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# Institutional Support for an International Forest Carbon Sequestration Agreement

**Liz Baldwin**

School of Public and International Affairs  
Indiana University

**USA**

**Kenneth R. Richards**

School of Public and Environmental Affairs  
Indiana University

**USA**



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Liz Baldwin

*School of Public and International Affairs and Maurer School of Law, Indiana University*

Kenneth R. Richards

*School of Public and Environmental Affairs and Maurer School of Law, Indiana University, and  
the Smith School of Enterprise and Environment, Oxford University*

[kenricha@indiana.edu](mailto:kenricha@indiana.edu)

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## **THE HARVARD PROJECT ON INTERNATIONAL CLIMATE AGREEMENTS**

The goal of the Harvard Project on International Climate Agreements is to help identify key design elements of a scientifically sound, economically rational, and politically pragmatic post-2012 international policy architecture for global climate change. It draws upon leading thinkers from academia, private industry, government, and non-governmental organizations from around the world to construct a small set of promising policy frameworks and then disseminate and discuss the design elements and frameworks with decision-makers. The Project is directed by Robert N. Stavins, Albert Pratt Professor of Business and Government, John F. Kennedy School of Government, Harvard University. For more information, see the Project's website: <http://belfercenter.ksg.harvard.edu/climate>

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# Institutional Support for an International Forest Carbon Sequestration Agreement

Liz Baldwin<sup>1</sup>

and

Kenneth R. Richards<sup>2</sup>

## Introduction

Because forests play a critical role in the global carbon cycle, the international community is actively pursuing policies and programs to increase the amount of carbon stored in forests. Recent estimates suggest that forestry could contribute an average 6.7 billion tons of emissions reductions annually, with over two-thirds of this potential coming from tropical nations.<sup>3</sup> Making full use of the forest carbon sink is appealing to both the developed and the developing world. Developed nations see forest carbon projects as a low-cost option for mitigating climate change. For the developing world, forest carbon payments could provide a sustainable source of much-needed income. At the most recent climate negotiation talks in Copenhagen, even as negotiations on greenhouse gas emissions limits stalled, the parties moved closer to a framework agreement on forest carbon.<sup>4</sup> Five donor nations have committed \$3.5 billion to jump-start a program to reduce emissions from, and increase carbon sequestration in, the world's forests.<sup>5</sup>

Parties to the UNFCCC have considered a wide range of policy options to address forest carbon.<sup>6</sup> However, no single approach has been selected by the parties. Whichever approach is ultimately chosen, it will also require the international community to develop institutional support mechanisms. To identify the key services and institutions that will be needed to support a successful IFCS program, this paper will examine three possible international forest carbon sequestration (IFCS) models: a fund-based approach, proposed by Brazil<sup>7</sup>; a market-based approach submitted jointly by several rainforest nations,<sup>8</sup> and the

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<sup>1</sup> School of Public and International Affairs and Maurer School of Law, Indiana University.

<sup>2</sup> Corresponding author, School of Public and Environmental Affairs and Maurer School of Law, Indiana University, and the Smith School of Enterprise and Environment, Oxford University. Email at [kenricha@indiana.edu](mailto:kenricha@indiana.edu). The author is grateful to the Smith School for support through the Senior Visiting Fellow program.

<sup>3</sup> Brent Sohngen, *An Analysis of Forestry Carbon Sequestration as a Response to Climate Change* at 11, Copenhagen Consensus on Climate (2009).

<sup>4</sup> See Copenhagen Accord, FCCC/CP/2009/L.7, at 2, U.N.F.C.C.C. Draft Dec.-/CP.15 (Dec. 18, 2009), available at <http://unfccc.int/resource/docs/2009/cop15/eng/107.pdf> (stating that “[w]e recognize the crucial role of reducing emission from deforestation and forest degradation and the need to enhance removals of greenhouse gas emission by forests and agree on the need to provide positive incentives to such actions through the immediate establishment of a mechanism including REDD-plus, to enable the mobilization of financial resources from developed countries.”).

<sup>5</sup> See Press Release, United States Department of Agriculture, United States Announces \$1 Billion to Reduce Forest Emissions (USDA Dec. 16, 2009).

<sup>6</sup> For a good overview of the range of options, see Charlie Parker et al, *THE LITTLE REDD+ BOOK* (Global Canopy Program 2009).

<sup>7</sup> Brazil's proposal was one of the initial REDD proposals and according to some commentators is the “frontrunner” proposal following the recent climate change talks in Copenhagen. See *Climate Change and Brazil Deforestation*, UNITED PRESS INTERNATIONAL, Dec. 11, 2009 (available at [http://www.upi.com/Science\\_News/Resource-](http://www.upi.com/Science_News/Resource-)

Forest Program for Inventories of National Carbon (PINC) approach, which focuses on rewarding a broad range of countries for increases in national carbon stocks.<sup>9</sup> While these three approaches share the same overall goal, they are structured in different ways, and their need for support services will differ as well.

The basic types of support services under any IFCS program will be similar – support will be needed during the initial negotiations, both for program design and for individual countries' decisions whether to participate; managing financial transactions; providing oversight of the entire program, including dispute resolution and enforcement; measuring and verifying carbon stocks; and ensuring developing country readiness to enter a program.<sup>10</sup> Within these basic categories, however, different IFCS programs will have different needs. For example, some programs will need more support in the negotiation process than in the enforcement process. A market-based IFCS program will need different kinds of financial transaction support than a fund-based program. These differences suggest not only different support service needs, but also different institutional options for delivery of support services.

This paper proposes that the success of any IFCS program will depend in large part upon the institutional design of its support services. A successful IFCS program must be supported by services and institutions that maintain its effectiveness, maximize its political viability, and minimize its transaction

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[Wars/2009/12/11/Climate-change-and-Brazil-deforestation/UPI-86931260550408/](http://www.unfccc.int/Wars/2009/12/11/Climate-change-and-Brazil-deforestation/UPI-86931260550408/)). For an overview of Brazil's proposal, see generally UNFCCC Subsidiary Body on Scientific and Technological Advice, *Views on the range of topics and other relevant information relating to reducing emissions from deforestation in developing countries*, p. 21-24, U.N. Doc. FCCC/SBSTA/2007/MISC.2 (hereinafter Brazil Proposal).

<sup>8</sup> This proposal builds on one of the first REDD proposals, which was jointly submitted by Papua New Guinea and Costa Rica. In addition to using a market approach to discourage emissions, this proposal includes two other options for developing country participation: a "readiness and capacity building" program and an "expanding implementation" program, which would allow countries to participate at incremental levels while building sufficient capacity to participate in the full program. This paper will focus on the market approach, which is the end goal of the Program. See generally UNFCCC Ad Hoc Working Group on Long-Term Cooperation, *Reducing Emissions From Deforestation and Forest Degradation in Developing Countries; and the Role of Conservation, Sustainable Management of Forests and Enhancement of Forest Carbon Stocks*, submitted at Accra, Ghana, (August 25, 2008) (available at [http://unfccc.int/files/kyoto\\_protocol/application/pdf/papuanewguinea190908.pdf](http://unfccc.int/files/kyoto_protocol/application/pdf/papuanewguinea190908.pdf)) (hereinafter Coalition Proposal). The coalition members are Belize, Bolivia, Cameroon, Central African Republic, Costa Rica, Democratic Republic of Congo, Dominican Republic, Equatorial Guinea, Ghana, Guatemala, Guinea, Kenya, Lesotho, Liberia, Nicaragua, Panama, Pakistan, Papua New Guinea, Singapore, Solomon Islands, Thailand, Uganda, and Vanuatu. *Id.* at 1.

<sup>9</sup> See generally Andrew Plantinga & Kenneth Richards, *International Forest Carbon Sequestration in a Post-Kyoto Agreement in POST-KYOTO INTERNATIONAL CLIMATE POLICY: IMPLEMENTING ARCHITECTURES FOR AGREEMENT 2009* (Joseph E. Aldy & Robert N. Stavins eds.) (hereinafter PINC proposal). The national inventories approach to IFCS was first proposed in Andersson, K. and K. Richards. 2001. "Implementing an International Carbon Sequestration Program: Can the Leaky Sink Be Fixed?" *Climate Policy* 1: 73-88. See also Andersson, K., A. Plantinga, and K. Richards. 2009. "The National Inventory Approach for International Forest Carbon Sequestration Management." In Dieter Helm and Cameron Hepburn, eds. *The Economics and Politics of Climate Change*. Oxford: Oxford University Press.

<sup>10</sup> Additional support services will be needed to assist individual countries with capacity development as needed to support a REDD program. National level services are beyond the scope of this paper. For a good overview of national level support service needs, see generally *Legal Frameworks for REDD: Design and Implementation at the National Level*, IUCN Environmental Law and Policy Paper No. 77 (John Costenbader, ed.) (2009). See also the World Bank Forest Carbon Partnership Facility website at <http://www.forestcarbonpartnership.org/fcp/>.

costs. To achieve these goals, the provision of these services should be based upon the available delivery options, the characteristics of each service and the overall goals of the IFCS program.

For example, the support service of measuring carbon stocks might be provided by individual nations, private contractors, or by quasi-governmental international bodies. Each party will approach the task with a different set of capabilities and incentives: individual nations have close proximity to data, but may be tempted to overestimate carbon stocks; private contractors may work quickly, but require extensive and costly contracting; international bodies may produce highly accurate data, but provide little transparency and raise controversial questions about national sovereignty. The relative weight of these advantages and disadvantages should be matched to the needs of the IFCS program. The effectiveness of some IFCS programs will depend upon measurement accuracy, while under others transparency or timeliness might be most necessary.<sup>11</sup> Because the different IFCS programs have different needs, the institutional arrangements that will be most successful will also differ, depending on the IFCS program that is ultimately chosen.

This paper examines key considerations for organizing support institutions under an IFCS program. Since the international community has not yet chosen a specific IFCS option, this paper will not recommend one set of support institutions over another. Instead, it will 1) identify the key characteristics of the support services needed under each of three possible IFCS options; 2) suggest possible institutional arrangements for these support services, considering both existing and new institutional arrangements; and 3) discuss the key advantages and disadvantages of each arrangement identified.

### **I. Three Basic International Forest Carbon Sequestration Models**

There have been many proposals for modifications and successors to the Kyoto Protocol approach to forest carbon sequestration.<sup>12</sup> This paper has selected three plausible IFCS models that illustrate the range of support service needs of the IFCS models.

