gas Mitigation, Pacific Northwest National Laboratory, (December 2008), p. 5.18. Available at <http://www.pnl.gov/science/pdf/PNNL18075.pdf>.

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IPRs

On intellectual property rights, there is a fundamental philosophical difference between the G77 and the Annex I views, despite recent softening from China, that is unlikely to be resolved within the context of the UNFCCC. IPRs will likely remain on the agenda for future negotiations. As such, although we do not see a strong set of actions that can or will be taken within the UNFCCC agreement to address this tension, there may be ways to address some G77 IPR-related concerns:

- In the context of an eligible NAMA, Annex I support should cover any incremental costs associated with intellectual property for a suitable technology. Including any IPR costs simply as part of the cost of the NAMA addresses affordability barriers.
- In so far as there are additional barriers as a result of the current IPR system (i.e., IPR preventing access to technologies), UNFCCC should make recommendations to the World Trade Organization (WTO) for addressing critical climate mitigation and adaptation technologies.

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Glossary of Acronyms

AWG-LCA	Ad-Hoc Working Group on Long Term Cooperative Action
BAP	Bali Action Plan
BRT	Bus Rapid Transit
CCS	Carbon Capture and Sequestration
CDM	Clean Development Mechanism
CST	Concentrating Solar Thermal power
EGTT	Expert Group on Technology Transfer
G77	Group of 77
GEF	Global Environment Facility
GHG	Greenhouse gas
IPR	Intellectual Property Rights
ISCC	Integrated Solar Combined Cycle
MDB	Multilateral Development Bank(s)
NAMA	Nationally Appropriate Mitigation Action
ODA	Official Development Assistance
PHEV	Plug-in Hybrid Electric Vehicles
R&D	Research and development
TNA	Technology Needs Assessment
UNFCCC	United Nations Framework Convention on Climate Change
WTO	World Trade Organization

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