Summary

Climate change poses a very serious threat to forests throughout the world and to millions of people who depend on forests to different degrees for their livelihoods, shelter, food and water. This report examines the impact of climate change on forests and sustainable forest management, and addresses the important roles that forests can play in mitigating and adapting to climate change and identifies possible actions on the part of the Forum to this end.

Globally, forest ecosystems in 2005 contained 638 (Gt) of carbon, with half (321 Gt) in forest biomass and dead wood. The carbon in forests is more than the amount of carbon now in the atmosphere. Deforestation and forest degradation are the primary drivers of carbon emissions from forests, accounting for 17.4 percent of total human-generated CO$_2$ emissions in 2004. The reduction of emissions from deforestation and forest degradation (REDD), and sustainable management and conservation of forests can contribute significantly to mitigating climate change.

Any decision by the UNFCCC on issues regarding REDD may open up new potentials of a funding source for the sustainable management and conservation of forests in a post-2012 Kyoto Protocol commitment period.

Consideration should be given to closer cooperation between the UNFF and UNFCCC, CBD and UNCCD as well as among CPF member organizations, on the role of forests in mitigating and adapting to climate change.

*E/CN.18/2009/1
** The delay in the issuance of the present report was due to the need for extended consultations.
## Contents

### Summary

### Abbreviations

### I. Introduction

### II. Forests as a microcosm for sustainable development

### III. Forests in the climate change equation

#### A. The impact of climate change on forests

#### B. The impact of deforestation and forest degradation on climate

### IV. The role of forests in responding to climate change

### V. Importance of reducing emissions from deforestation and forest degradation. (REDD)

### VI. Opportunities and challenges for the forest sector

#### A. Opportunities

#### B. Constraints and challenges

#### C. Promoting mitigation and adaptation strategies to climate change in national forest programmes

### VII. Conclusions
### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWG-LCA</td>
<td>Ad Hoc Working Group on Long-Term Cooperative Action</td>
</tr>
<tr>
<td>CBD</td>
<td>Convention on Biological Diversity</td>
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<td>CDM</td>
<td>Clean Development Mechanism of the Kyoto Protocol</td>
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<td>CIFOR</td>
<td>Center for International Forestry Research</td>
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<td>COP</td>
<td>Conference of the Parties</td>
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<td>COP/MOP</td>
<td>Conference of the Parties serving as the meeting of the parties to the Kyoto Protocol</td>
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<td>CPF</td>
<td>Collaborative Partnership on Forests</td>
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<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<td>FRA</td>
<td>Forest Resources Assessment</td>
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<td>GEO</td>
<td>Global Environment Outlook</td>
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<td>GHGs</td>
<td>Greenhouse gases</td>
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<tr>
<td>Gt</td>
<td>Billion tonnes</td>
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<td>ICRAF</td>
<td>World Agroforestry Centre</td>
</tr>
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<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<tr>
<td>IUUFRO</td>
<td>International Union of Forest Research Organizations</td>
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<tr>
<td>LULUCF</td>
<td>Land use, land-use change and forestry</td>
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<td>REDD</td>
<td>Reducing emissions from deforestation and forest degradation</td>
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<tr>
<td>SBSTA</td>
<td>Subsidiary Body for Scientific and Technological Advice</td>
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<tr>
<td>STRI</td>
<td>Smithsonian Tropical Research Institute</td>
</tr>
<tr>
<td>UNCCD</td>
<td>United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa</td>
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<td>UNDP</td>
<td>United Nations Development Programme</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
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<td>UNFF</td>
<td>United Nations Forum on Forests</td>
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<td>WMO</td>
<td>World Meteorological Organization</td>
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</tbody>
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I. Introduction

1. The non-legally binding instrument on all types of forests, hereinafter referred to as the forest instrument, agreed by the United Nations Forum on Forests at its seventh session and adopted by the General Assembly on 17 December 2007 recognizes, in its preamble, “the impact of climate change on forests and sustainable forest management, as well as the important contributions that forests can play in addressing climate change”. The seventh session of the Forum also adopted the multi-year programme of work of the Forum for the period 2007 – 2015, which calls for the eighth session in 2009 to address “forests in a changing environment”, including the themes “forests and climate change”, “reversing the loss of forest cover, preventing forest degradation in all types of forests and combating desertification, including low forest cover countries”; and “forests and biodiversity conservation, including protected areas”. This report addresses the first of these interconnected themes, with the latter two being the focus of separate reports of the Secretary-General. This issue is also of great importance to the member organizations of the Collaborative Partnership on Forests (CPF) who together have prepared a paper for this session entitled Strategic Framework for Forests and Climate Change: a Proposal by the Collaborative Partnership on Forests for a Coordinated Forest-Sector Response to Climate Change.