Brazil has proposed a voluntary, fund-based approach to IFCS. Under this approach, developing nations that demonstrate they have reduced deforestation rates are provided with *ex post* financial payments, equivalent to an avoided emissions price per ton as set in *ex ante* negotiations.<sup>13</sup> Avoided emissions are determined by comparing a reference emissions rate (based on historic deforestation rates)

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<sup>11</sup> Andersson, K., T. Evans, and K. Richards. 2009. "National Forest Inventories: Policy Needs and Assessment Capacity." *Climatic Change* Volume 93 (Nos. 1 -2): 69-101.

<sup>12</sup> Under the Kyoto Protocol, forest carbon in the developed world (Annex I nations) is treated separately from forest carbon in the developing world. Forest carbon sequestration in Annex I nations can be used to generate carbon credits, subject to the rules and restrictions of the Kyoto Protocol. *See* Kyoto Protocol Art. 3.3 – 3.4. In the developing world, projects that sequester carbon through afforestation, reforestation, and forest management may be eligible for funding under the Kyoto Protocol's Clean Development Mechanism (CDM). *See* Kyoto Protocol Art. 12. Deforestation and forest degradation in developing countries is not addressed under the Kyoto Protocol.

<sup>13</sup> *See* Brazil Proposal, *supra* note 7, at 22.

with rates of deforestation in the current year.<sup>14</sup> Annex I parties to the UNFCCC contribute to a fund used to reward forest nations for their avoided emissions. If deforestation rates increase, an equivalent amount is debited from that country's future rewards.<sup>15</sup> The proposal calls for emissions reductions to be measured via "a transparent and credible system that reliably provides estimates of the annual emissions from deforestation, by biome."<sup>16</sup>

In contrast, the coalition IFCS proposal links forest emissions to the broader international carbon market, allowing Annex I nations to use forest carbon credits to meet their reduction commitments under the Kyoto Protocol or its successors. Like the Brazil model, the coalition's IFCS approach rewards countries that reduce rates of emissions from deforestation and degradation below a historic reference emissions rate.<sup>17</sup> Instead of a set payment per ton of carbon avoided, however, the coalition approach would create "emissions reductions units," fully fungible with credits used by Annex I parties to meet their Kyoto obligations.<sup>18</sup> The proposal also calls for rewarding countries that increase forest stocks through activities such as afforestation and forest management, but does not describe a detailed financial mechanism for calculating the financial reward, and only requires that credits for reduced emissions from deforestation and degradation be fungible on the international carbon market.<sup>19</sup> The coalition program also stresses the need to provide adequate incentives to countries with a wide range of circumstances, and allows the use of "an appropriate development adjustment factor when assessing reference emissions levels."<sup>20</sup> The program further calls for Annex I Parties to agree to "deeper emissions reductions" to ensure that IFCS is supported by adequate demand for credits.<sup>21</sup>

A third policy option is the Forest Program for Inventories of National Carbon (PINC). Like the coalition approach, PINC rewards countries by allowing them to generate forest emissions credits that can be traded on the international carbon market. Unlike the other proposals, however, PINC rewards countries for changes in forest carbon stocks rather than changes in rates of deforestation.<sup>22</sup> This establishes a program that rewards countries not only for slowing rates of deforestation, but also for expanding existing forest carbon stocks through any number of modifications to forest policy and practice. The PINC model also does not differentiate between natural and human-induced changes – it considers only absolute changes in forest carbon stocks. This necessarily shifts the risk of intentional or

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<sup>14</sup> *Id.* at 22-24.

<sup>15</sup> *Id.* at 23.

<sup>16</sup> *Id.*

<sup>17</sup> *See* Coalition Proposal, *supra* note 8, at 6.

<sup>18</sup> *Id.*

<sup>19</sup> *See id.* at 9-10.

<sup>20</sup> *Id.* Development adjustment factors can include a wide range of information, including information about a country's economic development needs, social conditions, and environmental conditions.

<sup>21</sup> *Id.* at 7.

<sup>22</sup> *See* PINC proposal, *supra* note 9. Of course, changes in carbon stocks can be translated to changes in carbon flows.

natural losses in carbon stocks to the participants themselves. Finally, the PINC program encourages all nations to participate, not just developing countries, and evaluates carbon stock changes in all countries equally.<sup>23</sup>

Like the coalition approach, the PINC program recognizes that countries will enter a forest carbon agreement with different needs and circumstances. To accommodate these differences, the PINC approach allows nations to negotiate a reference carbon stock level, thus allowing nations with historically high deforestation rates to negotiate a more favorable reference stock to induce their participation in the program. Unlike the coalition approach, however, if such negotiations “create” forest carbon credits as an inducement to participation,<sup>24</sup> the PINC program would require nations to increase their *emissions* reduction commitments by a corresponding amount.<sup>25</sup> By allowing countries to negotiate explicitly for more favorable reference level stocks, the PINC approach separates the highly political negotiation process from the technical aspects of actual reference stock measurement.

There are many conceivable IFCS design options; these are only three examples drawn from the many proposals. There are two primary differences that distinguish among these three proposals. First, while the Brazilian proposal calls for funding via contributions from industrialized countries, the latter two are linked to the market for emissions allowances. Second, while both the Brazilian and the coalition’s IFCS approaches concentrate on emissions reductions from deforestation and forest degradation in developing countries,<sup>26</sup> the PINC proposal expands the scope to include a full range of forest management activities and is open to both developed and industrialized countries.

Under any of these IFCS options, additional services will be needed to support (1) the negotiation process, (2) IFCS financing, (3) overall program oversight, including dispute resolution, (4) the protection of the program integrity through accurate measurement and verification, and (5) country readiness. There are many possible institutions that could be used to provide these services, including use of existing institutions and creation of new, IFCS-specific entities.

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<sup>23</sup> Most REDD proposals restrict the program to developing nations only, while Annex I nations are currently allowed credits for forest and land-use activities under Art. 3.3 and 3.4 of the Kyoto Protocol. *See* U.N.F.C.C.C., Kyoto Protocol Art. 3.3 and 3.4 (Dec. 11, 1997).

<sup>24</sup> Often informally referred to as “hot air.”

<sup>25</sup> *Id.*

<sup>26</sup> The coalition approach would create fungible emissions reduction credits only for activities that reduce emissions in the forestry sector. The approach proposes rewarding countries for forest management and other activities that result in increased carbon stocks, but does not provide details on how these changes in carbon stocks would be measured and rewarded, or whether they would eventually be credited in an international carbon trading market. *See* Coalition Proposal, *supra* note 8, at 9-10.

## II. Why Institutional Design Is Important

A growing body of scholarship shows that the design and structure of institutions is an important predictor of institutional failure or success, particularly when those institutions are organized to serve complex needs in the face of uncertainty, bounded rationality and collective action.<sup>27</sup> This body of scholarship can provide a useful framework for examining the institutional needs of an IFCS program, since such a program is characterized by the need for collective action in the presence of significant uncertainty.

Very broadly we seek institutions with three primary characteristics. First, the institutions should be effective and should support the environmental integrity of the IFCS program. Second, to the extent possible, the institutions should minimize transaction costs – whether in carrying out negotiations, executing transactions, monitoring performance, or settling disputes. Third, the choice of institutions must be politically viable. Political support is important not only during the initial stages of IFCS policy development, to ensure broad participation, but also during the implementation stage, when the parties will inevitably encounter unforeseen challenges and may need to commit to mid-course corrections to realize a successful program.

This paper will use insights from New Institutional Economics, collective action, and common pool resource governance as a framework for analyzing IFCS support service organization. For each type of support service, we assess the effectiveness, political viability, and transaction costs of different possible institutional arrangements under the three IFCS models.

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<sup>27</sup> See, e.g., ELINOR OSTROM, *GOVERNING THE COMMONS* (1990); OLIVER WILLIAMSON, *THE ECONOMIC INSTITUTIONS OF CAPITALISM* (1985); MANCUR OLSON, *THE LOGIC OF COLLECTIVE ACTION: PUBLIC GOODS AND THE THEORY OF GROUPS* (Harvard University Press 1971).

### III. Negotiation Support

Supporting the negotiation process will be a critical step in developing an IFCS program. There are two distinct phases to IFCS negotiation. In the first phase, the international community will negotiate a framework for IFCS, possibly one of the three models discussed in above or a variation thereof. The UNFCCC currently provides a formal channel for these programmatic negotiations, in which a wide range of participants (including NGOs and international UN organizations) provide the UNFCCC Parties with information and analysis, and the Parties are expected to negotiate the details of the program until consensus or near-consensus can be reached, at which time the IFCS program is expected to become part of the UNFCCC treaty and implemented by the UNFCCC Secretariat.

Some IFCS programs will also require a second phase of negotiations, in which individual nations negotiate the terms of their participation in the program. This is an implicit part of the coalition and PINC approaches, which allow forest nations to negotiate individual “development adjustment factors” (the coalition approach) and starting reference stocks (PINC).<sup>28</sup> These negotiations need to be made concurrently with other aspects of the IFCS approach that indicate the degree of long-term support for the IFCS: under the Brazilian fund-based approach, countries will need to negotiate a carbon price and the commitment of funds from donor nations,<sup>29</sup> while under the coalition and PINC approaches, developed countries may be called upon to commit to additional emissions reductions concurrent with developing countries’ entry into the IFCS system.<sup>30</sup>

The last several UNFCCC COP meetings, particularly COP 15 at Copenhagen, show the tension between transaction costs and political viability during the negotiation process. There are currently 194 Parties to the UNFCCC, and as a result the “UNFCCC process involves too many countries to allow anything of real significance to be achieved. The larger the number of parties that are included in a negotiation, the larger the transactions costs incurred in reaching agreement.”<sup>31</sup>

Indeed, the Copenhagen talks resulted in an agreement only when a smaller number of Parties entered into last-minute negotiations, producing the Copenhagen Accord. In the aftermath of Copenhagen, however, it has become clear that this approach has had political ramifications, particularly with developing nations who felt excluded from the Accord and whose trust in the negotiation system has been undermined.<sup>32</sup>

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<sup>28</sup> See Coalition Proposal, *supra* note 20; PINC Proposal, *supra* note 9.

<sup>29</sup> See Brazil Proposal, *supra* note 7.

