

The Terrestrial Carbon Group

How to Include Terrestrial Carbon  
in Developing Nations in the Overall  
Climate Change Solution

[terrestrialcarbon.org](http://terrestrialcarbon.org)

July 2008

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Avoiding dangerous climate change requires a multifaceted response. Terrestrial carbon (including trees, soil, and peat) is a critical untapped element that could provide up to 25% of that response. Deforestation and the degradation of forests and peatlands in the tropics of developing nations currently cause the vast majority of terrestrial carbon emissions.

The Terrestrial Carbon Group came together to develop policy recommendations to unlock the potential of terrestrial carbon. It is an international group of specialists from science, economics, and public policy with expertise in land management, climate change, and markets. The Group has experience in nations and regions where land use is a significant source of greenhouse gas emissions, in nations and regions where land use could sequester atmospheric greenhouse gas, and in nations and regions with existing and emerging carbon markets.

The objective of the Terrestrial Carbon Group is for terrestrial carbon to be effectively included in the international response to climate change. This paper provides guiding principles to do so in support of: (a) ongoing global negotiations on reducing emissions from deforestation and degradation (REDD) under the United Nations Framework Convention on Climate Change and Kyoto Protocol; and (b) emerging national, bi-lateral, and multi-national efforts to maintain and enhance terrestrial carbon. Both market and non-market approaches to terrestrial carbon and climate change are necessary. Within that context, this paper proposes a system to credibly include terrestrial carbon in developing nations in the international response to climate change using carbon markets.

*How to Include Terrestrial Carbon in Developing Nations  
in the Overall Climate Change Solution*

The Terrestrial Carbon Group

July 2008 (Update 1 with corrections August 2008)

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ISBN 978-0-646-49550-7

## Acknowledgements

The work of the Terrestrial Carbon Group has been supported by the Wentworth Group of Concerned Scientists, with initial funding from the Purves Environmental Fund and private donors. The Terrestrial Carbon Group is indebted to and acknowledges the hundreds of scientists, economists, political scientists, policy experts, on-the-ground practitioners, private and public sector investors, diplomats, and others who over the last decades have thought deeply, undertaken detailed and focussed research and pilot projects, written carefully, and sought robust outcomes in relation to terrestrial carbon, forests, land use, and climate change. We thank them for the ideas, results, and suggestions in their publications and conversations with us. We specifically recognise the contribution of Caroline McFarlane and Fiona McKenzie from the Wentworth Group of Concerned Scientists to the development of this paper.

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## Executive Summary

Human-induced climate change is caused by the build-up of greenhouse gases in the atmosphere. Greenhouse gases have only two other places to go: the oceans and the terrestrial system (including land and vegetation).

Climate change is not just an environmental issue; it has impacts on all facets of life in developed and developing nations alike. Avoiding dangerous climate change is an essential task for the whole world. It is a difficult task, and we must therefore use all available means.

We can use terrestrial carbon (including trees, soil, and peat) to provide up to 25% of the climate change solution.<sup>1</sup>

Terrestrial carbon is not coherently part of the international response to climate change. Importantly, reducing the business as usual emissions of terrestrial carbon in developing nations is excluded from the Kyoto Protocol. The world agreed in Montreal in 2005 (and again in Bali in 2007) to explore including the reduction of greenhouse gas emissions from deforestation and forest degradation (REDD) in developing nations in the post-2012 international climate framework. A successful response to climate change must eventually include forests and all other terrestrial carbon. The immediate and ongoing effective reduction of emissions from deforestation and forest degradation is essential, and should and can be the first step on the path to a more holistic approach to terrestrial carbon.

Under the Bali Roadmap agreed in December 2007, developed nations agreed to pursue new “quantified emission limitation and reduction objectives”, and developing nations agreed to undertake “nationally appropriate mitigation actions”. Action on terrestrial carbon could contribute to fulfilling these commitments.

Over the coming decades, vegetated land in developing nations will be increasingly threatened with conversion to agricultural and plantation use, and to human settlements and infrastructure. The exception will be land that is protected by law, protected by biophysical conditions, or protected by economic constraints. This increasing threat will be driven by the dynamic links between (a) population, (b) demand for food, fibre, fuel, carbon, and land, (c) prices for those commodities, and (d) land use decisions. The business as usual scenario is that most existing terrestrial carbon on unprotected land will be emitted. As land is taken out of production to be “protected” for carbon sequestration, land for other uses will become scarcer, more valuable, and under even more pressure for conversion.

To harness the potential of terrestrial carbon in the climate change solution, we need a response that values terrestrial carbon so that it can compete in this dynamic global context.

The good news is that, while some uncertainty remains, we know enough to unlock the potential of terrestrial carbon in the climate change solution. The science on the problem and the solution is clear enough. The economics is clear enough. The drivers of land-use decisions are well enough understood. And the institutional arrangements are possible.

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<sup>1</sup> Based on McKinsey & Company’s analysis of reaching 450 ppm by 2030 using abatement measures costing less than 40 Euros per tonne of carbon (Enkvist 2007).

Action on terrestrial carbon that is consistent with the following nine guiding principles will be an effective contribution to the climate change solution:

1. Maximise long-term terrestrial carbon volumes
2. Maintain existing terrestrial carbon and create new terrestrial carbon
3. Include all types of terrestrial carbon (using a phased approach starting with carbon and CO<sub>2</sub> in peatlands, forest, and lands that can become secondary forest)
4. Use a mix of complementary approaches (market and non-market, public and private)
5. Take action on terrestrial carbon in addition to, not in substitution for, deep reductions in greenhouse gas emissions from all other sources across the world
6. Recognise sovereignty over land management
7. Build appropriate national and international institutions
8. Avoid perverse outcomes
9. Adapt to best available information

Both market and non-market approaches to terrestrial carbon and climate change are necessary. Within that context, the Terrestrial Carbon Group proposes a system to credibly include terrestrial carbon in developing nations in the international response to climate change using carbon markets.

The system includes all the components that would need to be agreed at an international level (whether bilateral, multilateral or global). Nations would determine (within their own political processes) national and sub-national implementation systems targeted to their specific circumstances. The system is as simple as possible and has two purposes: (i) to allow the international trading (whether bilateral, multilateral, or global) of carbon credits based on the maintenance and creation of terrestrial carbon, and (ii) to guarantee that action under the system contributes to long-term climate change mitigation.

The system places a nation's total terrestrial carbon into two categories: terrestrial carbon that is effectively protected from being emitted (by law or by being inaccessible because of biophysical or economic constraints), and all other terrestrial carbon. Protected terrestrial carbon must be retained. All other terrestrial carbon can be emitted over a fixed period. The system provides short-term and long-term incentives to change that outcome, recognising that land management decisions are made within nations.

Put simply, nations may emit an agreed volume of the original unprotected terrestrial carbon (an annual terrestrial carbon budget) each year with no penalty. If the nation emits less than its annual terrestrial carbon budget in a year, it can sell the difference as terrestrial carbon credits (and must add that volume of terrestrial carbon to its protected category, safeguarding the permanence of the avoided emissions). If the nation emits more than its annual terrestrial carbon budget in a year, it cannot participate in the system until it reverses the excess emissions. The fixed period could be set on a nation-by-nation basis to best reflect national business as usual scenarios. A nation can generate credits for any new terrestrial carbon it creates.

Categorising terrestrial carbon in this way addresses additionality and intra-national leakage completely. International leakage is effectively limited (especially as more nations join the system). The short-term and long-term incentives safeguard permanence.



The system encourages broad participation because it provides incentives to developing nations regardless of their historic rates of deforestation and terrestrial carbon emissions.

The system does not restrict economic use of land, but instead opens up one new economic development option – generating and selling terrestrial carbon credits.

Developing nations wishing to participate would need to (with assistance from other nations):

- Establish the infrastructure and expertise to collect (through remote-sensing using satellites and through on-the-ground surveying) and analyse terrestrial carbon data
- Agree methods to determine how much carbon is stored in a particular type of landscape and what happens to that carbon under different land uses
- Create and audit national terrestrial carbon inventories
- Effectively engage those who depend on forests and those who depend on deforestation and forest degradation
- Undertake a transparent process of clarifying rights to ownership and use of land, vegetation and carbon credits
- Establish credible and transparent systems and institutions to: measure terrestrial carbon; certify, verify and audit project- and national-level outcomes; monitor changes over space and time; produce national terrestrial carbon accounts; facilitate and oversee the stable, long-term disbursement of funds; and coordinate with international institutions
- Draft and enact regulations to establish terrestrial carbon registers, exchanges, dispute resolution and enforcement mechanisms, and regulatory oversight

## Action before UN Climate Change Meetings in Copenhagen (December 2009)

There is no need to wait until a new climate change treaty is agreed.

Certain steps can and should be taken before the UN Climate Change meetings in Copenhagen in December 2009. Critical steps include:

- **Get Ready:** Developing nations, with technical and financial assistance from developed nations, can continue to take concrete steps towards being market-ready (as set out in the bullet points above).
- **Recognise Early Action:** By the UN Climate Change meetings in Poznan in December 2008: (i) agree minimum standards for projects to maintain and create terrestrial carbon that are undertaken before a final treaty is agreed; and (ii) guarantee that credits generated under such projects will be valid under a post-2012 climate change treaty.
- **Agree, Design and Begin Implementing a National-Scale Pilot:** Most credible proposals for an international agreement on forests and carbon markets call for national level accounting. However, activities on forests and carbon markets are largely being undertaken at a sub-national level. While important, such pilots fail to address the fundamental institutional requirements of a credible system.
- **Resolve Outstanding Technical Issues:** Continue work on detailed technical issues such as inter-annual variability, natural disturbance, and harvested wood products.



# 1 Introduction

## 1.1 The Role of Terrestrial Carbon in Avoiding Dangerous Climate Change

Human-induced climate change is caused by the build-up of greenhouse gases in the atmosphere. Greenhouse gases have only two other places to go: the oceans and the terrestrial system (including land and vegetation).

The best available science tells us that to have a 50% chance of avoiding dangerous climate change,<sup>2</sup> we must stabilise greenhouse gas concentrations in the atmosphere below 450 parts per million (ppm) of carbon dioxide equivalent (CO<sub>2</sub>e) by 2050.<sup>3</sup> As better information has become available, climate scientists have revised this “safe” concentration downwards, with some now arguing for 350 ppm.<sup>4</sup> The concentration of greenhouse gasses in the atmosphere at a particular time is determined by the net volume of greenhouse gasses emitted and sequestered up to that time, rather than by an emissions rate at that time. It is therefore more useful to speak in terms of a “carbon budget” than an emission reduction target. A carbon budget is the maximum CO<sub>2</sub>e we can emit between now and a certain date to achieve the desired concentration. An emission reduction target is a pathway to stay within that budget.

