International Climate Technology Innovation Initiative: Structure and Strategy

Proposal for a Copenhagen Agreement "Technology Track"

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EXECUTIVE SUMMARY OF PROPOSAL FOR TECHNOLOGY TRACK IN COPENHAGEN AGREEMENT

1. **Technology Track**. There is almost universal consensus that a new "technology track" for low carbon innovation, capacity building and other functions is needed as part of the Copenhagen climate agreement, to complement expected cap and trade commitments from developed countries and any other commitments from developing countries.
2. **New Institutional Framework**. A technology track could be successfully implemented through a new framework either through an existing institution or a new body.[1] Its functions would largely choreograph, not manage the innovation actions of others, including capacity building, support technology innovation all along the value chain for key low carbon technologies, create solutions to intellectual property rights (IPR) problems, and develop finance and new business models. A new framework could be modeled after the "*Global Fund to Fight AIDS, Malaria and Tuberculosis" (Global Fund),* an existing global "public goods" partnership institution linked to but independent of the UN, and other global and national agencies.
3. **New Program Strategy**. This body should employ a modern, collaborative program strategy now successfully used in other private and public sectors: "distributed innovation" (DI) that focuses on technology product development against key time milestones, relying on a global group of experts with differentiated strategies unique for each technology and for each geographic area. This new program strategy could be modeled after the *CGIAR Generation Challenge Program (GCP*) that employs a DI strategy for agricultural product development in new markets, a collaboration of the same donors and governments now part of the Copenhagen process.
4. **Copenhagen Proposal**. A Copenhagen agreement should include, at a minimum, a commitment to: (a) establish a new technology framework modeled after the Global Fund, and (b) a new DI strategy to be employed by the body to address capacity building, innovation and related finance and IPR issues. The agreement should commit to develop detailed proposals for the fund and strategy within six months of the agreement.
5. **Implementing the Proposal: Next Steps**.
    - *Copenhagen Cop15, December 2009:* "Copenhagen Protocol" agrees to establish new climate technology institutional framework, which will employ DI strategy.
    - *2010:* Finalize detailed proposals for the institutional structure, funding and strategy. Establish technology node pilot as prototype for the larger Fund and strategy.

Climate Technology Context for New Framework and Program

- Most experts agree that, independent of emissions caps, the challenge of climate recovery demands a complementary process that drives technology innovation.[2] This is important for two related reasons. First, there is the simple political fact that governments will not agree to caps that cannot be achieved by currently available technology at reasonable projected costs. Second, any caps established will likely be insufficient to drive deep and radical innovation; they will generally drive incremental technical improvements and marginal cost reductions.

- Many have called for a new global climate technology innovation framework given recent evidence that the technology scale-up needed for stabilization is much greater than experts previously thought.[3] Solving the climate challenge will require technological solutions at an unprecedented scale and speed. This will require truly innovative approaches to low carbon technology RDD&D including new financing and business models.

- The need for technology innovation policies, to complement and support emissions targets within the UNFCCC international negotiations is now universally accepted. Technology issues have become central to the post-2012 climate change policy debate.

- The Bali Action Plan includes technology as one of the four 'building blocks' of a future agreement along with mitigation, adaptation and finance, while at the same time technology RD&D is integral to each of the other tracks.

- In fact, the technology and finance components of the post-2012 climate negotiations represent a significant opportunity for agreement.[4] Agreement on a technology track may allow for broader support for an overall package based on developed country targets and could lead to greater compliance with any emissions targets.[5]

- Most parties also recognize that a new body to manage technology innovation, "transfer"[6] and deployment is needed, which is independent but linked to the UNFCCC.[7]

- But despite this unanimity, what is missing is any agreement on how to do it. To address this shortcoming, this paper proposes: (1) a new structure, an institutional and funding mechanism to support climate technology innovation, transfer and deployment at a global level with functions including capacity building for technology transfer, dealing with IPR challenges and promoting innovation all along the technology development chain from research through deployment, including finance and business models, and (2) a new program strategy, a tailored and flexible approach—differentiated by technology and regional or national needs; this new "distributed innovation" strategy would use distributed and open innovation strategies for accelerating the research, development and full deployment of climate technology.

Elements of Proposal for New Structure and Program Strategy (ICTIF)

1. The Institutional Model: A New Global Climate Technology Innovation Framework

A new institutional structure for climate technology innovation will be needed at the international level. Existing global institutions such as the World Bank or the IEA do not have missions to be "operational" on these technology innovation challenges; their missions are designed for other important tasks. These missions will have to be expanded to include technology innovation or a new institution to manage and finance these essential global climate functions is needed.