2. Although the issue of forests and climate change was discussed by the Forum’s predecessors, the Intergovernmental Panel on Forests (IPF) and the Intergovernmental Forum on Forests (IFF), there were no proposals for action agreed upon regarding this issue. With the adoption of the programme of work 2007 – 2015, the Forum has the opportunity to effectively engage itself in addressing and supporting the global climate change agenda as it pertains to forests.

3. This report draws from different sources, including the work of the United Nations Framework Convention on Climate Change (UNFCCC), the Intergovernmental Panel on Climate Change (IPCC) and general literature. Contributions from member organizations of the Collaborative Partnership on Forests (CPF), particularly the Strategic Framework for Coordinated Response were important in the elaboration of this document. Proposals and recommendations of the Secretary General are presented in the report on Recommendations for addressing key challenges of forests in a changing environment.

II. Forests as a microcosm for sustainable development

4. In addressing the issue of forests and climate change, care must be taken to consider the full scope of forests in sustainable development. Forests provide much more than the carbon sequestration valued in the context of climate change and it would be a mistake to let this one issue dominate the global forest agenda. If a single good or service, among the many covered by sustainable forest management, gets disproportionate focus, including significant financing, there is a risk that sustainable forest management could be distorted to the detriment of other goods and services.

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1 UNFF Secretariat (2007), Subject Index and Thematic Clustering of the IPF/IFF Proposals for Action, UNFF Resolutions and Decisions and Relevant ECOSOC Resolutions, (unpublished). Hereinafter referred to as UNFF Secretariat (2007), Subject Index.

2 E/CN.18/2009/8
5. The forest instrument recognizes that forests and trees outside forests provide multiple economic, social and environmental benefits and that sustainable forest management contributes significantly to sustainable development and poverty eradication. In its statement of purpose, the forest instrument aims to enhance the contribution of forests to the achievement of the internationally agreed development goals, including the Millennium Development Goals, in particular with respect to the eradication of extreme poverty and hunger and environmental sustainability.

6. Forests contribute to the livelihoods of at least 1.6 billion people. About 60 million people, mainly indigenous communities, live within forests, and another 350 million people are highly dependent on forests. Forest industries, both formal and informal, employ 50 million people. It is estimated that the annual value of international trade in forest products is approximately US$ 270 billion, with 20 percent corresponding to developing countries. The forest sector continues to grow in economic importance.

7. Forests are critically important for maintaining vital ecosystem functions and the services required for sustainable development such as the conservation of biodiversity, soil conservation, carbon sequestration, water quality and supply, flood control, and climate regulation. It is estimated that at least 80 percent of the Earth’s remaining terrestrial biodiversity is found in forests, which, as will be seen in section III, are also a major carbon sink for regulating global climate.

8. Given the importance of forests to sustainable development, societal well-being and the provision of key environmental services, climate change poses a very serious threat not only to forests and forest ecosystems but also to millions of people who depend on forests to different degrees for their livelihoods, shelter, food and water.

III. Forests in the climate change equation

9. Anthropogenic greenhouse gas emissions, principally carbon dioxide (CO₂), are the main causes of climate change, including global warming. Over the past century there has been an average temperature increase of 0.74 °C. Eleven of the twelve years from 1995 to 2006 rank among the 12 warmest years since 1850. Projected increases in the frequency and intensity of storms, floods, heat waves and drought will affect the lives of billions of people worldwide. If the current trend continues unabated, the IPCC projection indicates an increase in global temperature of 1.8-4°C by the end of this century, impacting most severely on the planet’s most vulnerable, poor and disadvantaged people.

10. According to the IPCC, the largest increase in GHG emissions from 1970 to 2004 has come from energy supply, transport and industry, with lower rates of growth for residential and commercial buildings, and the forest and agriculture sectors. In 2004, it was estimated that energy

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supply accounted for 25.9 percent of all GHG emissions; industry, for 19.4 percent; and forests, for 17.4 percent, due primarily to deforestation and forest degradation.5

11. Parties to the UNFCCC in Decision 5/CP.13 welcomed the IPCC Fourth Assessment Report, recognizing it as the most comprehensive and authoritative assessment on climate change to date. The Fourth Assessment Report addresses options for limiting GHG emissions and mitigating climate change and concludes that unmitigated climate change would, in the long term, be likely to exceed the capacity of natural, managed and human systems to adapt. For the lowest mitigation scenario category assessed, emissions would need to peak by 2015 and for the highest by 2090.6

A. The impact of climate change on forests

12. The impact of climate change on forests can be negative or positive depending on their geographic location. The impacts in drylands or lands with lower precipitation rates, particularly in Africa and Asia, that suffer from increased temperatures and a drop in rainfall, will have far-reaching consequences for forests including also the forest dependent poor who are already highly vulnerable. In some other regions, such as in eastern Central America, there have been increases in precipitation, which can be beneficial, although higher temperatures and drought during El Niño episodes can still adversely affect forest ecology.