Carbon is a key component of many greenhouse gases, including the most prevalent, carbon dioxide. Terrestrial carbon is carbon stored in the terrestrial system. The emission of terrestrial carbon from human land use (including forestry) is currently the second largest source of human-caused greenhouse gas emissions, contributing 20% globally.<sup>5</sup> Deforestation and the degradation of forests and peatlands in the tropics of developing nations currently cause the vast majority of land-use emissions.

With our atmosphere overloaded, we have two complementary climate change mitigation options. We can reduce ongoing emissions of greenhouse gases into our atmosphere, and we can transfer greenhouse gases from the atmosphere to our terrestrial system and oceans.

Terrestrial carbon is a part of both elements of climate change mitigation: we can maintain existing terrestrial carbon (by changing land use to reduce terrestrial carbon emissions), and we can create new terrestrial carbon (by changing land use to sequester more atmospheric greenhouse gas as carbon).

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<sup>2</sup> That is, preventing the global average temperature rising more than two degrees Celsius above pre-industrial levels.

<sup>3</sup> IPCC, 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller (eds). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, p66, Table TS.5.

<sup>4</sup> Hansen, J., Sato, M., Kharecha, P., Beerling, D., Masson-Delmotte, V., Pagani, M., Raymo, M., Royer, D. L. and Zachos, J.C., 2008. ‘Target Atmospheric CO<sub>2</sub>: Where Should Humanity Aim?’, submitted for publication in *Science*, April 2008 (available at <http://arxiv.org/pdf/0804.1126v1>).

<sup>5</sup> Figure SPM 3 in IPCC, 2007. *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC.

Climate change is not just an environmental issue; it has impacts on all facets of life in developed and developing nations alike. Avoiding dangerous climate change is an essential task for the whole world. It is a difficult task, and we must therefore use all available means. Analysis suggests that existing and new clean technology can provide around 50% of the solution, energy efficiency 25%, and better land management 25%.<sup>6</sup>

Action that reduces terrestrial carbon emissions and increases terrestrial carbon sequestration will be meaningless unless accompanied by action that drastically reduces greenhouse gas emissions from all other sources (especially the use of fossil fuels) across the world.

## 1.2 The International Response So Far

Article 4 of the United Nations Framework Convention on Climate Change (UNFCCC) obliges all parties to the convention to “mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases”.<sup>7</sup>

Despite this, land use (one of the most important sources and sinks) is not coherently part of the international response.<sup>8</sup> Importantly, reducing the business as usual emissions of terrestrial carbon in developing nations (including avoided deforestation) is excluded from the Kyoto Protocol.

The world agreed at the UN Climate Change meetings in Montreal in 2005 (and again in Bali in 2007) to explore including the reduction of greenhouse gas emissions from deforestation and forest degradation (REDD) in developing nations in the post-2012 international climate framework. As explained in Section 1.1, a successful response to climate change must eventually include all terrestrial carbon. The immediate and ongoing effective reduction of emissions from deforestation and forest degradation is therefore essential, and should and can be the first step on the path to a more holistic approach to terrestrial carbon.

Under the Bali Roadmap agreed in December 2007, developed nations agreed to pursue new “quantified emission limitation and reduction objectives”, and developing nations agreed to undertake “nationally appropriate mitigation actions”. Action on terrestrial carbon could contribute to fulfilling these commitments.

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<sup>6</sup> Based on McKinsey & Company’s analysis of reaching 450 ppm by 2030 using abatement measures costing less than 40 Euros per tonne of carbon (Enkvist 2007).

<sup>7</sup> For completeness, this excludes greenhouse gases already controlled by the Montreal Protocol.

<sup>8</sup> Annex-I nations are industrialised nations (including industrialised nations “undergoing the process of transition to a market economy”) listed in Annex I of the UNFCCC. Annex-B nations are Annex-I nations that agreed to greenhouse gas emission reduction targets (called “quantified emission limitations” or “reduction commitments”) under the Kyoto Protocol and are listed in Annex B of the Kyoto Protocol. Emissions and sequestration of terrestrial carbon are accounted for differently in different Annex-I nations (developed nations), but not at all in non-Annex-I nations. The creation of new terrestrial carbon through forestry projects in non-Annex-I nations can be used by Annex-B nations to meet a capped percentage of their Kyoto Protocol emission reduction targets (although the European Union currently does not allow forestry credits to be used in this way, and to date only one forest project has been approved under the Kyoto Protocol). In non-Annex I nations, non-forest terrestrial carbon is excluded.

Without delaying effective action on the reduction of greenhouse gas emissions from deforestation and forest degradation, negotiations on terrestrial carbon should take account of the following:

1. There is more to terrestrial carbon than forests. We should agree a framework to eventually include all terrestrial carbon and other greenhouse gases from the terrestrial system, starting with carbon and CO<sub>2</sub> in peatlands, forest, and lands that can become secondary forest. Other pools and land uses can be phased in as information, methodologies, techniques and technology allow.
2. Ultimately, we need to simplify matters by consolidating the existing and emerging categories of forest (afforestation and reforestation; and deforestation, forest degradation and sustainable forest management) into a unified concept of terrestrial carbon, with different accounting rules for different categories where required.
3. Much of the discussion on forests, terrestrial carbon, and climate change focuses on reducing rates of deforestation. This is an important near-term goal that must be coupled with the essential long-term goal of reducing greenhouse gas emissions from land use (including deforestation and forest degradation) and on securing long-term volumes of terrestrial carbon. Deforestation rates can be an interim indicator of success in maintaining existing terrestrial carbon, and it is important to take action now to slow ongoing deforestation. However, reducing deforestation rates alone simply results in delayed forest destruction. As long as there are economic and social drivers to clear vegetation, the same area of forest will be destroyed, but over a slightly longer period; the same volume of greenhouse gas will be emitted, but over a longer period. Delaying greenhouse gas emissions could have significant near-term benefits (especially by preventing atmospheric concentrations of greenhouse gases reaching state-change thresholds or “tipping points”). However, without action to maintain the permanence of the “delayed” emissions, the long-term climate change impact is essentially the same.
4. Much of the current discussion does not fully account for the dynamic links between (a) population, (b) demand for food, fibre, fuel, carbon, and land, (c) prices for those commodities, and (d) land use decisions.
  - Almost half the Earth's land surface is already used for agriculture, at least one third of which is degraded.<sup>9</sup> Even protected areas are not immune from illegal and government-sanctioned use. Global population is predicted to grow from around 7 billion in 2010 to over 9 billion by 2050.<sup>10</sup> Per capita consumption of food, fibre and fuel is increasing.
  - Even without climate change and carbon markets, land (and its vegetation) will come under a vicious circle of increasing pressure as production of food, fibre and fuel expands onto currently uncultivated land to satisfy the demands of a burgeoning global population and its increasing living standards (and associated consumption). The building of human settlements and infrastructure will add to this pressure. In response, the price of food, fibre and fuel and the land on which they are produced will increase, making it even more attractive to expand production.
  - Over the coming decades, vegetated land in developing nations will be increasingly threatened with conversion to agricultural and plantation use, and to human settlements and infrastructure.

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<sup>9</sup> Foley, J.A., R. DeFries, G.P. Asner, C. Barford, G. Bonan, S.R. Carpenter, F.S. Chapin, M.T. Coe, G.C. Daily, H.K. Gibbs, J.H. Helkowski, T. Holloway, E.A. Howard, C.J. Kucharik, C. Monfreda, J.A. Patz, I.C. Prentice, N. Ramankutty, and P.K. Snyder. 2005. 'Global consequences of land use' in *Science* 309: 570-574.

<sup>10</sup> United Nations, 2006. *World Urbanization Prospects: The 2005 Revision*. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat. <http://esa.un.org/unpp>. United Nations, 2007. *World Urbanization Prospects: The 2006 Revision*. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat. <http://esa.un.org/unpp>

The exception will be land that is protected by law, protected by biophysical conditions, or protected by economic constraints. In other words, the business as usual scenario (over a climate-change-relevant period) is that most existing terrestrial carbon will be emitted unless it is effectively protected by law or is inaccessible because of biophysical or economic constraints. This does not have to be the outcome, but it is the trajectory the world is on.<sup>11</sup>

- As land is taken out of production to be protected for carbon sequestration, land for other uses will become scarcer, more valuable, and under even more pressure for conversion.

### 1.3 A Way Forward

The Terrestrial Carbon Group has written this paper to support ongoing global negotiations on reducing emissions from deforestation and degradation (REDD), and emerging national, bi-lateral, and multi-national efforts to maintain and enhance terrestrial carbon. The objective of the Terrestrial Carbon Group is for terrestrial carbon to be effectively included in the international response to climate change, whether that response is a disaggregated set of national and multi-national commitments or a global deal or a transition from one to the other.

It is tempting to jump in half way and either accept the constraints of current UNFCCC negotiations or put forward a “minimal change” proposal to avoid “rocking the boat”. Instead, the Terrestrial Carbon Group has started from first principles, away from the immediate pressure of the negotiating table. The Group has then used existing knowledge, methodologies and experience to develop a workable system consistent with those principles.

If the global and multi-lateral negotiations get it right, the world unlocks a significant part of the long-term solution to climate change, and an even greater part of the solution available to us in the short term while we continue with strategies to reduce fossil fuel emissions and to develop and deploy new technologies. We also possibly make overall mitigation less costly. If we get it wrong, we create a lot of “hot air” emission reduction credits, reduce reduction and sequestration efforts in other sectors, and make staying within our global carbon budget more difficult and potentially more expensive.

The good news is that, while some uncertainty remains, we know enough to get it right. The science on the problem and the solution is clear enough. The economics is clear enough. The drivers of land-use decisions are well enough understood. And the institutional arrangements are possible.

It will take time, but we can start now.

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<sup>11</sup> Modeling future deforestation (and by extension, terrestrial carbon emissions) is complicated. Most existing models do not factor in all the pressures described in the text associated with this footnote. On the one hand, many models exclude the effect of forest degradation, and the possibility of reaching state-change thresholds (when such a threshold is reached, forest systems might not be able to support themselves and so a self-propelling process of deforestation ensues). On the other hand, many do not factor in all the biophysical constraints on agricultural production. Work is continuing to bring together bottom-up and top-down modeling to ameliorate this issue. Even so, one of the most comprehensive models of deforestation available predicts a 40% loss of Amazonia’s forests between 2006 and 2050 (Soares-Filho et al 2006). Currently, the world’s tropical forests are being cleared a rate of roughly 0.5% per year (but this does not include forest degradation). At that rate, a quarter of the world’s tropical forests will be cleared within the next 50 years. Factoring in all the other pressures and constraints will most likely speed up rather than slow down the projected business as usual deforestation, forest degradation and resulting emissions of terrestrial carbon. If the other pressures described above lead to a 1% annual rate of deforestation, half of all remaining tropical forest will be cleared within the next 50 years.