A new, independent institution for climate innovation could be most successfully based on an existing, successful "public goods" model. It is *The Global Fund to Fight AIDS, Malaria and Tuberculosis (Global Fund*[8]*)*. The *Global Fund*'s purpose is to attract, manage and disburse resources to fight AIDS, malaria and tuberculosis. It does not implement programs directly, relying instead on the knowledge of local experts. As a financing mechanism, the *Global Fund* works closely with other multilateral and bilateral organizations involved in health and development issues to ensure that newly funded programs are coordinated with existing ones.

If a new institution is developed it could replicate some of the most successful attributes of the *Global Fund:*

- It could be established as an independent non-profit organization, but linked to the UN and other international organisations. It could be initiated by numerous national governments, within the context of the UN, G8, G8+5 or the Major Emitters Meetings and then approved in concept in Copenhagen in 2009.
- Funds contributed to an international climate technology innovation fund could be managed by the World Bank as Trustee to assure financial controls and accountability.
- This fund would support the practical programs outlined in this paper.
- A small governing board could consist of developing country representatives, donors, and civil society, with ex-officio members from the UN and World Bank Group, to allow a strong linkage to the UN institutions, where developing countries feel their interests are best protected.
- A foundation Secretariat could manage the fund, with outside technical review panels.
- It is difficult to say at this stage what the total pledges on an annual basis would be, but it would likely range on the order of billions of dollars per year. Similar to the Global Fund, a global climate technology fund would be supported by public, private and multilateral contributions, from both within and outside the UNFCCC system. The new fund would also aim to effectively coordinate existing and emerging clean technology funding efforts, such as the Climate Investment Fund, to make the best use of limited public resources.
- The experience of the *Global Fund*, which has disbursed pledges of more than US$10 billion, suggests that a small organisation of this kind is capable of handling and deploying significant sums of donor funding. Overhead costs that pay for the Secretariat and other expenses for the operations are low, about 3 percent per year of funds pledged for the *Global Fund*. The strategy that we propose for a global technology fund would require even less funding for administrative and other expenses. The vast majority of

funding would go directly to moving breakthrough technologies forward to full commercial deployment.

- Many of these attributes could also be incorporated into a new institutional framework within an existing institution.

2. Elements of an international climate technology innovation framework

- **Independent**. While climate technology innovation and diffusion are central to the international climate change negotiations, these issues are considerably broader than the scope and remit of the UNFCCC. Low carbon technology RD&D incorporates issues of trade, national security and other environmental public goods. Moreover, innovation works most successfully when managed by independent institutions.[9] For these reasons, a new International Climate Technology Innovation Fund (ICTIF) should be linked to a UNFCCC body with oversight of technology.

- **Public-private partnership.** The new framework would be funded like the *Global Fund,* through national agencies and private foundations. The GCTIF would also leverage private investment to support its mission.

- **Hub and Spoke.** The ICTIF would operate in a "hub and spoke" configuration with a small "Core Team"[10] at the center, surrounded by numerous "technology nodes," each one focused on developing and deploying a different low carbon technology. This would largely avoid an unwieldy centralized bureaucracy and allow for a flexible and adaptive approach that responds to the different challenges for specific technologies and regions.[11] Moreover, funders can choose specific technology nodes of their interest to support.

- **Technology Nodes.** The core team would create separate technology nodes that would function as the engine of the initiative. Each Node would be run by a small management team of experts in the relevant technology (e.g., solar experts for a solar technology node).[12] Experts in the technology nodes who would come from around the globe would establish a technology selection strategy and specific tools that would be employed for each technology. Rather than the government "picking winners," the experts would establish *technology strategies.* This technology focused approach corresponds with the G77 Technology Action Plans (TAPs) proposal, which recommends building platforms around individual technologies to define the policies, activities, and funding requirements necessary to scale up deployment of a given technology.[13] A technology node approach is also compatible with the EU's sectoral Technology Information Platforms proposal.[14]

- **Linking Regional Centers of Excellence**. In country or regional centers of excellence could play a significant role in the downstream deployment end of the RD&D stream, with region specific activities such as business incubation, local capacity building, and policy and market development. The technology nodes would ensure that the activities of local centers of excellence are linked to those of other regional centers working in the same technology areas. The program strategy (described below), a distributed, bottom up innovation approach, would ensure that centers of excellence in individual countries collaborate effectively with other regional centers and partner organizations to achieve accelerated product development with global implications. The proposed strategy would also ensure that they not become siloed, disconnected research institutions.[15]

3. Functions of a global climate technology innovation framework[16]

- **Capacity building**. All parties to the international climate negotiations agree on the importance of building capacity in developing countries to identify and implement nationally appropriate strategies, policies, and technologies. Technology transfer and innovation is not about "hardware" alone; it also involves building human, institutional and policy capacity to manage and deploy the technology. Capacity building includes developing capacity to participate in joint RD&D projects, building the enabling environment such as functioning markets and appropriate policies for low carbon technology diffusion, and developing the appropriate regulatory environments in order to access private funding. [17]

  Capacity building should not only concentrate on the administrative and programming capacity, but also on increasing the number of skilled workers capable to develop and operate technologies locally. Education and training programmes for people engaged in the application of technologies is crucial, but does not suffice. A 2007 UNDP report [18] indentifies in LDCs a high rate of emigration of workers with tertiary education. The fund should consider how to assist in the continuous education, training and improvement of working conditions for key professionals.