<sup>30</sup> See *supra* notes 20-25 and accompanying text.

<sup>31</sup> Robert Stavins. “Options for the Institutional Venue for International Climate Change.” Issue Brief 2010-3, Cambridge, Mass.: Harvard Project on International Climate Agreements, May 2010 at 2. Hereinafter Stavins.

<sup>32</sup> See, e.g., United Nations Development Program, *The Outcomes of Copenhagen: the Negotiation and the Accord* at 26 (UNDP 2010).

In addition to the problem of transaction costs and political viability, the negotiation process is characterized by technical complexity. For countries to effectively negotiate beneficial terms of the arrangement and their participation in an IFCS program, they need access to a wide range of information about the technical nature of forest carbon stock and flow assessment methods, the challenges associated with developing effective domestic forest policies, and the impacts on other political and trade agreements. All countries need to enter into negotiations armed with objective and reliable information to support the negotiation process.

The following sections will examine two aspects of the negotiation process. First, the choice of negotiation platforms and the decision about who should participate in negotiations will be examined in light of the tension between transaction costs and political viability. Next, the information needs and options for providing information will be discussed.

### **A. Platforms for Negotiation**

The first fundamental negotiation need is a platform for the negotiation process. Unlike most of the other support services, the initial programmatic negotiation cannot be tailored to a particular IFCS model – it is the negotiation process itself that will determine which IFCS model is chosen. Accordingly, the considerations for the initial choice of negotiation platform will be the same for any IFCS negotiation. The ideal negotiation forum will support effectiveness and political viability with minimum transaction costs by including all necessary parties, but minimizing the number of total negotiating parties, and providing a neutral negotiation forum.

Accordingly the first step in supporting IFCS negotiations will be to identify the necessary participants to the negotiations. Both the COP 15 and the recent climate talks in Bonn have illustrated the high transaction cost of negotiating with all 194 Parties to the UNFCCC. However, it may be possible to limit the number of countries directly involved in the IFCS negotiations. Of the 194 parties to the UNFCCC just 21 are responsible for 80 percent of global greenhouse gas emissions.<sup>33</sup> Similarly, in 2007, 80 percent of the world's forests were located in just 21 countries.<sup>34</sup> This would suggest that a subset of parties could work out the broad elements of an agreement and then invite other countries to participate.

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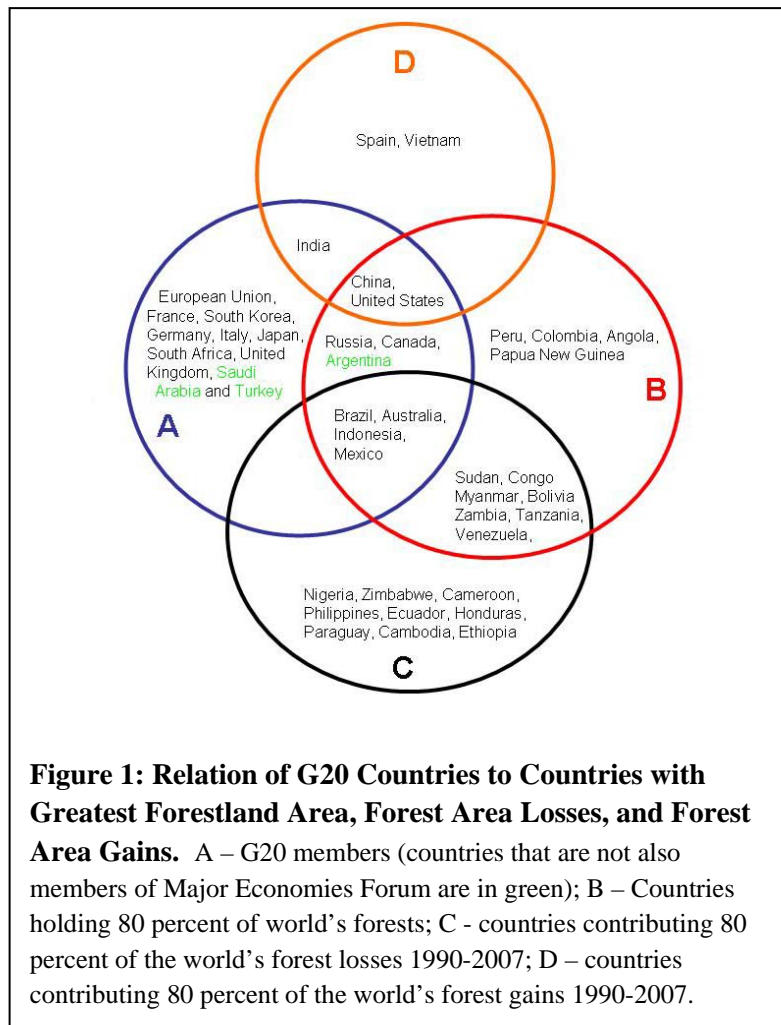
<sup>33</sup> For 2007, the countries are, in order of decreasing level of national annual emissions: China, United States, Italy, France, India, Russian Federation, Japan, Germany, Canada, United Kingdom, Republic of Korea, Iran, Mexico, South Africa, Saudi Arabia. Derived from data at “Carbon dioxide emissions (CO<sub>2</sub>), thousand metric tons of CO<sub>2</sub> (CDIAC).” <http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=749&crid>.

<sup>34</sup> Derived from FAO data available at <http://unstats.un.org/unsd/environment/forestarea.htm>. The 21 countries, from largest to smallest holdings, are: Russia, Brazil, Canada, United States, China, Australia, Congo, Indonesia, Peru, India, Sudan, Mexico, Columbia, Angola, Bolivia, Venezuela, Zambia, Tanzania, Argentina, Myanmar, and Papua New Guinea.

Robert Stavins has identified several alternative negotiation forums, including the Major Economies Forum (MEF) and the G-20.<sup>35</sup> The MEF involves 16 countries plus the European Union, a group that collectively accounts for 90 percent of global greenhouse gas emissions.<sup>36</sup> The G-20 includes the same 17 participants plus Argentina, Saudi Arabia and Turkey.<sup>37</sup> While both of these options would reduce transaction costs significantly relative to the UNFCCC, neither of these is likely to prove particularly effective for an IFCS negotiation simply because they do not include several countries with the greatest forest areas.<sup>38</sup>

Moreover, care should be taken not to oversimplify the assessment of

key participating countries. Certainly, the absolute number of acres in forests is one measure of a country's potential involvement in a IFCS program. But the list of 21 countries with the greatest forest acreage does not include, for example, Sweden and Finland, two countries with major industrial forest activities and a great deal of technical expertise in the field. Nor does the list include a number of countries from Africa (Nigeria, Zimbabwe, Cameroon, and Ethiopia), Asia (Philippines and Cambodia) and South America (Ecuador, Honduras, and Paraguay) that lie in the top 21 countries for loss of



<sup>35</sup> Stavins at 3-4. The list of alternatives to the current UNFCCC approach also includes bilateral and multilateral approaches, defining an alternative role for the UNFCCC, and an informal collaboration on unilateral actions by nations.

<sup>36</sup> *Id.* at 3. The participants include Australia, Brazil, Canada, China, the European Union, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Russia, South Africa, the United Kingdom, and the United States.

<sup>37</sup> *Id.* at 4.

<sup>38</sup> Specifically the G-20 does not include Congo, Peru, Sudan, Columbia, Angola, Bolivia, Venezuela, Zambia, Tanzania, Myanmar, and Papua New Guinea.

forestry area from 1990 to 2007.<sup>39</sup> Finally, five countries, China,<sup>40</sup> United States, India, Vietnam and Spain, account for over 80 percent of the newly established forest acreage from 1990 to 2007, and the latter two are not included in any of the previous categories.<sup>41</sup>

In all, there are 42 nations (plus the European Union) that fall in one or more of the key categories of (1) G20, (2) greatest total forest area, (3) greatest forest areas losses, and (4) greatest forest area gains (Figure 1). It is important that the choice of institutions accommodate the full range of relevant forest nations. In the case of either the Brazilian or the REDD approaches, which focus on deforestation, the G20 donor (or allowance consuming) countries and the countries with the greatest forest losses are key constituents (Figure 1, groups A and C). For the PINC model, there will be a larger group of countries with an interest, including those making substantial forest area gains (group D) and those with substantial forest area in absolute terms (group B). Thus the choice of forum could significantly affect the shape of the final agreement.

Moreover, limiting the number of participants could have negative consequences on political viability if nations feel excluded from the process and refuse to sign on, as has occurred with the Copenhagen Accord.<sup>42</sup> However, the political viability problem might be addressed by allowing individual countries to be represented by coalitions, thus assuring that all members are represented in the negotiations, even though the number of negotiating parties is limited.

Another approach to the question of who participates is to include non-Parties in the negotiations. The coalition approach suggests “leveraging the [World Bank Forest Carbon Partnership Facility] Participant’s Committee into an international “*Institutional REDD Platform*” for developing countries, donors, international agencies . . . to better coordinate, evaluate and reach consensus related to activities, standards and performance.”<sup>43</sup> Such an approach would take advantage of the World Bank’s current and ongoing IFCS implementation research, which could bring useful information into the negotiation process.<sup>44</sup> It would also bring in a wider range of parties to the IFCS negotiations, which could be useful

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<sup>39</sup> The G-20 does not include the following nations that are among the 21 countries with the greatest loss of forest area from 1990 to 2007: Sudan, Myanmar, Zambia, Congo, Nigeria, Zimbabwe, Tanzania, Venezuela, Bolivia, Cameroon, Phillipines, Ecuador, Honduras, Paraguay, Cambodia, and Ethiopia.

<sup>40</sup> Remarkably, gains in China forest area are almost identical in magnitude to Brazil’s losses.

<sup>41</sup> Although Spain is represented via its membership in the EU.

<sup>42</sup> It remains to be seen whether this political fallout will pose lasting damage to the Accord, as several countries who initially opposed the Accord have subsequently associated themselves with it, and more nations can reasonably be expected to do so in the near future.

<sup>43</sup> *Reducing Emissions From Deforestation and Forest Degradation in Developing Countries; and the Role of Conservation, Sustainable management of Forests and Enhancement of Forest Carbon Stocks at 3* (UNFCCC Ad Hoc Working Group on Long-Term Cooperation, August 25, 2008), available at [http://unfccc.int/files/kyoto\\_protocol/application/pdf/papuanewguinea190908.pdf](http://unfccc.int/files/kyoto_protocol/application/pdf/papuanewguinea190908.pdf).