## 2 Guiding Principles for Effective Action on Terrestrial Carbon

The Terrestrial Carbon Group provides the following nine guiding principles for managing terrestrial carbon in developing nations to reduce atmospheric greenhouse gas concentrations. Action that is consistent with these principles will be an effective contribution to the climate change solution.

### 1. Maximise Long-Term Terrestrial Carbon Volumes

The single, overriding factor determining whether action on terrestrial carbon is an effective contribution to climate change mitigation is whether that action maximises the long-term volume of carbon in the terrestrial system.

One way to achieve this is to fund action on terrestrial carbon through financial mechanisms that are linked to climate change commitments (including a carbon market approach). To be consistent with this principle, such mechanisms should:

- Optimise the accuracy of carbon measurement (how much terrestrial carbon is in a particular landscape) and ongoing monitoring.
- Optimise additionality (that payment is only made for an outcome that is unlikely to have happened in the absence of such an approach).
- Minimise the risk of non-permanence (that the outcome paid for is not reversed in the future).
- Minimise leakage (that the emissions that were avoided through incentives from such an approach are not simply emitted somewhere else or at some other time).

### 2. Maintain Existing Terrestrial Carbon and Create New Terrestrial Carbon

Maintaining existing terrestrial carbon and creating new terrestrial carbon are both required to avoid dangerous climate change, and both must therefore be fostered. This will be achieved by a combination of reducing emissions of terrestrial carbon from land use and increasing the sequestration of atmospheric carbon in the terrestrial system. There is no need to treat them differently.<sup>12</sup>

### 3. Include All Types of Terrestrial Carbon

Eventually, all terrestrial carbon pools (and other greenhouse gases from the terrestrial system) that interact with the atmosphere at timescales less than centuries, and all land uses, must be included. Initially, the carbon pools and land uses for which there are sufficiently robust information, methodologies, techniques and technology should be included. At a minimum, this would be carbon

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<sup>12</sup> Although different carbon accounting rules would apply to emissions and sequestration to address the “fast-out” nature of emissions and the “slow-in” nature of sequestration.

and CO<sub>2</sub> in peatlands, forest, and lands that can become secondary forest. Other pools and land uses can be phased in as information, methodologies, techniques and technology allow.

#### **4. Use a Mix of Complementary Approaches**

Land use decisions are often made at a complex intersection of competing economic, social and environmental factors. There is no single method to influence all land use decisions everywhere. Therefore, a mix of approaches is required. Key approaches are:

- Domestic government policies, measures, and enforcement
- Land-use planning (ie, determining which area of land will be used for what purpose so as to optimise sustainable development outcomes) and sustainable land-use intensification (ie, producing more output from the same area of land)
- Cost-effective certification of agricultural, forestry, and biofuel products and regulation of international trade in uncertified products
- Removal of government policy that rewards emission of terrestrial carbon (eg, policies that promote the production of biofuels without protecting existing terrestrial carbon)
- Overseas development aid, NGO activities, and private philanthropy
- Payments for the environmental services associated with terrestrial carbon in addition to carbon (eg, water, biodiversity, etc)
- Voluntary international funds (like the one proposed by Brazil in relation to reducing deforestation)
- Carbon markets (generating credits from maintaining and creating terrestrial carbon that can be traded on national and international carbon markets, both voluntary and regulatory)

It is unlikely that carbon markets alone will either prevent all terrestrial carbon emissions from land use or maximise the creation of new terrestrial carbon. There will be instances where land use decisions are based on economically “irrational” factors like social and environmental outcomes, personal and national security, emotion, ego, and power. There will be instances where sovereign risk and lack of capacity deters market activity. However, carbon markets do have a role, as it is unlikely that the public sector can provide the required capital over the long-term. Other approaches to ensure appropriate land use management must continue. This requires the ongoing effort of nations with significant terrestrial carbon emissions, nations importing the products of land use that releases terrestrial carbon (eg, timber products, beef, soy, and palm oil), nations that can create new terrestrial carbon, and nations with the means to assist them to become market-ready (eg, Norway’s International Climate and Forestry Initiative, and Australia’s Global Initiative on Forests and Climate). In particular, non-market mechanisms might be required to incentivise the maintenance of terrestrial carbon on land that is already protected.

#### **5. Take Action on Terrestrial Carbon in Addition to, not in Substitution for, Deep Reductions in Greenhouse Gas Emissions from all Other Sources across the World**

The incentives for action on terrestrial carbon could come from a variety of sources, including (without limitation) one or a combination of:

- Recognition by the international community of an effective new contribution to climate change mitigation (without relying on carbon markets)



- A fund created by various nations (developed and / or developing) that is not linked to satisfying existing or new climate change commitments
- Such a fund that is linked to satisfying existing or new climate change commitments
- Carbon markets linked to satisfying existing or new climate change commitments (in either developed or developing nations)

Existing climate change commitments are insufficient to avoid dangerous climate change. Therefore, action on terrestrial carbon cannot be used to satisfy such existing commitments.

If action on terrestrial carbon is funded through financial mechanisms that are linked to climate change commitments (including the third and fourth options above), additional demand must be created for the new credits that would be generated by that action.

## **6. Recognise Sovereignty over Land Management**

Land management regulation is the domain of nations and, depending on national constitutional and legal arrangements, sub-national entities (eg, states, provinces, local governments, communities). Nations will continue making sovereign decisions about optimising land use, just as the largely devegetated world (industrialised and non-industrialised) has done for centuries. Any international action on land management must make it attractive for nations and relevant sub-national entities to take part and to make appropriate decisions.

However, conflict or uncertainty over rights to the ownership and use of land, vegetation and carbon credits will compromise the permanence of sequestered terrestrial carbon. Resolving existing conflict, and avoiding creating new conflict, will increase the likelihood of maintaining terrestrial carbon in the long-term, thereby increasing the success and value of national- and project-level activity. Within the context of national sovereignty and national constitutional arrangements, all interested parties should therefore be engaged in a transparent process of clarifying and codifying such rights. That process should respect existing rights and obligations, including the United Nations Declaration on the Rights of Indigenous Peoples. These processes do not necessarily entail privatisation of land rights, and need to be undertaken with sensitivity to changes in land rights that have occurred in the past.

## **7. Build Appropriate National and International Institutions**

Including terrestrial carbon in developing nations in the climate change solution requires the credible and transparent:

- Measurement of terrestrial carbon.
- Certification, verification and auditing of outcomes.
- Monitoring of changes over space and time.
- Clarification of rights to ownership and use of land, vegetation and carbon credits.
- Stable, long-term disbursement of funds.

Climate change is a global problem but action on terrestrial carbon will largely be taken within nations. Therefore, international cooperation and coordination is essential. International institutions are required to (i) create a framework for matching demand with likely supply, (ii) avoid excessive carbon price

volatility, (iii) manage “teething problems” as the international response to climate change matures, and (iv) help manage a transition towards a common carbon price across all types of emissions or different prices for different types of transactions (eg, transactions between two nations under a fund approach might have a different price from transactions between sub-national actors under a market).

A market mechanism specifically requires regulations, registers, exchanges, dispute resolution and enforcement mechanisms, and regulatory oversight – some at a national scale and some at an international scale.

## 8. Avoid Perverse Outcomes

Action on terrestrial carbon must not cause perverse outcomes, especially during the transition from the *status quo*. For example:

- Action between now and the start of the system (early action) should be recognised and encouraged.
- There must be no incentive to increase terrestrial carbon emissions in the lead-up to the system starting.
- Consideration must be given to the mix of social, economic, and environmental benefits provided by land, vegetation, and terrestrial carbon, including economic development, climate change adaptation, biodiversity, weather regulation, and hydrologic function. Decisions on terrestrial carbon should maintain or improve these co-benefits.
- Action on terrestrial carbon should not lead to product substitution that shifts emissions to other sectors (eg, reducing the availability of timber products by halting timber production altogether rather than allowing sustainable forest management is likely to increase the cost of timber products and thereby lead to the use of alternative products like concrete and metals that cause higher greenhouse gas emissions than timber).

## 9. Adapt to Best Available Information

Information, methodologies, techniques and technology will improve over time, especially in response to the outcomes of existing action. Action on terrestrial carbon should adapt to these improvements but not be delayed or held hostage by them. Pilot projects can play a key role in the early stages by providing refinements to information, methodologies, techniques and technology.

## 3 Blueprint for a Credible Carbon Market Approach

### 3.1 Description

As explained in Principle 4 in Section 2, both market and non-market approaches to terrestrial carbon and climate change are necessary. Within that context, this section describes a system to credibly include terrestrial carbon in developing nations in the international response to climate change using a carbon market approach. The system is consistent with the guiding principles in Section 2. Section 3.2 sets out implementation steps. Appendix I provides a worked example, Appendix II suggests methods to safeguard ongoing compliance, and Appendix III answers frequently asked questions.

The system includes all the components that would need to be agreed at an international level (whether bilateral, multilateral or global). Nations would determine (within their own political processes) national and sub-national implementation systems targeted to their specific circumstances.

It is as simple as possible and has two purposes:

- To allow the international trading (whether bilateral, multilateral, or global) of carbon credits based on the maintenance and creation of terrestrial carbon.
- To guarantee that action under the system contributes to long-term climate change mitigation.

The system places a nation's total terrestrial carbon into two categories: terrestrial carbon that is effectively protected from being emitted (by law or by being inaccessible because of biophysical or economic constraints), and all other terrestrial carbon. Protected terrestrial carbon must be retained. All other terrestrial carbon can be emitted over a fixed period. The system provides short-term and long-term incentives to change that outcome, recognising that land management decisions are made within nations.

Put simply, nations may emit an agreed volume of the original unprotected terrestrial carbon (an annual terrestrial carbon budget) each year with no penalty. If the nation emits less than its annual terrestrial carbon budget in a year, it can sell the difference as terrestrial carbon credits (and must add that volume of terrestrial carbon to its protected category, safeguarding the permanence of the avoided emissions). If the nation emits more than its annual terrestrial carbon budget in a year, it is excluded from the system until it reverses the excess emissions. The fixed period could be set on a nation-by-nation basis to best reflect national business as usual scenarios. A nation can generate credits for any new terrestrial carbon it creates.

Categorising terrestrial carbon in this way addresses additionality and intra-national leakage completely. International leakage is effectively limited (especially as more nations join the system). The short-term and long-term incentives safeguard permanence over the fixed period.

The system encourages broad participation because it provides incentives to developing nations regardless of their historic rates of deforestation and terrestrial carbon emissions.

The system does not restrict economic use of land, but instead opens up one new economic development option – generating and selling terrestrial carbon credits.