- **Intellectual Property Rights.** In clean energy and low carbon technologies, the issue of protecting intellectual property rights (IPR) is a major area of controversy. Some believe the IPR problems are so significant that they may make it impossible to achieve full climate technology deployment or collaborative RD&D approaches. The G77 proposals within the UNFCCC in particular emphasize IPRs as a barrier to technology deployment, and call for developed country funding to cover the cost of acquiring new technologies.[19] Others argue, predominantly in Annex 1 countries, that the IPR issues are not significant and that their impact in climate technology is far overstated.

  However, most concerns that IPR is a major problem with clean energy are based on anecdote rather than hard evidence. According to a recent report, "there is currently no sound basis for any definite statements that IPR is–or is not–a barrier to low carbon technology diffusion across a range of key technologies."[20]

  In either case, those real or perceived IPR barriers need to be overcome if product development and accelerated scale up and deployment of new low carbon technologies are to occur. Many key reports have underscored how a failure to resolve IPR issues could undermine innovation and diffusion of clean energy technologies.[21]

  Negotiating a detailed, substantive IPR agreement for the divergent positions of G77 and Annex I countries may be almost impossible in Copenhagen. Without any real facts on specific IPF problems, such agreements cannot be reached. Instead, a more practical approach would be to create an institutional process to address the specific IPR challenges that will arise for particular technologies in particular countries. This is also the approach taken in the Asia-Pacific Partnership on Clean Development and Climate (APP).

  Therefore, an institutional ad-hoc response may be the most effective strategy at this time. A new institution would have the in-house capacity to systematically incorporate an "IPR strategy" function to determine (1) in which fields IPR problems exist that would prevent clean energy innovation and, (2) where they do exist, how to creatively address and overcome them.

This is exactly what donors and governments have done in the agricultural "public goods" area with the creation of PIPRA – the nonprofit Public Intellectual Property Resource for Agriculture (www.pipra.org) housed in the University of California at Berkeley. A climate fund would, where appropriate, incorporate these institutional IPR solutions from a structure such as PIPRA. There appear to be important lessons learned from other areas that could be successfully applied to clean energy. These approaches typically involve a systematic structure like PIPRA dedicated to solving IPR problems and implementing creative IPR strategies in new product development.[22]

- **Technology and Finance Innovation**. Climate recovery demands that there be successful accelerated low carbon innovation all along the value chain from research, development, and demonstration, through full commercial deployment including innovation in financing, business models, and market creation. Many Parties to the UNFCCC, particularly the G77, have proposed that the UNFCCC accelerate technology deployment by providing funding at all stages of technology development. Most Parties recognize the need for coordinated international R&D efforts. Both Annex I countries and the G77 support the idea of international collaborative R&D.[23] Most Parties also recognize the need to jointly fund demonstration projects to bridge the "valley of death." G77 countries have also pushed for funding to pay for the incremental deployment costs of new more expensive low carbon technologies. This is the mission of the new multilateral Clean Technology Fund, supported by the UK, the US Japan and others.

  The solutions to climate technology innovation and finance need to be technologically and geographically differentiated. The literature regarding technology transfer and development shows that it is complex and multidisciplinary— technical, regulatory, financial, behavioral, and political challenges all must be addressed, and each may be quite specific to individual countries.[24]

Program Strategy of the New Institution: Distributed Innovation

1. Distributed Innovation Strategy

To achieve its ambitious goals and serve the functions described above, this new framework will need to take a flexible and adaptive approach that allows for differentiated responses to the complex challenges arising from the development and deployment of multiple climate technologies in diverse regional contexts. The global and public goods nature of the climate challenge also requires any technology strategy to involve all stakeholders in a collaborative process. Therefore, a highly decentralized program strategy must be the core mission of this new framework, one that respects a "bottom-up" approach to innovation and product development.

"Distributed Innovation" (DI) is just such a bottom up, collaborative approach that has been used successfully in both private and public arenas to solve complex problems rapidly.