<sup>44</sup> The World Bank’s Global Carbon Partnership Facility has been engaged in demonstration projects and capacity-building activities needed to support a REDD program. See The World Bank, The Forest Carbon Partnership Facility, online at <http://www.forestcarbonpartnership.org/fcp/>.

for IFCS approaches that involve emissions trading. The World Bank option might benefit from including representatives from banking and insurance industries in the negotiations.

This approach, however, could also come at the expense of neutrality if the World Bank's existing work is seen as more favorable to some parties than others. Industrialized countries tend to place more trust in World Bank and its institutions than do the developing countries, which tend to prefer UN units such as the UNFCCC or the UN Forest and Agriculture Organization (FAO). Under a forest carbon agreement, however, developing nations will play a much more active role, since they control much of the world's forests. Indeed, most of the REDD proposals are aimed exclusively at forests in the developing world. Selection of a neutral forum may be crucial to building trust between developed and developing nations and encouraging negotiation toward a mutually beneficial IFCS program.

It is not clear that any of these options is the clearly superior choice of negotiation platforms. A negotiation platform need not be built on an existing institution, but could be created solely for IFCS negotiations, perhaps as a negotiation committee, workgroup, or independent entity responsible for bringing parties together to negotiate. To assure that the critical countries are included even as the number of participants is limited it might be necessary to develop a new multilateral organization comprised of the countries that are most likely to be participants in the IFCS program, both as suppliers of sequestration services and as funders or purchasers of the allowances. Such an institution could be selected for neutrality by including representatives from nations with divergent interests. However, creation of new institutions – and in particular, creation of new institutional rules – is costly and time-consuming, and should only be undertaken if the benefits of the new forum relative to the existing forum choices outweigh the costs of creating the new institutions.

Finally, it is important to recognize that negotiations regarding continuing adaptation of the IFCS program may have different institutional needs than the initial programmatic negotiations. Ongoing negotiations are more likely to center around scientific and technical issues than highly political issues. This suggests that while the UNFCCC or a similarly neutral negotiation platform might be needed initially, subsequent negotiations might be hosted by think tanks, universities, or other institutions known for their technical expertise rather than their neutrality. Similarly, if negotiations will become a regularly recurring part of an IFCS program, there may be significant advantages to be gained from creating an institution designed primarily for the purpose of IFCS negotiations. If negotiations are one-time occurrences, however, the costs of creating new negotiation institutions may outweigh these benefits.

## **B. Information to Support Individual Country Decisions**

Once the design of the IFCS program is determined, many of the individual countries will require neutral, transparent, accurate, and accessible information to help them consider the terms of their own participation. This information should include an assessment of current national carbon stocks, past forest trends, projected future trends, and the extent of opportunities to influence the direction of future stocks and flows of forest carbon. Potential participants will also need access to information about the expected future costs and benefits – economic, political, social, and environmental – of participation in the IFCS program, as well as information about the risks involved. Moreover, because the negotiations about carbon price (in the case of the Brazil model) and baselines (for all countries) are multilateral in nature, each country might want similar information about other participants in the program. This information is a crucial starting point for negotiations, because it will help all parties understand what each nation stands to gain from the program, as well as the opportunities each must forego by participating.

Parties will also need information about the IFCS program itself – about the other parties' commitments, the extent of funding likely to be available for forest carbon activities, the validity of measurement, verification, and compliance monitoring programs, the expected price of emissions allowances, and the interaction with any other carbon agreements. Countries are unlikely to negotiate participation and invest resources unless they are convinced that other parties will honor their commitments. This is particularly important with a forest carbon program, since countries will not receive the environmental benefits of reduced atmospheric carbon unless other countries also honor their commitments. In addition, a forest carbon program that does not include a majority of the forest nations risks the problem of leakage, in which deforestation activities migrate outside the program area and threaten to undermine the carbon benefits achieved by participating nations.

To adequately support the negotiation process, these information services must be characterized by trustworthiness. The information must be reasonably accurate and its preparation must be transparent. It must also be seen as neutral – that is, the parties gathering and analyzing information should not have any particular interest in the outcome of the negotiation. The information must also be accessible to all parties – made freely available in formats and languages that all parties can access.

### *1. Specific Information Needs Under the Three IFCS Models*

The key characteristics of information services – neutrality, transparency, accuracy, and accessibility – must be the same for information services used to support IFCS negotiations under any model. However, each model presents slightly different information needs that may affect the ultimate choice of institutions used to supply the information.

Under the Brazilian model, two key aspects of the negotiation will be carbon price paid to forest nations and the amount of funding available to reward these nations. Forest nations will invest in new policies and programs only if they have a credible commitment from donor nations that sufficient funding will be available to reward these activities. Donor nations, in contrast, will be willing to commit those funds only with sufficient assurance that the program will deliver the expected benefits. Since the Brazil model is not linked to emissions trading, the only benefit of the program to donor nations is its environmental impact – that is, its effectiveness at reducing atmospheric carbon levels. Donor nations will be looking for evidence that the program as a whole will be effective – that forest nations have the capacity to effectively address forest carbon, and that enough forest nations participate to maintain the environmental integrity of the program.

Because of these particular needs under the Brazilian model, negotiations will require information about the expected environmental and economic benefits of addressing atmospheric carbon levels through forest carbon programs. Parties will also need information about opportunity costs, particularly for key nations such as Brazil and Indonesia whose participation is crucial. Parties will need sufficient information about past, current, and projected future forest trends to establish a starting baseline for rewarding countries. If donor nations are not satisfied that the program is achieving the desired environmental benefits, they will be unlikely to continue to fund the program.

As with the Brazilian model, under the coalition approach forest nations will need similar assurance that their investments in forest policies and programs will be rewarded. However, unlike the Brazil system, this assurance must come from information about the expected market price for carbon credits or allowances at various points in the future. Countries that anticipate purchasing these credits will also need information about expected credit prices, as well as about their future obligations under a carbon trading agreement. These needs must be supported by accurate modeling of the overall carbon agreement, as well as a credible commitment on the part of the international community that such an agreement will remain in force with relatively stable rules into the foreseeable future.

While the PINC model includes industrialized as well as developing countries, and the scope of forest activities covered is broader than the coalition REDD model, the negotiation-phase information support needs are similar. Even though the number of participant countries increases under the PINC model, the industrialized countries under PINC are likely to be more self-sufficient in terms of information.

Under all IFCS models, parties will need information about countries' existing forest conditions as a starting place for determining baselines or reference stocks. This information must be accurate enough to reassure the international community that forest credits will be awarded on the basis of additional carbon savings, so that the environmental integrity of the system is not undermined. In addition, since buyer nations may be called upon to negotiate deeper emissions abatement commitments as forest carbon credits

come online, these nations need information about the environmental benefits of participating in the program. Finally, under the coalition approach, parties will need relevant information about a country's social, economic and environmental conditions to establish development adjustment factors for individual nations.

## *2. Institutional Options to Provide Information Services*

Ideal institutional arrangements will depend to a degree upon the IFCS model chosen. Because the coalition and PINC approaches tie IFCS credits to the carbon market, they require more detailed, accurate forest data than the Brazilian model requires. However, the Brazilian model may require highly detailed information and economic analysis targeted at a small handful of important forest nations. All models will require detailed modeling and analysis of the expected economic impacts of the IFCS program at different levels of participation, as well as modeling and analysis of the expected impacts of climate change at different levels of participation.

Much of this information is currently supplied by existing institutions – for example, the Food and Agriculture Organization of the UN (FAO) provides global forest data,<sup>45</sup> the World Bank provides economic modeling,<sup>46</sup> and the International Panel on Climate Change (IPCC) provides environmental modeling of climate change impacts.<sup>47</sup> Continuing to use these institutions provides an advantage in terms of cost and time. However, in some instances the accuracy and credibility of information from these institutions may be compromised – for example, data from the FAO is self-reported from countries that may lack resources to comprehensively assess forest extent. In other instances, some parties might question the neutrality of the institution.

These problems might be overcome by establishing protocols for information gathering and providing oversight by neutral international bodies. Alternately, independent third party contractors or academics might be hired to provide some information, although this will require additional time and will incur transaction costs associated with the contracting process. Nonetheless, such arrangements may be preferable where information needs have significant political implications or where timeliness of the information is less important.

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<sup>45</sup> The FAO conducts comprehensive global Forest Resource Assessments every five years. The most recent assessment, FRA 2005, includes limited data about forest carbon stocks. See U.N. Food and Agriculture Organization, *Forest Resource Assessment 2005* (available online at <http://www.fao.org/forestry/fra/fra2005/en/>).

<sup>46</sup> See, e.g., proceedings from The Costs of Reducing Carbon Emissions from Deforestation and Forest Degradation, (World Bank Workshop held on May 27, 2008) (proceedings available online at <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTCC/0,,contentMDK:21799130~pagePK:210058~piPK:210062~theSitePK:407864,00.html>).

<sup>47</sup> See, e.g., IPCC, *Fourth Assessment Report* (U.N.F.C.C.C. 2007).

#### **IV. Finance & Transaction Support**

Any IFCS program will need institutions to transfer funds to participating forest nations. These institutions will need to meet the divergent needs of both forest nations and donor or purchaser nations. Moreover, finance support will need to address the key features of IFCS transactions: the long time horizon between the initial negotiation and investment processes and the eventual reward for forest carbon sequestration, high information needs about changes in national forest carbon stocks, and high degrees of uncertainty and risk.

One of the key needs for many developing nations will be the availability of upfront financing to launch programs, policies, and measurement efforts. Adequate upfront financing for these activities is not only crucial to the effectiveness of the overall program, but is also an important aspect of political viability in many developing forest nations. However, upfront financing also requires increased monitoring of activities to ensure compliance with the IFCS program, thus increasing transaction costs.