## Highlights of the Proposed System

The proposed system:

- Sets a credible business as usual terrestrial carbon emissions scenario for a nation based on a simple, robust methodology using easily compiled data.
- Applies to developing nations with different terrestrial carbon circumstances (eg, high forest cover and high historical deforestation rates, low forest cover and high historical deforestation rates, high forest cover and low historical deforestation rates, etc).
- Addresses additionality, leakage, permanence, and flooding the market.
- Creates property rights over the maintenance and creation of terrestrial carbon.
- Issues terrestrial carbon credits in exchange for the maintenance and creation of terrestrial carbon above the business as usual terrestrial carbon emissions scenario.
- Requires a national body to certify project-level activities that generate terrestrial carbon credits, national registers and exchanges for those credits, and an international oversight and coordination body.
- Facilitates the international trading of terrestrial carbon credits.
- Provides direct short-term and long-term incentives to change land use decisions so that business as usual terrestrial carbon emissions are reduced and business as usual terrestrial carbon sequestration is increased.
- Provides indirect short-term and long-term incentives to maintain and better enforce protection of protected land (including forests and peatland) and the terrestrial carbon in and on it.
- Includes mechanisms to address the existing non-enforcement of laws that impact on terrestrial carbon (particularly illegal logging and forest clearing).
- Rests on national terrestrial carbon accounting and monitoring, but allows national-, sub-national-, and project-level activities and the participation of the private sector and civil society.
- Builds on existing monitoring infrastructure (including satellite systems).
- Builds on existing methodologies and standards developed under the UNFCCC and Kyoto Protocol for carbon quantification and terrestrial carbon accounting.
- Provides certainty to buyers and sellers of terrestrial carbon credits.
- Limits perverse outcomes (particularly because it rewards the maintenance of existing terrestrial carbon in the lead-up to the start of the system).

## 3.2 Implementation

### 3.2.1 National Terrestrial Carbon Budgets

Under the proposed system, a “National Terrestrial Carbon Budget” is the agreed maximum CO<sub>2</sub>e that a nation can emit as terrestrial carbon from land use between now and a certain date in the future. A nation’s National Terrestrial Carbon Budget would be set using the following methodology:

1. Protected Terrestrial Carbon is any existing terrestrial carbon (whether on public or private land) that:
  - As at 6 December 2005, was subject to international, national, or sub-national law or policies that effectively prevent its release<sup>13</sup> (this would not include terrestrial carbon that is subject to, or threatened by, illegal activity).<sup>14</sup>
  - As at the date the nation joins the system, is inaccessible because of biophysical or economic constraints, and will, with a reasonable degree of certainty, remain so for the next 50 years<sup>15</sup> (according to agreed international standards<sup>16</sup>).
2. All other existing terrestrial carbon as at the date the nation joins the system is Tradable Terrestrial Carbon.
3. A nation’s National Terrestrial Carbon Budget is equal to the volume of the nation’s total Tradable Terrestrial Carbon as at the date the nation joins the system.<sup>17</sup>
4. A nation’s Annual Terrestrial Carbon Budget is one-fiftieth of the overall Terrestrial Carbon Budget.

The fixed period in Paragraph 1 could be set on a nation-by-nation basis to best reflect national business as usual scenarios. The fraction in Paragraph 4 would be modified correspondingly. For the purposes of illustration, a 50-year period is used in this Section 3 and Appendix I.

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<sup>13</sup> For example, terrestrial carbon in areas designated for sustainable forest management, in conservation reserves, in riparian zones protected by vegetation retention regulations, subject to other land use laws, or subject to private covenants – and that is not subject to or threatened by, illegal activity. As explained in Frequently Asked Question 16, typically there is a reduction in terrestrial carbon when a natural forest is converted to a sustainably managed forest. Areas designated for sustainable forest management are categorised as “protected” because forest (and its associated terrestrial carbon) in these areas must be retained over time, even if that forest contains less terrestrial carbon than beforehand. In other words, even though some terrestrial carbon is lost, the majority cannot be emitted and is therefore “protected”. However, any loss of terrestrial carbon caused by converting a natural forest to a sustainably managed forest and at subsequent harvesting would be accounted for in the Accounting Standards and Participation Rules in Sections 3.2.4 and 3.2.5.

<sup>14</sup> 6 December 2005 is the date of the UNFCCC decision on REDD at the Montreal COP in 2005 (for a copy of the decision, see <http://unfccc.int/resource/docs/2005/cop11/eng/l02.pdf>). On the one hand, using this date for the calculation of terrestrial carbon in protected areas provides a reward to nations that have taken action to protect land and associated terrestrial carbon since the beginning of formal negotiations on REDD. On the other hand, using this date prevents perverse behaviour in the lead-up to the start of the system, by making it pointless for a nation to “strategically” unwind existing protection of terrestrial carbon and thereby increase its National Terrestrial Carbon Budget.

<sup>15</sup> For example, terrestrial carbon that is on slopes too steep to log or cultivate, or is too remote to log or cultivate and therefore unlikely to be economic to clear.

<sup>16</sup> This can be based on existing methodologies like the model described in Soares-Filho BS, Nepstad DC, Curran LM, Cerqueira GC, Garcia RA, Ramos CA, Voll E, McDonald A, Lefebvre P, Schlesinger P. 2006. ‘Modelling conservation in the Amazon basin’ in *Nature*, 440, 520-523 (23 March 2006).

<sup>17</sup> For completeness, the National Terrestrial Carbon Budget would be adjusted appropriately as new carbon pools were brought into the system in line with Principle 3.

For nations with robust data on terrestrial carbon emissions that show a reasonably stable level of terrestrial carbon emissions over the last 20 to 30 years, the Annual Terrestrial Carbon Budget could be set as the mean annual terrestrial carbon emissions over that period. This would not affect the categorisation of Protected Terrestrial Carbon under Paragraph 1.

(There could be other ways to set a credible National Terrestrial Carbon Budget. Possible examples are given in Frequently Asked Question 2.)

### 3.2.2 Terrestrial Carbon Credits

Nations first need to clarify who owns the right to (i) emit Tradable Terrestrial Carbon, and (ii) claim credit for creating new terrestrial carbon. For example, right owners could be the state, corporations, communities, and individuals.

The right to emit Tradable Terrestrial Carbon generates an annual right to emit a volume of CO<sub>2</sub>e set by the nation. The total of all annual rights cannot be more than the Annual Terrestrial Carbon Budget. The right owner can choose to emit their Tradable Terrestrial Carbon or take actions that maintain it in perpetuity. They could emit some and maintain some. At the end of a given year, they can redeem “Terrestrial Carbon Credits” (expressed in tonnes of CO<sub>2</sub>e) equivalent to the volume of Tradable Terrestrial Carbon for which they have taken actions that maintain it in perpetuity. As a whole, all right owners in the nation can redeem a volume up to the nation’s Annual Tradable Terrestrial Carbon per year for 50 years (or other fixed period as set under Section 3.2.1).<sup>18</sup>

The creation of new terrestrial carbon generates a right to redeem Terrestrial Carbon Credits equivalent to the volume of carbon sequestered. Terrestrial Carbon Credits are generated at the end of each year based on how much carbon was sequestered in that year.

In both cases, redemption rights “pause” whenever the nation is not in compliance with the participation rules (see Section 3.2.5) and resume when the nation rectifies the non-compliance (see Appendix II for further discussion of safeguarding ongoing compliance).<sup>19</sup>

### 3.2.3 Trading

Before a Terrestrial Carbon Credit could be redeemed, the underlying project would have to be certified as a valid terrestrial carbon emission reduction or sequestration project by a national body using standards set by that body. Once redeemed by a right owner, Terrestrial Carbon Credits would be entered on the relevant

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<sup>18</sup>This helps address fears of Terrestrial Carbon Credits flooding existing carbon markets by limiting annual flows of such credits to a maximum of the sum of Annual Terrestrial Carbon Budgets in all participating Seller Nations. It also offers an opportunity for nations to provide sub-national incentives to achieve permanence: if a right owner’s Tradable Terrestrial Carbon that has been redeemed for Terrestrial Carbon Credits is not maintained, national implementation regulations could prevent that right owner from participating in the system until the default is rectified. Permanence is dealt with at the national level by the “ratchet mechanism” in International Terrestrial Carbon Accounting Standard 5 (see section 3.2.4).

<sup>19</sup>A nation can determine how to avoid being in default of this rule or rectifying any shortfall (eg, creating buffers, taking out insurance, making the original generator of the credit liable, taking a pooled approach, purchasing credits on the general carbon credit market, etc). It would be up to nations to determine whether a right owner could continue redeeming its Terrestrial Carbon Credits if the right owner is not in compliance with national implementation laws (eg, because the right owner emitted Tradable Terrestrial Carbon for which it had redeemed a Terrestrial Carbon Credit while such a law required the ongoing maintenance of all Tradable Terrestrial Carbon for which a Terrestrial Carbon Credit has been redeemed). This is irrelevant to the international system so long as the nation remains within its National Terrestrial Carbon Budget.

nation's terrestrial carbon credit registry and could be bought and sold through an exchange. Nations would determine if and how the underlying right could also be traded, in addition to the trading of Terrestrial Carbon Credits. Nations would also determine whether to allow the creation and trading of derivatives products like futures.

Terrestrial Carbon Credits would be fully fungible with other credits in other emissions trading schemes and carbon markets. The system itself addresses any inherent difficulties in achieving fungibility before the credit is generated. In this way, buyers and sellers of Terrestrial Carbon Credits will not have to "look behind" the credit to determine its value or validity. It provides certainty to those relying on the credit to meet their emission reduction obligations. It also provides certainty to investors in projects to generate Terrestrial Carbon Credits because they know a successful project will lead to carbon credits that are tradable and fully fungible on international carbon markets.

### 3.2.4 Accounting Standards

The following International Terrestrial Carbon Accounting Standards would be used to quantify and characterise terrestrial carbon and to assess compliance with the system:

1. The existing methodologies and standards developed under the UNFCCC and Kyoto Protocol for carbon quantification for various types of landscape and vegetation are sufficiently precise for the proposed system, and can be adapted over time.
2. Subject to the other International Terrestrial Carbon Accounting Standards, all terrestrial carbon created on or after the date the nation joins the system is Tradable Terrestrial Carbon.
3. The original right owner of a Terrestrial Carbon Credit can "escape" their obligations<sup>20</sup> by acquiring another carbon credit (whether a Terrestrial Carbon Credit or other type) of equal volume. The right owner can then emit the corresponding terrestrial carbon without penalty. If the original right owner takes that course of action, the validity of the original Terrestrial Carbon Credit is not affected (ie, whoever has bought that Terrestrial Carbon Credit can continue to rely on it).
4. The existing methodologies and standards developed under the UNFCCC and Kyoto Protocol for the more technical aspects of terrestrial carbon accounting are sufficiently precise for the proposed system, and can be adapted over time.
5. A nation is within its National Terrestrial Carbon Budget at the start of any given year<sup>21</sup> only if the volume of all existing terrestrial carbon in that nation at that date is greater than or equal to:
  - The volume of original Protected Terrestrial Carbon
  - **PLUS** The volume of the Annual Terrestrial Carbon Budget multiplied by the years remaining of the original 50 years
  - **PLUS** The volume of all Terrestrial Carbon Credits redeemed up to that date
  - **MINUS** The volume of all Terrestrial Carbon Credits cancelled up to that date

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<sup>20</sup>It would be expected that most nations would choose to enact regulations so that once a right owner has redeemed a Terrestrial Carbon Credit, it would be against the law to emit the corresponding terrestrial carbon unless a correlating emission reduction credit were acquired.