- The term "distributed innovation" (DI) encompasses **global, collaborative product development initiatives** that link together numerous people working in different institutions and countries with disparate expertise, but united together under a single project focused on product development and deployment. No such product focused global innovation strategy – using distributed and decentralized strategies from developed and developing countries – is in place today in climate. "Distributed Innovation" includes strategies ranging from: open source approaches used to develop the Linux computer operating system; open innovation approaches used by individual companies such as Proctor & Gamble to supplement their own in-house research and development capacity; and global, collaborative product development initiatives, such as the Generation Challenge Programme (GCP).[25] Distributed innovation has been used to develop products as diverse as the iPod, Linux, Boeing airplanes, automobiles,[26] pharmaceuticals and drought resistant crops in the developing world.

- Although DI strategies have not yet been applied consistently or strategically to low carbon technologies, **DI is widely used in the information technology sector and, increasingly, in the industrial, agriculture and health sectors addressing public goods problems.** Companies, universities, governments, and donors in many sectors are using distributed innovation strategies to accelerate technology development and deployment.
- The driving objective for DI is to **accelerate deployment of a specific technology**. Distributed innovation strategies use an institutional infrastructure that supports the efficient transformation of upstream research into new technologies that penetrate the market. These strategies also allow for iterative learning and significant collaboration among institutions, public and private sector and all along the development chain from the lab to the market.
- **DI strategies take advantage of the rapid increases and distribution in knowledge and advances in electronic communication that characterize our modern world.** Companies use DI strategies to tap knowledge outside their institution and link together innovators, researchers, financiers, and others from around the globe to support the development and deployment of new technologies. They link RD&D to viable commercialization strategies. These are not conventional information sharing networks, but an entirely new approach that goes beyond linking existing institutions; it makes them work in new collaborative ways.

2. The Benefits of Distributed Innovation

Companies engage in DI not only because it speeds the process of innovation and commercialization but also because there are significant cost and risk sharing benefits. When IBM, for example, adopted the open source Linux operating system and tapped into the skills of the global Linux community, the company was able to cut their investment costs to upgrade their product lines to one-fifth the normal investment required to upgrade a single product and the resulting products were " better tested, more robust and market-ready more immediately."[27]

Similarly, Proctor and Gamble which has pursued an aggressive distributed innovation model has increased R&D productivity by nearly 60%, doubled the innovation success rate and reduced the cost of innovation significantly.[28]

To address the new problems of the climate crisis at the speed and scale necessary, we need new, modern low carbon innovation strategies. Instead of dividing responsibility among many government and private agencies for different elements of the innovation chain, there must be a new approach to link those efforts toward accelerated commercial goals.

3. Distributed Innovation Tools

This DI approach will deploy, along with traditional commissioned and competitive projects, new tools that have never been systematically applied to clean energy innovation; tools that are now commonplace in innovation strategies in the private sector and even in other public sector areas like agriculture and pharmaceuticals. Indeed, entirely new companies have emerged to apply these tools for corporate and public sector clients interested in product development and innovation. These tools include innovation platforms that link solution providers with those seeking solutions by offering a range of financial and other incentives. IT tools will also facilitate more effective real time collaboration networks that link geographical disbursed players along the RD&D continuum, and provide "consumer" market information to the lab and product pipeline information back to the market makers.

These new tools–to be deployed across the entire value chain of the chosen low carbon technology–include:

- **Information Technology (IT) Tools and other strategies for creating a global climate technology innovation community.** It will be important to build robust linkages between individuals and institutions with interest and relevant expertise in the development and commercialization of clean energy technologies. An IT infrastructure will create linkages among core members of the innovation community and enable on-going collaboration from the lab to the market.

- **Distributed Innovation Tools.** New tools such as "innovation platforms" are used in other sectors to solve problems and to accelerate innovation and product deployment. ACT II would use these tools to connect people who are encountering specific clean energy technology development challenges with "solution providers" who can help address these problems (solution providers could be, for example, other companies or academics, including individuals and institutions outside of the energy sector).

  These tools, which are often called the "matchmaking infrastructure," would enable potentially tens of thousands of people to review challenges and propose solutions. A range of financial incentives will be employed, including financial rewards to "solution providers" and cash rewards or a negotiated value for intellectual property rights.