Currently, several bilateral and multilateral initiatives are addressing some of the developing nations' upfront finance needs. The World Bank's Forest Carbon Partnership Facility, for example, is working with several developing countries to prepare them for the tasks of implementing new forest programs and policies and measurement of forest carbon stocks. Similar efforts are also underway through the UN-REDD program and through bilateral agreements between individual donor and forest nations.<sup>48</sup> In addition to providing valuable lessons about how to implement IFCS programs, these efforts may be able to minimize the need for upfront financing during actual IFCS program implementation, at least for developing nations already involved in these projects. Nonetheless, these programs address upfront finance needs on a country-by-country basis. An effective, comprehensive IFCS program will need to be multilateral to achieve maximally cost-effective greenhouse gas emissions reductions and minimize leakage. Addressing the finance needs of a multilateral program will at a minimum require either an additional finance mechanism or additional pledges from donor nations.

In addition to upfront finance needs, any IFCS financial institutions will need to address the "credible commitment" problems inherent in IFCS finance. Credible commitment problems arise when parties to a transaction, such as the participants in an IFCS program, make promises in the present that will not be in their interest to honor in the future. The primary credible commitment problem in an IFCS transaction is the risk of premature defection, since conditions may change over time that give one or both parties an incentive to dishonor their promises. This risk is particularly strong in the context of IFCS agreements, which depend heavily on long-term environmental and economic conditions, both of which are subject to

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<sup>48</sup> Most prominent among these is Norway's International Forest and Climate Initiative, which will be used to work directly with Indonesia, Mexico, and other countries to improve forest governance in preparation for an IFCS program. See <http://www.regjeringen.no/en/dep/md/Selected-topics/climate/the-government-of-norways-international-.html?id=548491>.

a high degree of uncertainty. The risk of premature defection will diminish over time as repeat transactions promote trust among parties, but some risks are inherent in the nature of the IFCS program itself, and are best addressed by institutions that allow each party to make credible commitments that other participants may rely on.

Moreover, credible commitments are crucial to the political viability of the IFCS program, particularly among developing nations, many of which have grown skeptical of developed countries' willingness to commit funds to climate change mitigation and adaptation programs and who will need to see credible commitments before agreeing to take action.

There are two elements necessary to overcoming the credible commitment problem – realigning the incentives and monitoring performance.<sup>49</sup> The following sections discuss the importance of credible commitments in the context of IFCS programs, as well as ways to realign the parties' incentives. Monitoring performance is addressed in Section VI.

#### **A. Finance and Transaction Support Under the Three IFCS Models**

There is generally a substantial lag time between the investment of resources to change current forestry practices and land uses, and the development of a recognizable difference that earns rewards in the international arena. In the case of new forest plantations, depending upon the location and species, it can take anywhere from 8 to 80 years for newly planted forests to hit their peak uptake rate. This significant lag time increases risks to all parties to the transaction – risks that are best addressed by transactions that provide credible commitments that reduce each parties' risks.

Under the Brazilian model, the transaction is between the forest nation and the forest carbon fund.<sup>50</sup> Forest nations participating in this program must invest money and labor in forestry projects and programs well in advance of the payoff from those programs. To proceed with these programs, forest nations will need a credible commitment from the international community that the agreed-upon carbon price will be payable at the end of the compliance period. If the forest carbon fund is large enough at the outset of the program to pay all forest nations for their expected carbon savings, this will be seen as a credible commitment. However, donor nations are unlikely to be willing to supply this full amount without a credible commitment on the part of forest nations that the expected savings will be realized.

In the coalition and PINC models, donor nations' carbon emissions obligations might provide a credible commitment that they will be willing to purchase forest carbon credits. With these models, however, forest nations will need a credible commitment on the part of the international community that

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<sup>49</sup> See OSTROM, *supra* note 27, at 45.

<sup>50</sup> Variations on this model might involve transactions directly between forest nations and donor nations, or forest project managers and donors.

these obligations are stringent enough to create demand for forest credits, and that they will be imposed and enforced long enough into the future to make current investment in forests worthwhile. In addition, since buyer nations may face more stringent emissions reduction requirements under these models, these nations will need a credible commitment from forest nations that the credits will be available when needed.

In addition to credible commitments, all three IFCS programs need institutions to address risk of forest carbon losses from natural disasters. The appropriate allocation of risk among the IFCS parties should depend upon whether any parties are able to prevent the disaster and which parties are best able to absorb risk-related losses. Forest nations in the developing world are likely to be ill-prepared to absorb loss of investment in forest programs and policies, and as a political matter the international community has repeatedly stated that developing nations' needs for economic development should be respected.<sup>51</sup> However, if these nations are not required to bear any risk, they will have little incentive to aggressively prevent catastrophic losses from forest fires and insect infestations, which may be preventable through silvicultural management.

The issue of risk allocation becomes more complex under the coalition and PINC models. Since these models link forest carbon credits to emissions trading, any unexpected carbon emissions due to natural disasters could have significant impacts on the entire carbon program. The coalition model expressly exempts natural disasters from the IFCS program, with the result that such disasters could contribute unaccounted-for carbon emissions and undermine the entire program. This amounts to a *de facto* allocation of risk among the entire global community, with the greatest risk borne by nations who face the most detrimental impacts from climate change. It also suggests that monitoring of countries' forest management programs will be important, so that forest nations are exempt only from natural disasters that are truly beyond their control, boosting transaction costs significantly under the coalition approach.

The PINC model, in contrast, requires countries to account for all carbon losses and gains, regardless of whether the cause is natural or anthropogenic. This approach reduces transaction costs by reducing the monitoring need under the coalition approach, but places the risk of losses from natural disaster solely on forest nations unless other institutional arrangements are made.

Finally, all three IFCS programs will need to consider developing nations' need for initial financing of some forest carbon programs, particularly in nations where significant investment will be needed to increase national capacity to implement these programs and policies. However, these financing arrangements necessarily involve the risk that despite investment in capacity, the country will be unable

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<sup>51</sup> The principle that developing nations share "common but differentiated responsibilities" for environmental problems recurs throughout most environmental treaties, including the U.N.F.C.C.C. *See* United Nations Framework Convention on Climate Change, Art.3 (U.N. 1992).

to implement programs and policies that result in carbon savings. As with the risk of natural disaster, institutions will be needed to allocate these risks among the parties in such a way that balances the high-powered incentives of risk bearing with the political need to minimize the amount of risk burden placed on developing countries who can least afford to bear it.

### **B. Institutional Options to Provide Credible Commitments**

All three IFCS models provide some incentive for forest nations to promise high reductions in deforestation and subsequently increase deforestation rates. In the case of the Brazilian and coalition models, countries may slow their deforestation rates for a period of time, reap rewards from the fund in the present, and then increase their deforestation in the future. In the case of the PINC model, if countries experience a decline in forest carbon stocks following enrollment they are responsible for making up the debit. However, under PINC some countries may negotiate a favorable reference stock (one that is lower than their actual stock) as a condition for their enrollment, maintain their stocks for the first compliance period, reap the short term rewards, and then withdraw.

Commitments, of course, run in both directions. All three models require developed nations to follow through with either financial pledges or purchase of carbon credits. Developed nations may promise significant amounts of funding during negotiation stages, but may be reluctant to follow through on these commitments if the political and economic incentives change over time.

There are several strategies to address the incentives problem. First, much of international cooperation and treaty compliance is based on honor and reputation. No country wants to admit in an international forum that it did not keep its promises. However, that motivation seems less compelling in the climate change arena, where the costs of addressing greenhouse gas emissions can have enormous economic consequences. Several countries have failed to meet their emissions commitments under the Kyoto Protocol, even after ratifying the treaty. Moreover, once there are substantial resources at stake, such as the payments from a fund or income from emissions allowance sales, the temptation for countries to game the system could be substantially increased. Still, any institutions that can increase the visibility of noncompliance will at least marginally increase countries' inclination to continue cooperation.

A second approach to address the credible commitment problem is for the promisor to provide a bond or hostage that is valuable enough to assure delivery or performance. In the case of participants in an IFCS program, that bond could be their future funding from the World Bank, their participation in the WTO, or some other privilege that the country enjoys but that can be revoked by the international community. This approach would address credible commitments of both forest and donor nations, and is likely to be more effective than the honor-based system described above. However, it also raises the potential negative consequences for participating nations and will be less attractive for nations concerned

about their own potential non-compliance. It will be more politically viable, however, among nations that are less concerned with their own non-compliance than they are with the overall effectiveness of the program.

A third mechanism is to monitor performance to assure adequate preparation for eventual performance. Performance monitoring has been used with particular success where users of a common pool resource can easily monitor each others' behavior.<sup>52</sup> In the IFCS context, performance cannot be readily measured in the early years of the program, due to the lag time needed for forests to mature. However, inputs to performance, such as enactment of forest policies and development of measurement and governance capacities, can be monitored and verified as a proxy for performance and to assure other parties to the transaction that a nation is capable of performing and has invested time, personnel, and financial and political capital in its eventual performance.

Some of this monitoring will be in the form of self-reporting, combined with a degree of oversight from the international community. Existing institutions, such as the World Bank's Forest Carbon Partnership Facility, might provide some of the monitoring related to national capacity building and policy implementation. For this type of monitoring, the technical and policy expertise of the institution will be most important, as well as the neutrality and transparency of the information provided. Once the IFCS program is well underway and input monitoring is less crucial, institutions that provide measurement and verification<sup>53</sup> might be used to monitor forest nations' interim progress between compliance periods, suggesting institutions that have expertise in actual forest carbon stock measurement.

Any of these approaches will, however, raise the transaction costs of the approach. However, the need to monitor inputs will tend to diminish over time, as countries provide a track record of meeting obligations and as the inputs become less novel and more routine. The information from monitoring can also be useful for overall IFCS program oversight,<sup>54</sup> so that greater utility can be derived from the process, despite its high transaction costs.

A final mechanism to provide credible commitments is to release rewards gradually over time. For example, under the Brazilian model, payments from the fund for carbon sequestration gains could be structured to pay out over time, contingent on continued performance. Similarly, under the PINC approach, if countries are due significant allotments of allowances at the end of the first applicable compliance period, those allotments can be released in a phased pattern over several years. If a country appears to be headed for a debit (i.e., loss in carbon stock) during the next period, then the release of allowances can be delayed, serving as a type of performance bond.

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<sup>52</sup> See Ostrom, *supra* note 27.

<sup>53</sup> See *infra* Part VI.

<sup>54</sup> See *infra* Part V.