<sup>21</sup>Subject to the other International Terrestrial Carbon Accounting Standards.

### 3.2.5 Participation Rules

Seller Nations are developing nations that wish to generate Terrestrial Carbon Credits and sell them on the international market, and / or allow sub-national actors to do so. Buyer Nations are nations that wish to purchase Terrestrial Carbon Credits, and / or allow sub-national actors to do so. A nation can be both.

To participate in the system, a nation must agree to the following:

#### 1. Carbon Market Rules

- a) Each Seller Nation and Buyer Nation contributes to (i) collating existing satellite and ground-truthed terrestrial carbon data, and (ii) developing a comprehensive, ongoing satellite data gathering and monitoring system (over space and time).<sup>22</sup>
- b) Seller Nations and Buyer Nations agree to standard methodologies to determine Protected Terrestrial Carbon and Tradable Terrestrial Carbon.
- c) Each Seller Nation quantifies and maps its Protected Terrestrial Carbon and Tradable Terrestrial Carbon, and agrees to a National Terrestrial Carbon Budget.
- d) Each Seller Nation clarifies who owns the right to (i) emit Tradable Terrestrial Carbon, and (ii) claim Terrestrial Carbon Credits for creating new terrestrial carbon.<sup>23</sup>
- e) Each Buyer Nation clarifies who can buy Terrestrial Carbon Credits (this could be the nation or sub-national actors or both).
- f) In coordination with other Seller Nations and Buyer Nations, each Seller Nation sets standards for project-level activities that generate terrestrial carbon credits<sup>24</sup> and establishes a body to certify such projects.
- g) Each Seller Nation and Buyer Nation establishes a National Terrestrial Carbon Credits register and exchange.
- h) Each Seller Nation allows right owners to sell their Terrestrial Carbon Credits to Buyer Nations or to entities in Buyer Nations, provided the relevant Seller Nation and Buyer Nation are both in compliance with all applicable participation rules.
- i) Each Buyer Nation creates new demand for the Terrestrial Carbon Credits that it will allow into its carbon market.
- j) Each Seller Nations stays within its National Terrestrial Carbon Budget.

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<sup>22</sup>This could be made up of different sub-systems, rather than one single uniform system across all participating nations. It does not require a whole new international satellite system, but can build on existing systems.

<sup>23</sup>For both elements, this could be the nation or sub-national actors or both. Ownership of these rights can be different from the ownership of the right to land, to forests, to water, to use the forests etc.

<sup>24</sup>These could be based on, eg, the Voluntary Carbon Standard's guidelines (Voluntary Carbon Standard 2007), the Chicago Climate Exchange's *CCX Rulebook* (Chicago Climate Exchange 2004), the Climate, Community and Biodiversity Alliance's *Climate, Community and Biodiversity Project Design Standards* (Niles et al 2005), and other relevant existing guidelines.



2. Non-Carbon Market Rules

- a) Each Seller Nation and each Buyer Nation removes all laws, trade arrangements, subsidies, and policies in relation to land use and terrestrial carbon that (in their own nation or elsewhere) are contrary to requirements under international treaties to which it is a party (including the UNFCCC and its Kyoto Protocol).

3. Reporting

- a) Seller Nations and Buyer Nations establish an international oversight and coordination body.
- b) Once a year, each Seller Nation and each Buyer Nation submits to the international oversight and coordination body a statement of compliance with the applicable participation rules (including for Seller Nations a set of national terrestrial carbon accounts prepared in accordance with the International Terrestrial Carbon Accounting Standards, and the latest standards for project-level activity).
- c) Each Seller Nation and each Buyer Nation allows the international oversight and coordination body to audit the nation's statement of compliance, and validate, coordinate, and harmonise Seller Nations' standards for project-level activity.



## 4 Action before UN Climate Change Meetings in Copenhagen (December 2009)

There is no need to wait until a new climate change treaty is agreed. Certain steps can and should be taken between now and the UN Climate Change meetings in Copenhagen in December 2009. Critical steps include:

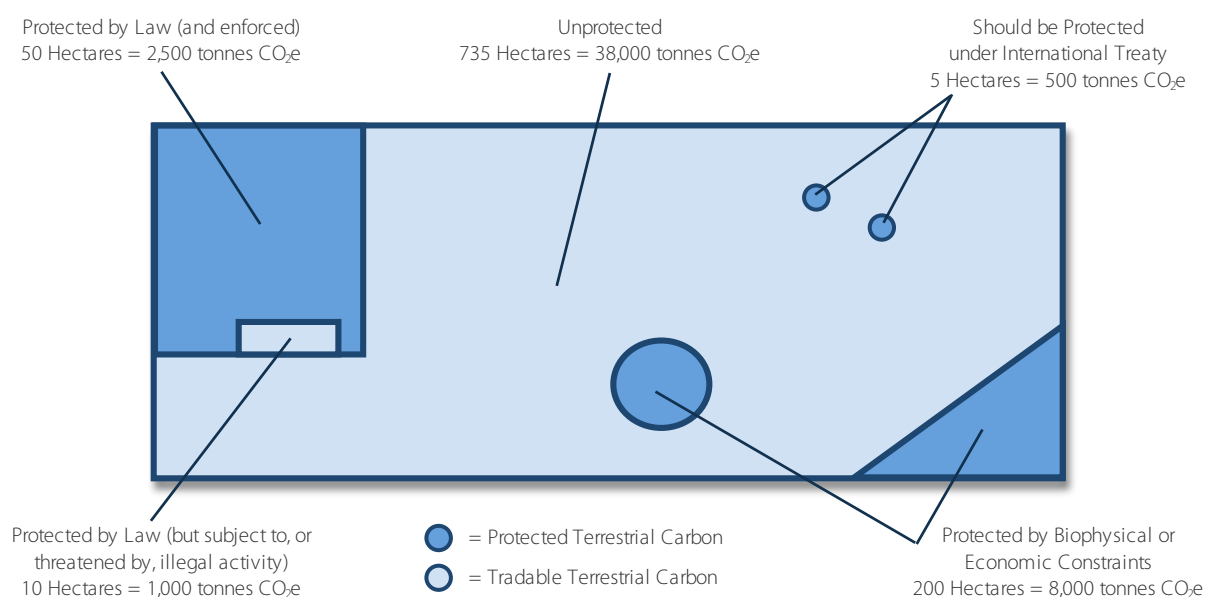
- **Get Ready:** Developing nations, with technical and financial assistance from developed nations, can continue to take concrete steps towards being market-ready by:
  - Establishing the infrastructure and expertise to collect (through remote-sensing using satellites and through on-the-ground surveying) and analyse terrestrial carbon data
  - Agreeing methods to determine how much carbon is stored in a particular type of landscape and what happens to that carbon under different land uses
  - Creating and auditing national terrestrial carbon inventories
  - Effectively engaging those who depend on forests and those who depend on deforestation and forest degradation
  - Undertaking a transparent process of clarifying rights to ownership and use of land, vegetation and carbon credits
  - Establishing credible and transparent systems and institutions to: measure terrestrial carbon; certify, verify and audit project- and national-level outcomes; monitor changes over space and time; produce national terrestrial carbon accounts; facilitate and oversee the stable, long-term disbursement of funds; and coordinate with international institutions
  - Drafting regulations to establish terrestrial carbon registers, exchanges, dispute resolution and enforcement mechanisms, and regulatory oversight
- **Recognise Early Action:** By the UN Climate Change meetings in Poznan in December 2008: (i) agree minimum standards for projects to maintain and create terrestrial carbon that are undertaken before a final treaty is agreed; and (ii) guarantee that credits generated under such projects will be valid under a post-2012 climate change treaty.
- **Agree, Design and Begin Implementing a National-Scale Pilot:** Most credible proposals for an international agreement on forests and carbon markets call for national level accounting. However, activities on forests and carbon markets are largely being undertaken at a sub-national level. While important, such pilots fail to address the fundamental institutional requirements of a credible system. It is therefore desirable to bring at least two nations (one with a carbon-constrained economy and one with significant terrestrial carbon) together with the private sector on a commercial basis (rather than philanthropic basis) and civil society to demonstrate how to implement a national approach (with project level activity).
- **Resolve Outstanding Technical Issues:** Continue work on detailed technical issues such as inter-annual variability, natural disturbance, and harvested wood products.



## Appendix I: Illustration of the Proposed System

This illustration focuses on the main elements of the proposed system. For the sake of simplicity, it does not explain every detail in the system. In this illustration, the international system begins on 1 January 2013 but the example nation, “Examplania”, first joins the system on 1 July 2015.

Examplania comprises 1,000 hectares, owned variously by the state, corporations, communities, and individuals. Examplania would map and categorise all terrestrial carbon on its entire landmass as at the date it joins the system (1 July 2015) into two possible categories: protected and tradable. Examplania would then quantify its Protected Terrestrial Carbon and Tradable Terrestrial Carbon in tonnes of CO<sub>2</sub>e.



Note: the various categories of terrestrial carbon would be spread across the entire nation, rather than conglomerated as in this schematic map.

On the date Examplania joins the system, there is a total of 1,000 hectares with 50,000 tonnes of terrestrial carbon (CO<sub>2</sub>e) in Examplania – see schematic map above and table below.

- 60 hectares are protected under laws that prevent the conversion of terrestrial carbon into atmospheric carbon (eg, areas designated for sustainable forest management, conservation reserves, riparian zones protected by vegetation retention regulations, areas subject to other land use laws, or areas subject to private covenants).
- However, 10 hectares of these supposedly protected areas are being cleared illegally or under threat of illegal clearing in the next 50 years.
- A further 5 hectares should be protected because of existing treaty obligations (eg, the Ramsar Convention).
- 200 hectares is not legally protected but is inaccessible because of biophysical or economic constraints, and will, with a reasonable degree of certainty, remain so for the next 50 years (eg, because it is in an inaccessible mountainous area).

- The remaining 735 hectares is not subject to any protection.