  Many new companies have been established for just this purpose – to create "innovation platforms" for use in DI. These include entities as diverse (topically and with different business-models) as YourEncore, NineSigma, InnoCentive, Innovation Exchange, Oakland Innovation and Science24Seven. Every one of these companies approach to distributed innovation differs in its breadth, focus and value proposition. [29]

InnoCentive: A New Innovation Company

InnoCentive (**http://www.innocentive.com**) is an example of an innovation platform that has emerged to support distributed innovation. InnoCentive hosts an internet based platform that posts scientific problems from its clients (pharmaceutical, biotechnology, consumer goods, specialty chemicals; including Eli Lilly, Procter & Gamble, Avery Dennison, Janssen, and the Rockefeller Foundation) to a global network of over 170,000 registered solvers from over 175 different countries. Solvers offer solutions to the problem for a pre-specified money award; all IP is transferred to the "seeker." Since 2001, more than 800 problems that could not be solved by the RD&D laboratories of some 50 clients have been posted. About 50% of the posted problems have been solved and the associated prizes awarded, almost $4 million has been paid out to successful Solvers.[30]

One example of success from InnoCentive comes from the Ocean Spill Recovery Institute which posted a problem in 2007 on how to separate frozen oil from water in oil recovery barges. This challenge was solved by a chemist from the concrete business with no experience in the oil industry. He successfully adapted a tool from the cement industry that was designed to vibrate the cement to keep it in liquid.

In InnoCentive original business model the solvers work independently and do not share their knowledge and solutions with each other. Recognizing the limitations of this format and learning from the experience of their solvers, last year InnoCentive launched a new initiative to support and encourage teams of innovators to work together on challenges through shared workspaces and new IP governance structures.

4. A Distributed Innovation Model: The Generation Challenge Program (GCP)

A successful example of Distributed Innovation strategies, after which a Global Climate Technology Initiative could be modelled, is the *Generation Challenge Programme (GCP),* a global project involving well over 100 scientists in more than 30 countries collaborating to develop improved crop varieties including rice and maize.

The GCP grew out of a reform agenda for the Consultative Group on International Agricultural Research (CGIAR). CGIAR is a global partnership of governments, research institutes and private foundations working to improve agricultural science and food security for the poor. It was established in the 1970's as a network of individual research centers in the developing world and is widely recognized as being a key player in the "green revolution." [31] Despite its early success, CGIAR's accomplishments have slowed in the past few decades because of "increasingly fragmented and restricted project and Center based programming and funding." [32] The traditional loosely networked "centers of excellence" approach was not capable of solving the complex agricultural challenges facing the developing world today.

A reform agenda was initiated in the last decade to move the CGIAR towards funding results-oriented research agendas directed toward significant and compelling challenges which draw on the competencies of the relevant Center and partners. The reform agenda also aims to create an open CGIAR system that values dynamic partnerships, and moves away from the model of independent centers to a coherent system. The goals include reducing bureaucracy and increasing cost-effectiveness.

The Challenge Program (CP) concept was developed as part of the CGIAR's reform program to bring about a programmatic approach to take on global challenges in cooperation with a wider range of partners. A CGIAR Challenge Program (CP) is a "time-bound, independently-governed program of high-impact research that targets the CGIAR goals in relation to complex issues of overwhelming global and/or regional significance, and requires partnerships among a wide range of institutions in order to deliver its products."[33] The Generation Challenge Program (GCP) specifically aims to produce better crop varieties for poor farmers, making use of innovations in plant genetic diversity, advanced genomic science and comparative biology.

- The GCP is funded by national governments, multi-lateral institutions and private foundations.[34] It exemplifies how a collaborative distributed innovation approach could be applied to a climate technology effort.

- The GCP was created to better link "upstream," research activities with "downstream" activities (product development, testing and deployment). The GCP is designed to drive research from the laboratory to the "market."

- The program recognizes that no single institution could command the breadth of expertise and resources necessary to achieve these objectives.

- Thus, the GCP employs a distributed innovation strategy that leverages intellectual and physical resources—funds, skills, equipment, knowledge, and social capital— from many institutions and initiatives, public and private. This structure provides the agility needed to capture emerging opportunities, promote innovative partnerships, and develop appropriate product delivery schemes.[35]

- Importantly, it must be underscored that it is a strategy specifically designed to go beyond conventional "centers of excellence" approaches that failed to produce accelerated product development in agriculture – key international donors have forced that evolution from centers to this DI approach to get quicker product results in the public good.