Under the Brazil approach, credible commitments are likely to occur incrementally over time, through international negotiations, in response to others' commitments, and through some combination of the approaches described above. Since the Brazil approach is not supported by a broader international climate change treaty, the use of honor and reputation is less likely to provide credible commitments; instead, credible commitments will be better provided through monitoring inputs, releasing rewards over time, and, as parties gain trust in the program, perhaps parties will become willing to be bound to their promises through use of a hostage – an approach that will almost certainly require near consensus of the Parties to whatever international agreement is used to provide that hostage.

Under the coalition and PINC approaches, in contrast, credible commitments will largely be provided by the legal architecture of an international climate change regime. However, the climate change regime itself will still need to incorporate one or more of the approaches described above. In the context of a broader international treaty, the use of national reputation and the use of hostages become more effective and politically viable options. However, because countries can generally withdraw from treaties at will, the use of input monitoring and phased payments are likely to increase the effectiveness of the program, outweighing the extra transaction costs that these approaches entail.

### **C. Institutional Options to Address Risk**

The three different IFCS models place the risk of natural disaster upon different entities. Both the Brazilian model and the coalition model focus exclusively on anthropogenic forest changes only – the coalition model explicitly excludes natural disasters, and the Brazil model focuses only on deforestation. As a result, the risk of natural disaster under these models is borne by donor or buyer nations – who may inadvertently pay for carbon “savings” that are undermined by natural disasters – and by the global community as a whole, which is not protected from the environmental effects of carbon released by natural disasters. Under the PINC model, however, all changes in the national forest carbon inventory, regardless of cause, are treated identically, so that forest nations bear the risk of natural disasters.

Under the Brazil and the coalition models, risk might be reallocated so that both parties share the risk of natural disasters, perhaps by reducing, but not eliminating, the carbon price paid to forest nations that have experienced natural disaster. This approach would be helpful in the case of natural disasters in which the forest nation has some ability to prevent the disaster from occurring; risk sharing would give the forest nation an incentive to prevent the problem. However, this approach will involve determining whether a natural disaster is preventable – an exercise that could prove difficult, time-consuming and highly political. In addition, members of the international community might object to imposing any financial burden on developing nations that have recently experienced an unintended carbon stock loss, such as

through catastrophic forest fire. This approach should only be taken if the benefits from providing incentives for prevention outweigh the political costs.

An alternative option is to pool risk. Under the Brazil model, one possibility is to make any payment to forest nations contingent upon the overall success of participating nations. Thus, no nation would be rewarded unless participants had together achieved some amount of carbon savings. This would ensure that donor nations receive at least some benefit, and might provide some risk management incentive to forest nations. However, it would, decrease individual country accountability, diminish the credible commitment provided to forest nations, and might discourage participation.

Under the coalition or PINC models, risk pooling could take the form of a carbon credit set-aside program.<sup>55</sup> Under such a program, a small percentage of all carbon credit sales would be removed from the market and set aside as insurance against natural disasters. The cost of setting aside credits could be placed upon forest nations, donor nations, or shared between both. Similarly, the credits could be used to ensure that the forest nation is fully compensated despite the natural disaster, simply retired to protect the environmental integrity of the carbon market, or allocated so that forest nations and the international community both share in the benefits and risks of the program. As with other risk sharing arrangements, the forest nations will have incentives to prevent disasters only if they share in some amount of the risk, but developing forest nations can only share in the risk to the degree that the international community agrees is equitable.

#### **D. Institutional Options to Address Upfront Financing Needs**

Upfront financing needs of developing nations present a unique and challenging situation. In many cases, nations' upfront financing needs may not be directly related to forests per se, but will be investments in judicial, agency and education systems that are needed to implement forest programs and policies. Thus, these investments will tend to be most important in the early years of the program and are likely to yield benefits beyond the IFCS program itself, but the investments themselves may not be capital-intensive or provide readily measurable returns on investment. As a result, developing nations may have difficulty accessing funds through ordinary finance channels, making financing through the IFCS program itself an attractive option.

The problems with upfront IFCS financing are similar to the problems related to natural disaster. In any financing arrangement, risk must be shared between the parties providing the financing and the parties receiving the financing. The precise allocation of risk between these parties needs to provide the recipient with incentive to use funds wisely, but avoid placing heavy burdens on developing nations.

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<sup>55</sup> For a discussion of carbon credit pooling and other risk management options for REDD, see Michael Dutschke & Arild Angelson, *How Do We Ensure Permanence and Assign Liability in MOVING AHEAD WITH REDD* 2008, at 83.

In the IFCS context, financing could be arranged in the form of early payments to forest nations for IFCS credits. Under such a system, the early payment would need to be sufficient enough to provide needed investment, but small enough so that the anticipated final payment provides sufficient incentive for the forest nation to continue in the program. Such a system would also work well with the single buyer approach, since it would allow the single buyer to determine how much upfront financing to provide, advance the appropriate amount of funding, and allocate risk among the various buyers. However, this approach would work only for nations whose total anticipated payment is significantly higher than their upfront capacity needs.

Another option to provide the upfront financing is to offer low-cost loans to developing countries, either through existing institutions such as the World Bank, through some of the IFCS funds that have begun to emerge post-Copenhagen, or by a small levy on the sale of emissions credits. Under this approach, developing nations and loan institutions could negotiate loan terms that allocate risk among the parties accordingly. However, this approach could be politically difficult among developing nations who already bear significant debt burdens.

A final option for providing this funding is through direct donation by developed countries. This approach removes risk to developing nations, although the amount of funding available may be limited by donor willingness to invest in national capacity-building efforts without certainty that these efforts will be successful.

## **V. Oversight Support**

Under any of the IFCS models discussed, an institution or set of institutions will need to ensure the smooth functioning of the entire system. One crucial aspect of the oversight function is proper monitoring. Oversight monitoring differs somewhat from the monitoring functions described in Part IV to ensure credible commitments. Credible commitment monitoring is largely directed at input monitoring of individual countries – making sure that parties are capable and prepared to make good on their commitments. Individual performance is important to program oversight, but in addition to monitoring individual country performance, oversight requires monitoring of the program as a whole – not only individual countries' actions, but the sum of those actions and their interactions.

Part IV discussed the use of monitoring as a way for individual countries to provide credible commitments to all parties involved in IFCS financial transactions. IFCS program oversight can build on information gained from this monitoring function, as well as information gained from the negotiation and carbon measurement processes. This information will then be used to make midcourse corrections, enforce the program, resolve disputes, and discourage defection.

For oversight purposes, the crucial use of monitoring information is to identify difficulties and make midcourse corrections before problems become severe. An IFCS oversight institution will need to monitor the amount of aggregate funding (or forest carbon credit demand) anticipated at the end of any given compliance period, the extent and pace of forest nations' aggregate progress toward slowing or reversing deforestation trends, and any significant gaps in global forest participation that suggest leakage could be a problem. The oversight institution will also need to be in a position to suggest ways to address problems that occur during IFCS program implementation, such as putting additional political pressure on donor nations, providing forest nations with needed technical assistance, or developing policy approaches to address leakage.

Since much of this information should be available from other aspects of the IFCS program (such as the negotiation and transaction support services), the oversight institution need not have significant research and technical expertise. This institution will need some expertise with analysis and economic modeling, however, as well as enough political clout to effectively pressure countries and suggest needed policy adjustments in the program. It will also need to be perceived as neutral, so that any midcourse corrections it recommends will not be seen as favoring some parties over others. Such an oversight committee could be part of the UNFCCC itself, or could take the form of a high-level advisory board to the IFCS program itself. The latter option might be particularly useful in conjunction with the carbon markets created under the coalition or PINC models.

The WTO offers a potentially useful model of a "bilateral surveillance" approach to monitor individual countries' performance at meeting their WTO obligations. Under this approach, representatives from several WTO nations periodically undertake a rigorous and transparent review of each country's implementation of WTO-relevant policies. The WTO surveillance system is entirely separate from the enforcement and dispute resolution processes, and instead serves as an opportunity to exchange information among all WTO parties, provide reassurance about countries' abilities to perform, and identify potential problems that may be rectified before a country falls into non-compliance. This model offers at least two potentially useful advantages for an IFCS oversight institution – the representative nature of the committee and the separation of surveillance from enforcement both increase the neutrality of the forum. However, if this approach is used, steps should be taken to ensure that the oversight institution has sufficient power – legal, political, or both – to spur changes as needed.

The overall complexity of oversight monitoring will depend upon the chosen IFCS model. Under the Brazil model, forest nations do not need to pre-commit to specific reductions and donor nations do not need to commit to particular finance levels, so performance monitoring will be relatively simple – perhaps simple enough to combine with forest carbon measurement and verification services. Under the coalition or PINC approaches, however, significantly more oversight will be needed. A monitoring institution will

need to gather information about countries' IFCS investments and progress toward expected goals, and provide this information to appropriate entities that can anticipate potential problems and, where possible, intervene with rule changes, technical assistance, or enforcement actions where necessary.

### **A. Enforcement & Dispute Resolution**

Enforcement of environmental treaties is notoriously difficult. Overly stringent enforcement regimes can discourage the entry of new participants and encourage defection, thus undermining treaty participation.<sup>56</sup> At the same time, however, inadequate enforcement provisions can lead to lackluster efforts at meeting national commitments. This causes problems not only because poor performance can undermine the environmental effectiveness of the program, but also because it encourages other nations to underperform on their obligations.

These challenges suggest that a politically viable enforcement system must be reliable enough to prevent underperformance, while minimizing the degree of risk that individual countries face in the case of noncompliance. Stringent enforcement systems will be most politically viable where costs of compliance are low and there is little uncertainty about how countries will comply. Under the Montreal Protocol, for example, countries could comply with restrictions by substituting readily available alternatives to the ozone-depleting substances regulated under the treaty. Stringent trade sanctions were politically viable because they provided the certainty that parties were complying with the treaty, but did not expose any individual countries to excessive risk of non-compliance, since compliance was relatively easy in the first place.

In most environmental treaties, however, there is much more uncertainty about how countries will comply and what the costs of compliance will be. Where uncertainty is significant, treaties often rely heavily on transparent monitoring systems to enforce treaties, even where extensive enforcement and dispute resolution provisions exist. This approach minimizes countries' noncompliance risk, but may do so at the expense of some countries' performance, unless the approach is accompanied by significant political pressure to perform. The challenge with designing such an oversight system will be to balance both aspects of political viability with the need to minimize transaction costs.