	Total	Protected			Tradable	
		Protected by Law (and enforced)	Should be Protected by Law	Protected by Biophysical or Economic Constraints	Protected by Law (but threatened)	Balance
Hectares	1,000	50	5	200	10	735
Tonnes CO <sub>2</sub> e	50,000	2,500	500	8,000	1,000	38,000

Over the next 50 years, most vegetated land in Examplania will be increasingly threatened with conversion to agricultural and plantation use and to human settlements and infrastructure. In other words, the business as usual scenario is that most existing unprotected terrestrial carbon will be emitted. Therefore, under a business as usual scenario, the outcome over the next 50 years is likely to be:

- 11,000 tonnes of CO<sub>2</sub>e on 255 hectares would not be emitted (this is Protected Terrestrial Carbon, and represents 22% of all terrestrial carbon in Examplania)
- 39,000 tonnes of CO<sub>2</sub>e would be emitted from 745 hectares (this is Tradable Terrestrial Carbon)

Examplania can now choose to comply with the participation rules (see Section 3.2.5) so that it (or corporations, communities and individuals) can maintain those 39,000 tonnes of CO<sub>2</sub>e and sell corresponding Terrestrial Carbon Credits through the international system. In other words, the nation and sub-national actors have a new economic development option for terrestrial carbon – generating and selling Terrestrial Carbon Credits. Examplania decides to comply with the participation rules.

Examplania’s Annual Terrestrial Carbon Budget is 780 tonnes of CO<sub>2</sub>e (one-fiftieth of 39,000 tonnes of CO<sub>2</sub>e).

For the sake of simplicity, assume that the State of Examplania retains the rights and obligations in respect of public land, and assigns the rights and obligations in respect of private land to the private landholders. We assume that landholders own the rights to any carbon that they create on their land.

Provided Examplania remains in compliance with the system, whoever has the right to emit a portion of the Tradable Terrestrial Carbon can instead choose to maintain that terrestrial carbon and redeem Terrestrial Carbon Credits. We assume that, to remain in compliance with the participation rules (see Section 3.2.5) at a national level, Examplania introduces laws that regulate how many Terrestrial Carbon Credits a right owner can redeem each year. That regulation states that a right owner can redeem up to one-fiftieth of their total Tradable Terrestrial Carbon each year for a continuous 50-year period.

- **Example (Maintaining Existing Terrestrial Carbon):** Assume a private landholder (Landholder A) has 100 hectares with 2,000 tonnes (CO<sub>2</sub>e) of Tradable Terrestrial Carbon and 1,000 tonnes (CO<sub>2</sub>e) of Protected Terrestrial Carbon. They could redeem Terrestrial Carbon Credits for 40 tonnes (CO<sub>2</sub>e) of their Tradable Terrestrial Carbon each year (ie, one-fiftieth of 2,000), assuming they maintained that carbon as terrestrial carbon. Their underlying project would first have to be certified as a valid terrestrial carbon emission reduction project by Examplania’s national body. Once redeemed, the Terrestrial Carbon Credits would be entered on Examplania’s terrestrial carbon credit registry and could be bought and sold through an exchange.

If someone creates new terrestrial carbon, they have created Tradable Terrestrial Carbon. They can emit that carbon with no penalty or they can maintain it and redeem an equivalent volume of Terrestrial Carbon Credits at the end of the year in which it was created (or any later time).

- **Example (Creating New Terrestrial Carbon):** Assume the State of Examplania owns 100 hectares with no terrestrial carbon on it. It plants the land with new forest that grows at an average of 2 tonnes (CO<sub>2</sub>e) per hectare per year. At the end of a year, the State could redeem Terrestrial Carbon Credits for the actual volume of carbon it grew that year. The underlying project would first have to be certified as a valid terrestrial carbon sequestration project by Examplania's national body. Once redeemed, the Terrestrial Carbon Credits would be entered on Examplania's terrestrial carbon credit registry and could be bought and sold through an exchange.

Other landholders can make other decisions and emit their terrestrial carbon (eg, by clearing forested land for agricultural purposes).

- **Example (Ongoing Emissions of Terrestrial Carbon):** Landholder X owns 70 hectares with 7,000 tonnes (CO<sub>2</sub>e) of Tradable Terrestrial Carbon. They decide to clear their land for soy or palm oil production. They clear at the rate of 7 hectares per year, emitting 700 tonnes (CO<sub>2</sub>e) of carbon per year. In the third year, various landholders emit an additional 800 tonnes (CO<sub>2</sub>e) of carbon (a total of 1,500 tonnes). In the fourth year, a total of 500 tonnes is emitted across Examplania, and in the fifth year a total of only 200 tonnes is emitted.

If a landholder has not redeemed a credit for maintaining certain terrestrial carbon, there is no penalty for emitting that terrestrial carbon (eg, by clearing land). However, once a landholder emits terrestrial carbon, they cannot redeem Terrestrial Carbon Credits for that terrestrial carbon. If a landholder has redeemed Terrestrial Carbon Credits for maintaining certain terrestrial carbon and then emits it after all, they must acquire another carbon credit (whether a Terrestrial Carbon Credit or other type) of equal volume to remain in compliance with the system. If Examplania as a whole emits more than its Annual Terrestrial Carbon Budget in a year, it cannot participate in the system until it reverses the excess emissions.

Each time Tradable Terrestrial Carbon (whether existing when Examplania joined the system or newly created) is redeemed for Terrestrial Carbon Credits, an accounting entry is made that adds that volume of carbon to the nation's Protected Terrestrial Carbon. If at the end of any year, the total volume of all terrestrial carbon is less than the deemed Protected Terrestrial Carbon as at that date, Examplania is in default of the participation rules (see Section 3.2.5) and no one in Examplania can redeem Terrestrial Carbon Credits until the default is remedied. This "ratchet mechanism" addresses concerns about the permanence of avoided emissions of terrestrial carbon and newly created terrestrial carbon. The annual payment mechanism also matches the timing of the credit with the timing of the avoided emission of terrestrial carbon or the creation of new terrestrial carbon.

▪ Example (Accounting – in tonnes CO<sub>2</sub>e):

	End of Year 1	End of Year 2	End of Year 3	End of Year 4	End of Year 5
Protected Terrestrial Carbon at start of year	11,000	11,042	11,084	11,126	11,168
PLUS: Annual Terrestrial Carbon Budget for years remaining	38,220	37,440	36,660	35,880	35,100
PLUS: Terrestrial Carbon Credits redeemed for avoided emissions	40	40	40	40	40
PLUS: Terrestrial Carbon Credits redeemed for new sequestration	2	2	2	2	2
<b>Total Deemed Protected Terrestrial Carbon ("P")</b>	<b>49,262</b>	<b>48,524</b>	<b>47,786</b>	<b>47,048</b>	<b>46,310</b>
Total terrestrial carbon at start of year	50,000	49,300	48,600	47,100	46,600
LESS: Terrestrial carbon emissions	(700)	(700)	(1,500)	(500)	(200)
<b>Actual Existing Terrestrial Carbon ("A")</b>	<b>49,300</b>	<b>48,600</b>	<b>47,100</b>	<b>46,600</b>	<b>46,100</b>
<b>Balance (= "A" – "P") (If negative, nation is not in compliance)</b>	<b>38</b>	<b>76</b>	<b>(686)</b>	<b>(448)</b>	<b>90</b>

In this example, Eximplania and sub-national actors cannot continue to redeem Terrestrial Carbon Credits in Year 4 or Year 5 because there is less existing terrestrial carbon than the deemed Protected Terrestrial Carbon at the end of Year 3 and Year 4. However, in Year 6, Eximplania can start to redeem Terrestrial Carbon Credits again because at the end of Year 5 it is back in compliance with the system. Eximplania could become compliant again earlier by taking action, either through its Reserve, insurance, or other means, to rectify the shortfall. All Terrestrial Carbon Credits redeemed before Eximplania fell out of compliance would be valid. Projects that had already been certified by Eximplania's certification body could continue to generate Terrestrial Carbon Credits (provided the project remained in compliance with the national standards).



## Appendix II: Safeguarding Ongoing Compliance

### National

It would be in the interests of each Seller Nation (and any sub-national right owner) for the Seller Nation to remain in compliance with the system. Otherwise they would be unable to access financial flows from selling their Terrestrial Carbon Credits in the international market. Each Seller Nation could therefore maintain an independent terrestrial carbon reserve bank (Reserve) to manage ongoing compliance at a national level.

The Reserve's main function would be to smooth out the bumps caused by the loss of Protected Terrestrial Carbon through natural events like wildfires or wilful human conduct like illegal logging, and thus keep the nation within its National Terrestrial Carbon Budget.

The Reserve would make ongoing assessments of the risk of default and hold sufficient carbon credits (Terrestrial Carbon Credits or other) to mitigate any projected default. This assessment would reflect the nation's implementation strategy (eg, national vs project), inherent natural risks, and ability to enforce legislation protecting Protected Terrestrial Carbon. To build up and maintain the Reserve's holdings, the nation could withhold a percentage of all new Terrestrial Carbon Credits (although the Reserve could hold other types of carbon credits in addition to, or to the exclusion of, Terrestrial Carbon Credits). For instance, the Reserve could receive 10 Terrestrial Carbon Credits for every 100 Terrestrial Carbon Credits created, and the right owner could trade the remaining 90 Terrestrial Carbon Credits. As information and risk assessments improve over time, the proportion of Terrestrial Carbon Credits lodged with the Reserve could change. This would create an incentive for sub-national actors to maintain Protected Terrestrial Carbon in the long term because higher levels of compliance would lead to the Reserve withholding a lower proportion. The nation could also give back previously withheld Terrestrial Carbon Credits based on high levels of compliance.

Nations and Reserves could determine how to further ameliorate risk through regulation of activities that generate Terrestrial Carbon Credits. For example, right owner could be obliged to insure all Protected Terrestrial Carbon, create buffers (as in, eg, the Voluntary Carbon Standards' guidelines for avoided deforestation projects), or hold project-level reserves of carbon credits (akin to the prudential requirements in the banking sector).

The independence, transparency and credibility of a Seller Nation's Reserve would affect the likelihood that:

- Other nations would become Buyer Nations and recognise in their own carbon markets the Seller Nation's Terrestrial Carbon Credits.
- Other nations, philanthropic actors and the private sector would provide assistance to build the Seller Nation's potential to generate Terrestrial Carbon Credits.
- Buyers of voluntary carbon credits would choose to buy the Seller Nation's Terrestrial Carbon Credits because those Terrestrial Carbon Credits would have a high level of credibility.