- Thus while it will be important to create and support regional "bricks and mortar" climate technology centers- similar to the CGIAR model- what really has moved this initiative forward in the past decade has been the introduction of the GCP strategy to link, coordinate and lead the centers toward time-bound, product development model in the marketplace.[36]

5. Applying Distributed Innovation to Climate Technology Development and Diffusion

This decentralized and bottom-up approach will improve existing global climate technology RD&D policy to accomplish the following:

- **Support the accelerated development and deployment of *breakthrough* clean energy technologies and scale up of existing technologies.** This new institutional framework and DI strategy is focused on goals that can fundamentally change the game in energy and climate. Note, however, that achieving those goals will yield useful outputs and products along the way, including breakthroughs in the laboratory and accelerated development and deployment of these new, as well as existing, technologies.
- **Be product focused** to rapidly drive upstream RD&D to downstream product development and deployment within defined timeframes.
- **Build linkages among all relevant actors** early in RD&D process (e.g., academic researchers, national laboratories, government agencies, private companies, financiers, utilities, installers, state deployment funds) and incentivize their engagement and financing at earlier stages in the RD&D process. This will result in new cross-functional teams that will link the upstream RD&D community with the downstream commercialization, finance, and deployment community in an innovative, synergistic manner.
- **Address the whole technology value chain** from applied research through deployment – by filling in the gaps that block effective accelerated deployment, to operate at the breaks in the value chain from upstream research, deployment and through to diffusion.

- **Utilize existing physical and intellectual capital** from public sector institutions, companies, and individuals (through various DI tools) throughout the United States and around the world including universities, national laboratories, industry and venture capital firms.
- **Efficiently utilize public and private funding** by coordinating key players from the funding and finance communities early in the RD&D process and by shifting funding away from siloed research projects towards product focused projects. DI tools can also incentivize private capital to finance a technology earlier in the technology development continuum.
- **Produce a replicable model**, using various individual technologies to create the model for replication for a broad suite of low carbon technologies that could benefit from the distributed innovation process.
- **Develop a truly diverse portfolio of technology options on different time scales –** from short-term solutions to reduce emissions almost immediately to mid-range commercial opportunities in the next 5-10 years, to longer term, disruptive innovations not yet imagined for energy – all designed to create the framework for a long-term, 50 year transitional plan to stabilize greenhouse gas emissions.

Implementing Next Steps

- ***2009 H1**:* Background research to support the climate technology institutional framework and DI strategy concept. Outreach to negotiators at Bonn and Bangkok, through informal meetings and side events, on proposal and DI concept.
- ***2009 H2**:* Introduce full-fledged climate technology framework and strategy proposal into the negotiations supported by the EU, US, Japan and other, notably a number of developing country governments.
- ***Copenhagen Cop15, December 2009**:* “Copenhagen Protocol” agrees to establish new climate technology framework, which will employ DI strategy.
- ***2010 H1**:* Finalize detailed proposals for the institutional structure, funding and strategy.
- ***2010 H2***: Establish technology node pilot as prototype for the larger framework and strategy.

Endnotes

[1]A number of groups have recommended the creation of a new climate technology institution. E3G released a report in November 2008, *Innovation and Technology Transfer: Framework for a Global Climate Deal,* in which they propose the creation of a Global Innovation and Diffusion Fund (see pg 104-118). While compatible in many ways with the E3G proposal, our proposal recommends that an institution be created that is independent of but linked to the UNFCCC. We further recommend that this single institution manage IPR challenges, which we believe are integral to its mission.

[2] There is a growing body of academic literature to support that position. See, for example, Knut A. Alfsen and Gunnar S. Eskeland, "A Broader Palette: The Role of Technology in Climate Policy" (2007); "Report of the Climate Dialogue at Pocantico: International Climate Efforts Beyond 2012," Pew Center on Global Climate Change, (2005). Available at http://www.pewclimate.org/docUploads/PEW_Pocantico_Report05.pdf; Lewis Milford, "From Here to Stabilization: A Call for Massive Climate Stabilization," Clean Energy Group (September 27, 2006), available at http://www.cleanenergystates.org/international/techdiffusion.html.

[3] Roger Pielke, Jr., Tom Wigley, and Christopher Green, "Dangerous Assumptions," Commentary, *Nature*, April 2008.

[4] More on why this is the case can be found in Bazilian et al. "Considering Technology within the UN Climate Negotiations." Energy Research Center of the Netherlands, November 2008, pg 5-6.

[5] See Bazilian et al, pg 20 for a review of the literature on this issue.

[6] The IPCC 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 amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organizations (NGOs) and research/education institutions" that also, "comprises the process of learning to understand, utilize and replicate the technology, including the capacity to choose it and adapt it to local conditions and integrate it with indigenous technologies." Bazilian et al, pg 10.

[7] See Childs Staley, Britt, Jenna Goodward and Hilary Mcmahon, *From Positions to Agreement: Technology and Finance at the UNFCCC.* December 2008. WRI. Pg 7.

[8] www.theglobalfund.org

[9] This independent innovation model is prevalent throughout Europe; from Denmark to Finland to the UK, "these nations have made an explicit decision not to place their innovation-promotion activities under the direct control of large government departments," experts have noted, and they "usually have a substantial degree of independence." See Clean Energy Group, "*Climate Choreography*" at pp. 14-16.