There are two primary international models that offer possible approaches to enforcement and dispute resolution, although neither is entirely satisfactory for IFCS purposes. The Montreal Protocol established trade sanctions against non-participants as a means of both inducing participation in the Protocol and

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<sup>56</sup> A classic example of this problem is the Kyoto Protocol itself, which created an extensive enforcement regime, but had difficulty convincing major greenhouse gas emitters to join, and even as the first compliance period nears its end, it is unclear whether many parties will be able to meet their emissions reduction targets.

handling the risks of non-compliance.<sup>57</sup> This worked well for the Protocol, where only a small number of countries actually manufactured the regulated substances; for the remainder of the world, participation in the Protocol was clearly preferable to the trade sanctions, and the sanctions have not posed enough harm for any nations to challenge them under WTO law. Under any IFCS program, however, it is less clear what the costs and benefits of participation will be to individual nations, and a stringent enforcement system could easily deter participation or invite disadvantaged parties to challenge its legality.

Under the second model, the WTO has a highly developed enforcement and dispute resolution understanding (DSU).<sup>58</sup> The WTO system provides a degree of enforcement by allowing countries to retaliate against others' noncompliance by imposing trade sanctions of their own. In addition, the WTO has an entire judicial branch that resolves disputes between actors, which is the basis for enforcement actions, and has been regularly used throughout the 15 years the WTO has been in existence.<sup>59</sup>

A similar dispute resolution system might work well in an IFCS context. This approach offers several distinct layers of dispute resolution: informal, intermediary, and appeal level. In an IFCS program, one of these layers might treat some of the IFCS institutions as quasi-governmental agencies, allowing countries to bring disputes before IFCS institutions with particular expertise. For example, countries might be able to appeal verification decisions to an appeals board within the forest carbon verification institution, or appeal accounting treatment to an appeals board within the transaction and finance institutions. This would allow disputes about highly technical aspects of IFCS to be reviewed by parties that have particular expertise in these areas.

Another feature of the WTO system that could prove useful in the IFCS context is the availability of specific remedies. A dispute resolution body should be able to enjoin an IFCS participant from using methods that violate the IFCS program. This could apply to methods of measuring forest carbon, but it could also extend to other aspects of the program. For example, injunctions could be used to enforce aspects of an IFCS program that are designed to protect the rights of indigenous people or other

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<sup>57</sup> In practice, however, the Protocol has relied less on trade sanctions and more on a compliance committee that investigates alleged instances of noncompliance and works with violators to improve performance. Moreover, it is not clear whether trade sanctions for noncompliance under the UNFCCC or the Kyoto Protocol would be as effective. The trade sanctions under the Montreal Protocol are widely viewed as violations of the WTO, but have not been challenged because most of the substances regulated under the Montreal Protocol are manufactured in a small number of nations. Trade sanctions imposed as part of the UNFCCC or the Kyoto Protocol would almost certainly be challenged, and it is not clear that sanctions could be designed that comport with current WTO rules.

<sup>58</sup> See generally World Trade Organization Dispute Settlement Understanding (December 1996).

<sup>59</sup> See *id.* Complaining nations must first raise problems with the alleged violator. If suitable arrangements cannot be made between the parties, complaints are brought to the WTO's dispute resolution panel, staffed by representatives from a wide range of developed and developing nations. Panel decisions may be appealed to the WTO's appellate body. Panel and appellate body decisions are officially adopted by the WTO unless the WTO members unanimously reject the decision. The WTO panel includes use of a wide range of legal remedies tailored to international trade. The DSU allows for injunction, use of trade retaliation, or compensation of prospective damages by offending countries, often in the form of additional trade concessions.

populations that rely on the use of forests. Other specific remedies could be helpful in other contexts – for example, REDD parties could re-adjust baselines as a remedy for misrepresenting data about national forest trends.

The WTO model, however, relies on individual countries' bringing disputes before the WTO. This works well in the context of trade agreements, where individual nations are directly harmed by other nations' noncompliance, providing incentives for harmed nations to raise claims. This approach might work well under an IFCS program that relied heavily on bilateral contracting, but could be less effective under any of the three models discussed in this paper, which are multilateral in nature, so that any individual nations' failure to perform harms the system as a whole but does not provide other individual nations with an incentive to compel performance. Alternatively, an IFCS approach could broaden standing to raise complaints to include key stakeholders, such as environmental groups, community organizations, landowners, and forest trade groups. Since these actors are actively involved in the IFCS implementation process, they are in an excellent position to monitor implementation and detect non-compliance. However, involving these actors also increases transaction costs significantly, since they are geographically dispersed and will need to have access to a global dispute resolution system, and in some cases their incentives may not be entirely aligned with the smooth functioning of the system as a whole.

The Brazilian model, which does not require countries to pre-commit to a particular amount of deforestation, might have minimal enforcement needs. (The Brazil approach would, however, need donor nations to commit sufficient funds to provide adequate performance incentive, suggesting that enforcement of donation commitments could be crucial, although these would likely need to be politically rather than legally enforced.) Under this approach, a simple oversight system might be sufficient.

The coalition and PINC models, however, have greater enforcement needs, since these models are closely connected with other aspects of a complex environmental treaty and carbon market. For these models, a politically viable approach to enforcement will likely need to have several different elements: stringent enough sanctions so that countries are better off complying, but not so stringent that the sanctions are politically non-viable; a functional dispute resolution system; and a transparent monitoring system that allows the international community to enforce by providing technical assistance and applying political pressure.

## **B. Discouraging Defection**

The problem of defection is closely related to the problem of dispute resolution and enforcement and echoes some of the concerns about credible commitments from parties who have incentives to

underperform.<sup>60</sup> Any IFCS program requires parties' long term commitments to allow time for forest policies and programs to result in significant carbon savings. For forest nations, much of the incentive to participate in IFCS will be to gain the financial benefits of improving forest carbon stocks or reducing rates of deforestation. In addition to the initial incentive to participate, nations will need incentives to induce continued long-term participation. These incentives need to be sufficient to keep nations in the program even when opportunities emerge that would reward defection. For example, a nation that has received up front financing to invest in forest programs and then faces a drought that reduces forest extent might decide to exit the program rather than continue to invest in its forests and face little or no reward at the end of the compliance period. Moreover, when the nation exits the program, it might decide to encourage increased deforestation to take advantage of high timber prices resulting from other nations' participation.

This problem can be addressed in two ways: by providing positive incentives for countries to remain in the system, and by providing consequences for countries that exit the system. The simplest way to provide positive incentives is to ensure that even with upfront financing, countries receive a significant benefit only at the end of the compliance period when they can demonstrate that they have achieved forest carbon savings. This approach needs to be combined with some sort of insurance or risk-sharing system to ensure that nations facing natural disaster will not be forced to bear all of the risk, since a risk bearing system that places all the burden on forest nations will encourage, rather than discourage, defection, at least among developing countries.<sup>61</sup>

Consequences for leaving the system can be addressed by including terms for withdrawal in the IFCS treaty. The Montreal Protocol offers a useful model for limiting defection. A party may leave the ozone treaty, but only after four years' participation and one years' notice to other parties that it intends to withdraw.<sup>62</sup> Parties must seek approval from other parties before withdrawing, but they are allowed to withdraw for justifiable reasons that include changed circumstances or frustration of purpose.

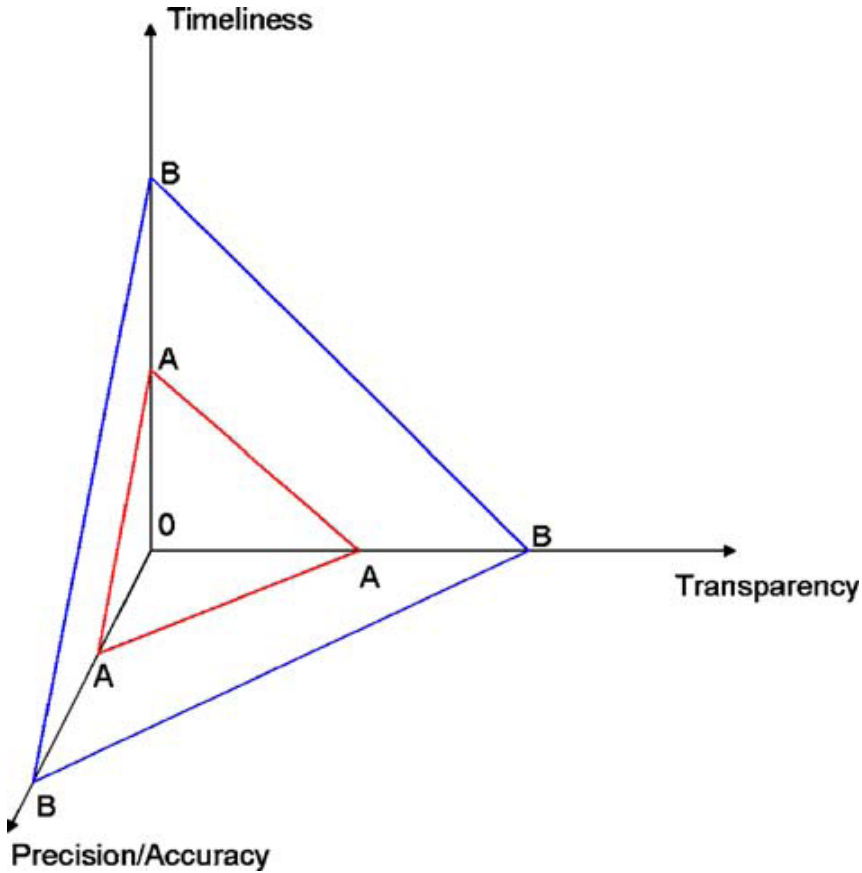
This approach to discouraging defection allows countries to voluntarily relinquish their right to defect. As a practical matter, it also means that discouraging defection and committing to long-term participation will be addressed in the initial negotiation process itself – a process that could be ongoing as parties periodically re-commit to another compliance period in the program and renegotiate program terms as needed. Thus, the institutions needed to avoid defection are closely related to the institutions needed to negotiate participation in the first place.

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<sup>60</sup> See *infra* Part IV.

<sup>61</sup> See *infra* Part III.

<sup>62</sup> See United Nations Environment Program, Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer at 23 (2009).