To facilitate ongoing compliance with the system, Seller Nations could also enact domestic legislation to:

- Allow the emission of Protected Terrestrial Carbon only if a correlating emission reduction credit is acquired (except if emission is contrary to existing treaties, laws or standard of care) – this does not necessarily prevent economic use of that land, including sustainable forest management
- Allow the emission of Tradable Terrestrial Carbon subject to existing treaties, laws and standard of care
- Allow the creation of new terrestrial carbon anywhere, subject to existing treaties, laws and standard of care (eg, an existing biodiversity protection law might prevent the conversion of biodiverse grasslands into more-carbon-rich woodland, forest, or quick-growing tree plantation)

## International

It would be in the interests of all participating nations that the international trading of Terrestrial Carbon Credits is inclusive, relatively smooth and devoid of major contagious disruptions. An example of a major disruption would be the unexpected non-compliance of a large Seller Nation (or group of smaller Seller Nations). The national Reserves would be a first line of defence against such failure. To reduce the risk further, all participating nations could contribute carbon credits (Terrestrial Carbon Credits or other) to an international terrestrial carbon fund. The fund would work with Seller Nations that suffer major disruptions to keep the Seller Nation in compliance with the system.

Many Seller Nations wishing to participate in the system will need assistance to build the required capacity. The fund could provide them with the resources (financial, technical and human) to do so (eg, by providing upfront financing to fund the installation of monitoring systems, carbon rights clarification, and funds distribution mechanisms).<sup>25</sup>

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<sup>25</sup> It might be possible to design a system of global insurance instead of the reserve system described above.

## Appendix III: Frequently Asked Questions about the Proposed System

### 1. Is this the only possible credible system?

No. The proposed system is one possible way of building a credible market approach to terrestrial carbon; we would welcome better alternatives or suggestions to improve ours.

### 2. Are there other ways to set a credible National Terrestrial Carbon Budget?

Yes. Provided they are consistent with the Principles set out in Section 2 (especially Principle 1), possible methods might include:

- Using the projections of future terrestrial carbon emissions that nations report as part of IPCC communications to calculate the Tradable Terrestrial Carbon (after review by experts).
- Asking Seller Nations to prepare a sustainable development land management plan (mapping and classifying land into protection, production, infrastructure, and conversion land), and including as Tradable Terrestrial Carbon only terrestrial carbon on land that is planned for conversion.

### 3. Who decides if a nation joins the system?

Joining the system is voluntary but once a nation has joined, there are obligations. This is no different from the vast majority of international agreements. Nations would determine for themselves if and how they will become and remain compliant with the system and how they will distribute rights, obligations, impacts, compensation, participation, and revenues as well as how they will make choices between economic, social and environmental outcomes.

### 4. Does this rely on a “global deal”?

The system does not rely on all nations participating. It would work with just two nations (eg, the mooted partnership between Australia and Papua New Guinea), as part of a multi-lateral carbon market, or as part of an international carbon market created under the successor to the Kyoto Protocol.

### 5. Would this work under other proposed approaches like the “fund” approach, “nested” approach, and “dual markets” approach?

The proposed system would be complementary to a “fund” approach under which nations contribute resources to an international fund and forested nations access those resources based on taking specific steps forward on reducing their deforestation and becoming market-ready. As set out in Principle 4, they are not mutually exclusive.

The system would work under:

- The so-called “nested” approach, which allows terrestrial carbon credits to be generated through project-level activity during a specified transition period before a nation has implemented national accounting and monitoring of terrestrial carbon.
- A “dual markets” approach, which creates demand for terrestrial carbon credits independently of other greenhouse gas emissions sectors (ie, terrestrial carbon credits cannot be used to offset industrial emissions). It is worth noting that such approaches lead to different shadow prices for carbon in different uses. This means that the cost of reducing overall carbon emissions is not minimised.

It would also work under a system that transitions from a “fund” approach to a “dual markets” approach to an eventual fully fungible carbon market approach (whether or not a “nested” approach is also used).

**6. Would this fit with the proposed Lieberman-Warner Bill?**

Yes. US legislation is simply an example of the national implementation approach. It is consistent with sovereign decision-making and would be incentivised to comply by access to international sources of carbon credit supply as well as opportunities to act as an intermediary through exchanges and financial institutions.

**7. Would this prevent a developing nation establishing a domestic carbon market?**

No. A developing nation could join this international system whether or not it established a domestic carbon market that allows the trade of terrestrial carbon credits.

**8. Does this affect obligations of nations that took on emission reduction commitments under the Kyoto Protocol (Annex-B nations)?**

No, the aim of this system is to include terrestrial carbon in developing nations, particularly forest and peatlands in the tropics, in the climate change solution. It is not to change the obligations of Annex-B parties. Annex-I nations should not be able to use action on terrestrial carbon as a way to satisfy existing commitments on "International Cooperation" under the UNFCCC and Kyoto Protocol.

**9. Could this system be used to meet new climate change commitments by developing nations?**

Yes.

It would also be possible to modify the proposed system so that the incentives for action come from a combination of:

- Recognition by the international community of an effective new contribution by a nation with terrestrial carbon to climate change mitigation (without relying on carbon markets)
- Carbon markets linked to existing or new climate change commitments (in either developed or developing nations)

The following changes would be required. Before a nation can start generating Terrestrial Carbon Credits in any given year, it must first reduce the actual emissions of terrestrial carbon by an Annual Buffer equal to (for example) 20% of its Annual Terrestrial Carbon Budget. The nation's Annual Target is its Annual Terrestrial Carbon Budget less its Annual Buffer. If the nation emits less than its Annual Target in that year, it can sell the difference as Terrestrial Carbon Credits. Accounting Standard 5 under Section 3.2.4 would then read:

A nation is within its National Terrestrial Carbon Budget at the start of any given year only if the volume of all existing terrestrial carbon in that nation at that date is greater than or equal to:

- The volume of original Protected Terrestrial Carbon
- **PLUS** The volume of all Annual Buffers up to that date
- **PLUS** The volume of the Annual Terrestrial Carbon Budget multiplied by the years remaining of the original 50 years
- **PLUS** The volume of all Terrestrial Carbon Credits redeemed up to that date
- **MINUS** The volume of all Terrestrial Carbon Credits cancelled up to that date

## 10. Is this a top-down or bottom-up approach?

The international system creates the incentives for nations to join out of self-interest, and for a domestic constituency – out of self-interest – to push its nation (through political processes) to join. It is top-down only to the extent necessary to guarantee robust climate change mitigation outcomes. It relies on the self-interest of nations and citizens to develop a national implementation approach that satisfies both the needs and circumstances of the nation and the participation rules (see Section 3.2.5).

## 11. How does this affect sovereignty over land management?

The system does not prevent or penalise the emission of terrestrial carbon (and therefore the clearing of vegetation) up to the business as usual level. Instead, it provides incentives to reduce business as usual emissions. Nations and sub-national actors can continue to make sovereign land management decisions.

A National Terrestrial Carbon Budget does not impinge on national sovereignty and does not necessarily prevent economic use of land (eg, sustainable forest management). It is not the same as a economy-wide, sector-wide carbon budget, and it is not the same as Annex-B nations' emission reduction targets under the Kyoto Protocol. It is limited to terrestrial carbon emissions from land use. The International Terrestrial Carbon Accounting Standards provide nations and sub-national actors with options to “unwind” land management decisions while still maintaining the climate change mitigation integrity of the system (see Section 3.2.4).

## 12. How do war and insurgency affect the system?

In cases where a country does not control part of its territory through no fault of its own (eg, because of insurgency), terrestrial carbon in that part could be excised from the National Terrestrial Carbon Budget until control is regained.

## 13. Is new forest protection rewarded?

Yes. If a nation creates a new protected area, or changes business as usual land use from one with high terrestrial carbon emissions (eg, conversion of forest to agriculture) to one with lower emissions (eg, sustainable forestry management), it can generate and sell corresponding Terrestrial Carbon Credits.

If a nation undertakes such action between the start of the proposed system and the date the nation joins the system, it could still claim credit for that action as “early action”. Therefore, there is no disincentive for nations to undertake such action while it gets ready to take part in the system.

## 14. Are nations rewarded for enforcing existing laws?

The system does not reward the prior effective legal protection of terrestrial carbon because the decisions to provide that legal protection were made in the absence of a carbon market. Therefore, obtaining funding from a carbon market could not have been a consideration in weighing the economic, social, and environmental factors of making the decision. Providing financial incentives from a carbon market to maintain such terrestrial carbon would fail the additionality test.

However, areas that are “legally” but not effectively protected (because already subject to or threatened by illegal encroachment) would be included when setting the National Terrestrial Carbon Budget. An international fund could also help nations seeking to address the failure of enforcement through other channels.

## 15. What is the role of land-use intensification?

The challenge of terrestrial carbon is to increase production of food, fibre, and fuel and maintain and create more terrestrial carbon. Historically, more production has meant less native vegetation and less terrestrial carbon. This does not have to be the case. In the mid-term, land-use intensification can provide the world with more food, fibre, and fuel and more terrestrial carbon. For example, in the case of South American livestock, current grazing densities

(about 1 head / hectare) could be tripled or quadrupled with current technology. Even healthy agro-industry builds up soil carbon stocks.

## **16. What is the role of sustainable forestry management?**

Sustainable forest management has a very important role. The world will always need products from forests. If managed appropriately, forests can be one of our best renewable resources. Sustainable forest management is one way to maintain terrestrial carbon while producing necessary food, fibre, and fuel, especially fibre (including timber, pulp and paper). Put simply, sustainable forest management: converts terrestrial carbon (in trees) to products like timber, pulp and paper; some of the carbon in those products is eventually emitted into the atmosphere; and in the meantime, the forest is regrown under sustainable practices, replacing most of the terrestrial carbon that was converted to those products.

Typically there is a reduction in terrestrial carbon when a natural forest is converted to a sustainably managed forest. Areas designated for sustainable forest management are categorised as “protected” because forest (and its associated terrestrial carbon) in these areas must be retained over time, even if that forest contains less terrestrial carbon than beforehand. In other words, even though some terrestrial carbon is lost, the majority cannot be emitted and is therefore “protected”. However, any loss of terrestrial carbon caused by converting a natural forest to a sustainably managed forest and at subsequent harvesting would be accounted for in the Accounting Standards and Participation Rules in Sections 3.2.4 and 3.2.5.

## **17. What is the role of the private sector and civil society?**

Nations would determine the role of the private sector (including civil society), and any national implementation rules that would apply to the private sector (which could mirror the proposed international system and / or build on existing methodologies). Nations could allow the private sector to participate in almost all aspects of this system, including developing and running the required national infrastructure (eg, data gathering and interpretation, monitoring, terrestrial carbon register and exchange), instigating and managing terrestrial carbon projects, providing financial services (providing finance, developing derivatives products like futures, etc), providing broking services, providing project and political risk insurance, and certifying project compliance.