[10] The Core Team would consist of energy, management, technical, policy and finance experts, including developing country representatives, along with a small group of expert staff providing support and assistance. Strategically, the Core Team would focus on product development and deployment by building linkages among key players in the low carbon technology RD&D process; this would link the upstream research community with the downstream finance and deployment community (e.g., companies, universities, governments, foundations, financial institutions). It would also focus on policy development and coordination, as well as work on collaborative finance strategies. The Core Team would have several key responsibilities: (a) provide day-to-day management; (b) develop and implement an evolving strategy; (c) make connections and facilitate "cross-learning" between and among the modules of activity by focusing on specific strategies developed by the Technology Nodes; (d) link individuals within the Technology Nodes with innovation and network experts to apply cutting-edge information technology (IT) tools, business models, and other innovation techniques; and (e) provide strategic and management support for activity modules.

[11] The distributed innovation strategy driving this new climate technology initiative means that a light and adaptable management structure would choreograph outside expertise that largely already exists in bricks and mortar institutions.

[12] The management team would focus on assembling teams of scientists, business experts and others with the goal of accelerating the development and deployment of a specific technology. The Technology Nodes would perform the substantive work of the Initiative by devising ways to accelerate product development of specific low carbon technologies by working with the different activity modules. The driving objectives for each Technology Node would be to accelerate the development and deployment of a specific technology, to identify investment needs, and to create sustainable business models for technology commercialization.

[13] Submission of Antigua and Barbuda on behalf on the G77 and China to AWG-LCA. A Technology Mechanism under the UNFCCC. August 27, 2008. (From WRI pg 10.)

[14] The European Union (EU) has proposed technology-oriented agreements, which would be recognized by the Convention but could be outside it, to facilitate and finance international R&D projects. WRI pg 10.

[15] This is precisely why the CGIAR Generation Challenge Program evolved from a centers of excellence strategy to one that focuses now on DI to develop market-ready, agricultural "public goods" in the form of new crop varieties in developing countries.

[16] We propose that MRV functions to monitor, report and verify country pledges within a post-Kyoto agreement should remain under the mandate of UNFCCC body, within the technology body linked to the a new Global Climate Technology Innovation Fund, as these issues are fully within the scope and remit of the UNFCCC.

[17] The issues and best practices related to capacity building have been written about extensively, See Bazilian et al. Ghana's oft cited proposal to the UNFCCC includes five aspects of institutional capacity building needed to manage technological change:

a. Structure – Are the institutions or organizations structured efficiently to fulfill the needs for technology development and transfer?
b. Human resources – Are they adequate in the institution, are they adequately qualified and skilled as a whole?
c. Financial resources – Are any available, are they managed efficiently in the institution, are they distributed adequately?
d. Information resources – Is the necessary information available and reliable, and is it distributed and managed efficiently within and outside the organization?
e. Technical resources – Are the necessary buildings, facilities, vehicles, computers, and specialized equipment available? Are they distributed and managed adequately? From Childs Staley et al, pg 7.

[18] UNDP (2007), *The Least Developed Countries Report 2007: Knowledge, Technological Learning and Innovation for Development*

[19] Staley et al.

[20] An excellent report on the international dimensions of this IPR energy problem raises issues that could plague domestic IPR and its effect on clean energy innovation. See Tomlinson, Shane, Pelin Zorlu and Claire Langley, *Innovation and Technology Transfer: Framework for a Global Climate Deal*. November 2008 E3G and Chatham House at 84 and 88. Also supported in Bazilian et al, pg 27.

[21] See note 17.

[22] A climate technology IPR function would have capabilities to detect and, where possible, remedy practices that restrict licensing, need to be developed and expanded and avoid imprecise approaches which would undermine the positive role that IPRs can play. Other activities to consider:

- Attention to the specific challenges associated with, IPR protections in rapidly developing countries as well as in the least developed countries
- Further exploration of existing options under the current TRIPS agreement, with particular attention to the manner in which the so-called TRIPS flexibilities could be used
- International collaboration on low-carbon technology development with IPRs for new technologies
- Decisions by developed nations to forego the practice of preferential licensing of publicly funded

technologies to national firms. From Bazilian et al, pg 28.

[23] "The G77 supports funding for collaborative R&D, coordinated by a new body, and paid for by a new fund. China, Brazil, and Argentina support collaborative R&D, and the latter two of the three add an emphasis on building capacity for research in developing countries. Annex I countries propose to support international R&D, but avoid proposing new funds or bodies under the UNFCCC to do so. Japan supports voluntary international joint R&D including Annex I countries and those Non-Annex I countries that wish to participate. The European Union (EU) proposes technology-oriented agreements, which would be recognized by the Convention but could be outside it, to facilitate and finance international R&D projects." Childs Staley et al, pg 10.