**Figure 1: Isocost Planes for Performance Characteristics of an IFCS Program Monitoring**

## **VI. Measurement and Verification Support**

All of the IFCS options require accurate assessments of changes in forest carbon flows or stocks that can be used to estimate carbon emissions avoided and/or increases in carbon inventories. In addition to accuracy, these assessments must be transparent, so that all parties are confident in the amount of carbon savings they represent. This is equally true for developing nations and for the international community. To develop confidence and trust in the program, developing nations need to know that they are fully rewarded for their efforts. At the same time the international community needs to know that the carbon credits generated through forestry programs represent real net emissions reductions. In addition to accuracy and transparency, measurements should be timely enough to be usable in a periodic system of measurement and reward, particularly for the PINC system. Finally, the cost of the measurement services needs to be minimized (Figure 1).<sup>63</sup>

<sup>63</sup> Figure 1 from Andersson, K., T. Evans, and K. Richards. 2009. "National Forest Inventories: Policy Needs and Assessment Capacity." *Climatic Change* Volume 93 (Nos. 1 -2): 69-101 at 89.

In the abstract, if we think of these three characteristics as being measured along three different dimensions, then it is possible to describe any national inventory program as falling somewhere in “inventory space” (this of course assumes we are holding constant other important factors, such as the number of participating actors in the program).<sup>64</sup> This inventory space is illustrated by Fig. 1, which expresses the coordinates of this space as measures of timeliness, precision/accuracy and transparency. Moreover, each point in this “inventory space” will have a cost associated with it, which we might measure in dollars per year. Collecting all of the points in the space that have a given cost, say *A* dollars per year, will provide a hyperplane that economists call an “isocost” curve. In Fig. 1, the isocost hyperplane *A* is a collection of all combinations of programs (each described in terms of timeliness, precision/accuracy, and transparency) that have a cost of *A* dollars per year. The hyperplane is depicted as flat, though the result could easily be a paraboloid.

This means that for any given cost, there are a host of inventory designs, each with a different level of timeliness, precision/accuracy, and transparency. Designing a program for a given cost will involve making tradeoffs among the three characteristics. For example, achieving increased precision and accuracy of inventory estimates might require managers to assign more resources to increase the sample size of field plots. Ensuring more transparency in the preparation and reporting of results also carries costs—more public scrutiny will require modifying working routines for data collection, analysis, processing, and communication of data, methods, and results (e.g., web-based database and library) as well as broader participation of nongovernmental actors in all stages of the inventory. Finally, improving the timeliness of the reported results of the inventory will also require more resources to speed up the work during the data collection and processing stages.

Recent advances in technologies such as remote sensing provide promising tools for measurement and verification of forest carbon stocks. While these technologies are promising, they do not offer a stand-alone tool for measuring forest carbon stocks. Most REDD analysis has recommended a combination of remote sensing and field measurements to measure and verify changes in carbon stocks.<sup>65</sup> However, different types of remote sensing technologies provide different levels of accuracy at different cost points.<sup>66</sup> Similarly, the accuracy of field measurements depends upon the amount of time that can be devoted to data collection and the number of field measurements that can be taken. Moreover, achieving a high level of transparency in the measurement process will also raise measurement costs. Thus, any choice of measurement technologies involves tradeoffs between accuracy, transparency, timeliness, and cost.<sup>67</sup>

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<sup>64</sup> *Id.* at 88.

<sup>65</sup> *Id.* at 73.

<sup>66</sup> *Id.* at 79-80.

<sup>67</sup> *Id.* at 88-89.

These tradeoffs are important considerations when determining how to organize measurement and verification support. Choices between these tradeoffs will also depend upon the choice of IFCS model. Under the Brazil approach, for example, cost minimization may be a higher priority than under the PINC or coalition models, since the funding stream is likely to be more limited than under the other models. Transparency of the measurement system is more important under either the PINC model or the coalition model, since overall confidence in the program can have tremendous impact on the success or failure of the larger carbon trading system. Accuracy is most important under the PINC model, which requires measurement of forest carbon due to all changes – not only deforestation, but also degradation, afforestation, reforestation, and other land use changes.<sup>68</sup>

FAO currently provides significant amounts of information about forest type, extent, and carbon content.<sup>69</sup> While this information is admittedly flawed, it provides an initial assessment of the state of the world's forest carbon stocks and presents a model for collection, measurement and verification of forest carbon data. The FAO approach relies heavily on self-reporting by individual countries, using a common reporting format. FAO then compiles, analyzes, and publishes the data.

The current approach used by FAO suggests a possible approach to measurement and verification, in which nations are primarily responsible for measurement, with an international institution that harmonizes the data collection process, provides technical assistance, publishes the measurements, and verifies the accuracy of the measurements themselves.

The advantage of this approach is that transaction costs are minimized, since countries have a logistical advantage of proximity to the forests, and the support of a single institution takes advantage of economies of scale in harmonizing data collection methods and providing technical assistance. This approach also offers some economies of scale to individual nations, who can combine data collection efforts with implementation of forest policies and programs and improved capacity building via increased involvement of stakeholders.

There are several disadvantages of this approach, however. A major concern is that some nations lack the capacity to conduct these assessments. In addition, this approach requires extensive effort by the FAO (or similar organizations) to ensure that countries use common reporting definitions and methodologies so that data can be accurately aggregated.<sup>70</sup> In addition, nations may have an incentive to misrepresent the

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<sup>68</sup> See Marku Kanninen et al, *Do Trees Grow on Money? The implications of deforestation research for policies to promote REDD* 10, Center for International Forestry Research (2007) (commenting that measurement of degradation requires higher resolution data compared to measurement of deforestation).

<sup>69</sup> See *supra* note 45.

<sup>70</sup> Lack of common definitions and methodologies has diminished the accuracy of the FAO reports, which rely on a common reporting format for all countries, even though countries' actual field measurements may use different categories and definitions as the basis for measurement.

data to gain the maximum benefit in the negotiation and/or compensation phases of the IFCS program, requiring significantly more verification than the FAO currently provides.

These disadvantages could be minimized by allowing some countries to conduct joint measurements where doing so would represent an economy of scale, for example in West African countries that share geographic proximity and similar forest conditions. These disadvantages can also be addressed through appropriate assistance, monitoring, and verification, although doing so will increase overall IFCS program costs.

An alternative option would be to create an international entity to undertake all measurement activities. However, such an organization would face the same capacity-building problems faced by individual nations, since no single organization has the capacity to undertake such a large forest carbon measurement process. In addition, such an entity would be costly to create. However, such an entity would have no incentive to misrepresent data, would require less oversight and verification, and could use uniform, transparent data collection methodologies.

A related option is to use third party contractors to conduct measurements. Under this approach, private contractors, universities, or other entities could bid for the right to conduct the assessments. This approach might also be used *only* in countries that currently lack the capacity to measure forest carbon, perhaps in conjunction with requirements that private contractors transfer technology to host nations as part of the measurement process. This approach would address the problem of capacity without the need to raise significant funds. It would also address the incentive to misrepresent data – although it might introduce a new problem if contractors are tempted to minimize costs in ways that affect accuracy. However, it would require an entity to coordinate and monitor each contract, from the bidding process to the results. In addition, this approach could create problems with transparency if the contracts do not provide adequate guidelines about the methods that should be used and the ways that information should be reported.

## VII. Country Readiness

Under each of the three IFCS models the unit of analysis is the nation itself.<sup>71</sup> This means that the changes in carbon flows or stocks are measured at the national level. This in turn implies that national governments must take the lead to induce domestic changes, track their progress, and determine how the rewards for success (payments in the case of the Brazilian model, marketable carbon allowances in the case of the REDD and PINC proposals) are distributed. Not all nations are ready to take on and succeed with these new responsibilities.

The first step for virtually all countries participating in an IFCS program will be to develop, implement and enforce policies to slow deforestation, increase forest expansion, and manage forests for increased carbon sequestration. Given the poor track record that some countries have experienced, there may be a place for organizations such as the UN, the World Bank, international NGOs, and policy research centers to advise countries on options for developing effective forest policies.

Countries will also have to develop at least some internal forest science capacity to evaluate their programs and to track changes in forest sequestration. Depending upon the design of the international monitoring system,<sup>72</sup> countries may also require substantial capacity building before they can confidently and successfully participate in an IFCS program. Options to develop internal forestry skills, particularly in developing countries, include expansion of funding for schools of forestry around the world, investment by the World Bank, and bilateral funding by donor nations. It might also be possible to build training programs into the design of the IFCS program itself.

Finally, and perhaps most intractable, it will be important for countries to have domestic accountability for the management of resources – both forest and financial. An expansive IFCS program could represent a substantial new source of funding for a number of countries. As recent events in Liberia demonstrate, even the largely voluntary carbon offset market that is in place today may have induced substantial graft and misappropriation.<sup>73</sup> Moreover, even where there are legitimate national programs based on international incentives, it will be necessary for government officials to manage the IFCS payments from the fund (Brazilian model) or tradable allowance market (REDD and PINC models). As the IFCS program is designed and implemented, parties should at least consider steps that could be taken to increase domestic accountability for the appropriation and management of the resources involved.

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<sup>71</sup> There are some variations on the REDD proposal that evaluate changes at the regional or even project level. However, the generic trend in the literature and discussions represents an increasing awareness that the national level approach has several advantages.

<sup>72</sup> See discussion below, Section VI.

<sup>73</sup> See Michael Peel and Fiona Harvey. “Police probe as carbon deal hit by bribe accusation” *Financial Times*, June 4, 2010; reporting a London police investigation of Carbon Harvesting Corporation on allegations that the company planned “to pay Liberian officials \$2.5m (£1.7m) in connection with land concessions the company hoped would earn it more than \$2bn.” Available at <http://www.ft.com/cms/s/0/3e9cb276-6f47-11df-9f43-00144feabdc0.html>.

## **Conclusion**

Institutional design can have an enormous impact on the success or failure of an ambitious IFCS program. By examining some of the aspects of each service needed to support an IFCS program, we can begin to identify the key institutions that can make the IFCS program a successful way to reduce atmospheric carbon levels in the years and decades to come. Part of the IFCS discussion should include the characteristics of the support services needed, the way those support services relate to overall IFCS program goals, and the need for institutions to adapt over time in response to changes in the IFCS program. As the global community enters into the first phases of IFCS implementation, these considerations should be a starting place for decisions about how to invest IFCS funds and move forward with a long-term implementation program.