## **18. What is the role of projects?**

The system provides a framework for project- and national-level activities. It is based on national terrestrial carbon accounting and monitoring, but does not exclude project-level activities. Nations would determine the role of projects within their national implementation system.

## **19. Could bonds be used instead of, or in addition to, Terrestrial Carbon Credits?**

Yes. It would be possible to use bonds. The value of the bond (in terms of carbon credits) would vary over time depending on the performance of the entity that issued the bond. For example, if a sub-national actor issued a bond for 10 tonnes of CO<sub>2</sub>e of avoided deforestation and in the first three years maintained all 10 tonnes as terrestrial carbon in their existing forest, the bond's value would be equal to its face value. The purchaser of the bond could use the bond as a credit for 10 tonnes of CO<sub>2</sub>e. If, however, in the fourth year, the issuer of the bond cleared half their forest, emitting 5 tonnes of CO<sub>2</sub>e, the purchaser of the bond could only use the bond as a credit for 5 tonnes of CO<sub>2</sub>e, and would have to buy another credit for their remaining requirements. The risk of non-compliance would be reflected in the price purchasers are willing to pay that bond issuer: the higher the risk of non-compliance, the lower the price. Bonds would work best where the issuer is a repeat player in the market – so that purchasers can use historic performance as a price guide and so that the issuer is incentivised to perform because non-performance will negatively impact on the price received for its future bond issues.

**20. Are existing methodologies and standards for measurement and accounting good enough?**

The existing methodologies and standards developed under the UNFCCC and Kyoto Protocol for carbon quantification for various types of landscape and vegetation and for the more technical aspects of terrestrial carbon accounting are sufficiently precise for the proposed system, and can be adapted over time.

**21. Does this require a whole new satellite system?**

No. The satellite monitoring system could be made up of different sub-systems, rather than one single uniform system across all participating nations. It does not require a whole new international satellite system, but can be built build on existing systems.

**22. Do all carbon pools and land uses have to be included from the start?**

Not necessarily. The proposed system provides an overarching modular framework. Initially, the carbon pools and land uses for which there are sufficiently robust information, methodologies, techniques and technology can be included. At a minimum, this would be carbon and CO<sub>2</sub> in peatlands, forest, and lands that can become secondary forest. Other pools and land uses can be phased in as information, methodologies, techniques and technology allow. However, included carbon pools and land uses must be accounted for nationally.

**23. How does this address additionality and leakage?**

To effectively address additionality and leakage, National Terrestrial Carbon Budgets must be credible reflections of a business as usual scenario (ie, what volume of terrestrial carbon would have been emitted without a carbon market).

***Additionality***

The world's population is expected to increase by 50% between 2000 and 2050.<sup>26</sup> Nations and their citizens will continue to pursue economic development. As a consequence, vegetation will be cleared to make way for the production of food, fibre, and fuel, and for human settlements. Under a business as usual scenario over the next 50 years, most terrestrial carbon will be converted to atmospheric carbon. The exception will be terrestrial carbon that is actually and effectively protected by laws<sup>27</sup> or by being inaccessible.<sup>28</sup> Therefore, any unprotected terrestrial carbon that is maintained by a financial incentive offered by a carbon market is a reduced emission compared with the business as usual scenario. The emission reduction is additional to what would otherwise have happened. Any terrestrial carbon created by human activity is additional (subject to the National Terrestrial Carbon Accounting Standards).

***Leakage***

Given the demand for food, fibre, fuel, and human settlements, if one hectare of land containing terrestrial carbon is protected through financial incentives, another hectare will be cleared to make way for activities that meet the

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<sup>26</sup> United Nations, 2006. *World Urbanization Prospects: The 2005 Revision*. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat. <http://esa.un.org/unpp>. United Nations, 2007. *World Urbanization Prospects: The 2006 Revision*. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat. <http://esa.un.org/unpp>.

<sup>27</sup> For example, terrestrial carbon in areas designated for sustainable forest management, in conservation reserves, in riparian zones protected by vegetation retention regulations, subject to other land use laws, or subject to private covenants – that is not subject to or threatened by, illegal activity.

<sup>28</sup> For example, terrestrial carbon that is on slopes too steep to log or cultivate, or is too remote to log or cultivate.

latent demand (locally or internationally). It appears that the emission of terrestrial carbon has simply leaked from the first hectare to the second hectare. It appears that there is no net benefit to atmospheric greenhouse gas concentrations. However, that is taking an immediate or intermediate perspective. At the time-scale relevant to climate change (ie, 50 years), leakage is not a problem. In that time scale, all unprotected terrestrial carbon would have been emitted to satisfy demands for food, fibre, fuel and human settlements (see previous paragraph). Therefore, any unprotected terrestrial carbon that is protected produces a net benefit to atmospheric greenhouse gas concentrations in the long term.

The proposed system addresses intra-national leakage completely. International leakage is effectively limited to a maximum volume equal to the protected terrestrial carbon in all nations that do not participate in the system. Whether or not those nations participate, all unprotected terrestrial carbon in those nations will be emitted under a business as usual scenario in any case. The only additional impact of not participating is the potential for protected terrestrial carbon to be emitted. International leakage is minimised further as more nations participate. The system encourages broad participation because it provides incentives to developing nations regardless of their historic rates of deforestation and terrestrial carbon emissions.

#### 24. Will this “flood the market” and delay action on other emissions (eg, fossil fuels)?

The world is either serious about avoiding dangerous climate change or it is not. If it is, then terrestrial carbon emissions and sequestration must be part of the solution (as must all other elements) and the world must adopt a global carbon budget consistent with stabilizing greenhouse gas concentrations at a safe level. The pathway to stay within that budget requires major emissions reductions from the status quo.<sup>29</sup> If terrestrial carbon emissions are part of the solution and the world is serious, then the world must (by definition) create the new demand for the new terrestrial carbon credits. In this case, there will be no flooding of the market. If the world is not serious, the whole question is rather moot because we will not avoid dangerous climate change whether we flood the market with Terrestrial Carbon Credits or not.

The proposed system limits annual flows of Terrestrial Carbon Credits to a maximum of the sum of Annual Terrestrial Carbon Budgets in all participating Seller Nations.. In the initial stages, there would most likely be a supply-side constraint as nations and sub-national actors became compliant with the system and developed certifiable terrestrial carbon projects. Various other mechanisms exist to deal with the possibility of Terrestrial Carbon Credits flooding the market. These include:

- Allowing inter-temporal trading.
- Safety valves that only allow Terrestrial Carbon Credits into a carbon market once the carbon price in that market reaches a certain level (this could be subject to a minimum guaranteed flow to provide predictability to investors in terrestrial carbon projects).
- Limiting the volume of terrestrial carbon credits to a proportion of the overall carbon market (as the Lieberman-Warner Bill does).
- Limiting who can buy and sell in the initial phase (this would also help minimise disruptions caused by speculation).
- Use auctions with restricted participation in the initial phase (rather than a fully-functioning, always-open, market) to induce transparency and match supply and demand.
- Establishing a “single desk” to purchase all available Terrestrial Carbon Credits (possibly at a discount to the price for other carbon credits) and manage the release of those Terrestrial Carbon Credits in carbon markets with the aim of avoiding price destabilisation in those markets. The seller of the Terrestrial Carbon Credits would receive payment immediately, but the single desk might not on-sell the Terrestrial Carbon Credits until a later date.

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<sup>29</sup> See eg, Stern, N., 2008. *Key Elements of a Global Deal on Climate Change*. London School of Economics and Political Science.



**25. Does this guarantee reduced emissions of terrestrial carbon and increased sequestration of carbon in the terrestrial system?**

Yes. The proposed system creates new demand for the new Terrestrial Carbon Credits. Maintaining existing terrestrial carbon and creating new terrestrial carbon will occur where the price offered by the carbon market (coupled potentially with other payments and incentives) is more attractive than the price offered by alternative uses of that carbon (eg, converting it directly to wood products or converting it to atmospheric carbon to produce soy, palm oil, beef etc). Examples of other payments and incentives include government policy and enforcement, NGO conservation programs, payments for other environmental services, other livelihoods, and overseas development assistance. As discussed in Section 1 and under Question 24, the most important factor that will determine success is setting the right level of demand for Terrestrial Carbon Credits.

**26. Does this guarantee reduced concentrations of greenhouse gases in the atmosphere in the long term?**

Yes, if the right level of demand is created for new Terrestrial Carbon Credits.

**27. How does this foster capacity building (readiness)?**

Compliance with the participation rules will require resources, time and technical expertise. This will be beyond the current capacity of some nations that are contributing a significant portion of carbon emissions from land use or that have significant carbon sequestration potential. There will, therefore, be an important role for an international fund to provide financial, administrative and technical assistance in addition to what may be available from other nations, philanthropic actors (including NGOs), and the private sector.

**28. How does this foster early action?**

The more terrestrial carbon that exists at the start of the system, the more terrestrial carbon can be traded. It is therefore in the interests of nations and sub-national actors to retain as much terrestrial carbon as possible before the system starts.

**29. How does this affect co-benefits?**

This system provides incentives to reduce terrestrial carbon emissions and increase terrestrial carbon sequestration. This rewards the protection of existing forests and other native vegetation as well as the rehabilitation of degraded land. Existing tropical forests will be far more valuable than other types of land when measured as stores of CO<sub>2</sub>. This protection and rehabilitation, coupled with existing international and domestic treaties, laws, and policies on sustainable development, will result in positive outcomes for climate change adaptation, biodiversity, weather regulation, and hydrologic function. The outcome for biodiversity protection in tropical forests alone will be massive.

The system does not reward the conversion of land to a lower carbon-density state (eg, converting forest to pasture), but does reward the reverse (eg, converting a grassland to a plantation). Where they do not already exist or are not already enforced, nations would need to implement and enforce laws and policies to prevent the undesired conversion of low-carbon density land to higher-carbon density land (eg, the conversion of a grassland containing a rare species of grass or providing habitat to a rare species of bird to a mono-species tree plantation).

The access to finances from a carbon market is a positive outcome for economic development.

Parties with an interest in outcomes in particular aspects of sustainable development can use the finance from a carbon market to help them achieve their outcomes. In other words, it should be easier to achieve those outcomes with a carbon market than without. Parties can then use the “freed up” money to further their objectives at a larger scale. For example, Terrestrial Carbon Credits could be combined with credits in emerging payment for environmental services (PES) markets for water, biodiversity, weather regulation etc.

30. Does this favour maintaining existing terrestrial carbon over creating new terrestrial carbon or vice-versa?

No. Maintaining existing terrestrial carbon and creating new terrestrial carbon are both required to avoid dangerous climate change, and both must therefore be fostered. The proposed system provides incentives to do both without favouring one or the other.

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# Notes

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July 2008

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ISBN 978-0-646-49550-7