[24] Bazilian et al, pg 10.

[25] For more background literature on distributed innovation see:

- Milford, Lewis and Daniel Dutcher. "Climate Choreography: How Distributed and Open Innovation
- Could Accelerate Technology Development and Deployment," Clean Energy Group (2008). www.cleanegroup.org/Reports/Climate_Choreography_July08.pdf.
- Harnessing Collective Intelligence to Address Climate Change; Thomas Malone and Mark Klein; Innovations, Summer 2007.
- Leadership and Innovation in a Networked World; Diego Rodriguez and Doug Solomon; Innovations, Summer 2007.
- Collaboration Rules; Philip Evans and Bob Wolf; HBR; July - August 2005.
- Distributive Innovation for Social Change; Clayton Christensen, Heiner Baumann, Rudy Ruggles, Thomas Sadtler; HBR; December 2006.
- Innovation through Global Collaboration: A New Source of Competitive Advantage; Alan MacCormack, et al.; HBS; August 31, 2007
- The Principles of Distributed Innovation; Lakhani and Panetta; Innovations; Summer 2007.
- Innovation at the Speed of Information; Steven Eppinger; HBS; January 2001.
- Connect and Develop: Inside Proctor and Gamble's New Model for Innovation; Larry Houston and Nabil Sakkab; March 2006.
- Here's an Idea: Let Everyone Have Ideas; William Taylor; New York Times; March 26, 2006.
- Open Source Models of Collaboration in the Life Sciences: A Report from Bellagio; The Rockefeller Foundation; 2005.

[26] Takeuchi, Hirotaka, Emi Osono, and Norihiko Shimizu, "The Contradictions That Drive Toyota's Success" *Harvard Business Review,* June 2008.

[27] Nambisan, Satish and Mohanbir Sawhney. *The Global Brain*. Wharton School of Business. 2008. Pg xx1.

[28] Ibid, pg. 25.

[29] For a list of companies cited, see InnoCentive http://www.innocentive.com; YourEncore http://www.yourencore.com; NineSigma http://www.ninesigma.com; Science24Seven http://www.science24seven.com; Oakland Innovation http://www.oakland.co.uk; Innovation Exchange (IX) http://www.innovationexchange.com

[30] Hagel, John and John Seely Brown. *Business Week*.com. April 8, 2009. "The Next Wave of Open Innovation: How InnoCentive aims to exploit sophisticated technology and networking capabilities to connect problems with their potential solvers" at http://www.businessweek.com/innovate/content/apr2009/id2009048_360417.htm

[31] The CGIAR partnership now includes 25 developing and 22 industrialized countries, 4 private foundations, and 13 regional and international organizations. http://www.cgiar.org/who/members/index.html

[32] CGIAR. *A revitalized CGIAR – a new way forward: the integrated reform proposal.* Change Steering Committee (2008). Pg . 4.

[33] CGIAR. "Designing and Implementing Challenge Programmes. Report to the CGIAR Interim Executive Council" by the Challenge Programs Task Force, Aug. 30, 2001.

[34] The largest donors of the Challenge Programs have consistently included: the UK government, the USA, European Community, and the World Bank, all of which would also most likely be key funders for a climate change technology innovation initiative.

[35] www.generationcp.org

[36] CGIAR has produced a useful body of information on lessons learned from the challenge programs, including implementation, institutional and funding best practices. This experience would be an excellent resource to develop the implementation plan for a Global Climate Technology Innovation Fund.
See:

- CGIAR (2004). Synthesis of lessons learned from initial implementation of CGIAR pilot Challenge Programs. CGIAR Science Council, Rome and CGIAR Secretariat, Washington, DC, October 2004.
- CGIAR (2007). Lessons learnt from selection and implementation of the CGIAR Challenge Programs. CGIAR Science Council, Rome and CGIAR Secretariat, Washington, DC, October 2007.
- Change Steering Team (2008). A revitalized CGIAR – a new way forward: The integrated reform proposal. CGIAR Change Steering Team, 3 November 2008.
- Palenberg, M. (2008). Cross-cutting observations based on the review of three CGIAR Challenge Programs. Institute for Development Strategy, Munich, 24 April 2008. presented at CGIAR ExCo 14, Ottawa, Canada, May 2008.
- Woolley, Jonathan (CPWF), Jean-Marcel Ribaut (GCP), Howarth Bouis (HarvestPlus) and Adewale Adekunle (SSA-CP). The CGIAR's Challenge Program Experiences: A Critical Analysis: A contribution to Consortium and Mega-program design. 6 February 2009.