13. Climate change is significantly affecting forests through changes in their physiology, structure, species composition and health, largely resulting from changes in temperature and rainfall. Also at risk are the important environmental services that they provide. Of particular concern are the effects that increased temperatures and drought, resulting in more frequent outbreaks of pest infestations, more forest fires and increasing alterations in populations of plant and animal species, are having on forest health and productivity.

14. The IPCC Fourth Assessment Report projects that by 2050 increases in temperature and associated decreases in soil water will lead to the gradual replacement of tropical forests by savannas in eastern Amazonia. Many tropical forests in Latin America will experience a loss in biodiversity.7 In another example, by 2030 productivity from forests is projected to decline over much of southern and eastern Australia and over parts of eastern New Zealand as a result of drought and fire.8

15. One of the most publicized examples has been the catastrophic infestation of the mountain pine beetle (Dendroctonus ponderosae), due to increased temperatures, that has devastated large expanses of forests in Canada. From 1997 to 2007, an estimated 13 million hectares, or 130,000 km², have been destroyed by this pest in western Canada. This destruction is one order of magnitude greater than any previous outbreak.9

6 Ibid.
7 Ibid.
8 Ibid.
16. Global warming due to climate change can also provide some positive effects to forest ecosystems, for example, by providing longer growing seasons, especially to temperate and boreal regions, lending to faster growth. However, unpredictable changes in composition of flora and fauna and other environmental factors should not be underestimated.

B. The impact of deforestation and forest degradation on climate

17. Carbon is the key component of the leading greenhouse gas contributing to global warming that is stored in large amounts in the trees, under-story vegetation, and forest soils. Globally, forest ecosystems contained 638 billion tonnes (Gt) of carbon in 2005, with half (321 Gt) in forest biomass and dead wood. The carbon in forests is more than the amount of carbon now in the atmosphere.\(^\text{10}\)

18. Deforestation and forest degradation in developing countries are some of the primary sources of carbon emissions from forests, as carbon stored in trees and soil are quickly released to the atmosphere by burning forests. In 2004 the forest sector accounted for releases of approximately 8.5 billion tonnes of carbon dioxide (CO\(_2\)), mostly from deforestation, which is equivalent to 17.4 percent of total human-generated CO\(_2\) emissions\(^\text{11}\).

19. In contributing to forest degradation and destruction, climate change is also exacerbating the release of carbon dioxide and further compounding global warming. For example, it is estimated that the cumulative impact of the destruction of forests in western Canada by the mountain pine beetle from 2000-2020 as a result of warmer temperatures will be 270 megatonnes of carbon, which is equivalent to the reduction of gas emissions by 2012 committed to by Canada under the Kyoto Protocol.\(^\text{12}\)

IV. The role of forests in responding to climate change

20. Discussion on the role of forests in addressing climate change has been a long on-going process. Adopted in 1992, the United Nations Framework Convention on Climate Change in Article 4 recognizes the importance of forests as a sink for greenhouse gases (GHGs). In Article 4, paragraph 1 (d) Parties commit to “Promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all GHGs not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems”.


21. Several Articles and especially paragraph 3 of Article 3 of the Kyoto Protocol, adopted in 1997, make provisions for the inclusion of land use, land-use change and forestry (LULUCF) activities by Parties as part of their efforts to implement the Protocol and contribute to the mitigation of climate change. Article 12 of the Protocol defines the clean development mechanism (CDM) that allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits. CERs can then be traded, sold, and used by industrialized countries to meet a part of their emission reduction targets. It should be noted however, under the CDM, with regard to forestry, only afforestation and reforestation activities are considered eligible.¹³

22. Despite the provision for the inclusion of afforestation and reforestation projects in CDM, due to various methodological and policy constraints so far there is only a negligible number of registered CDM projects on forests.

23. More recently, forests have received greater attention in climate change deliberations not only because of their role in mitigating and adapting to climate change, but also due to growing concerns over carbon emissions resulting from deforestation and forest degradation in developing countries where emissions are considerable and increasing. Deforestation and forest degradation are receiving particular attention due to their significant account of global carbon emissions. Deforestation is causing 35 percent of emissions in developing countries, in the least developed countries this ratio is as high as 65 percent.¹⁴

24. The inclusion of deforestation and forest degradation in developing countries in combating global warming is receiving more traction in international negotiations and public discussions. The discussions include various options of public payments and market-based mechanisms to avoid deforestation and degradation.

25. The Bali Action Plan adopted by the Conference of the Parties (COP) of the UNFCCC in December 2007 (Decision 1/CP.13) is a two year process that aims to finalize a post-2012 regime for the Kyoto Protocol at the Convention’s fifteenth session in December 2009. To conduct the process the Bali Action Plan establishes the Ad Hoc Working Group on Long-Term Cooperative Action (AWG-LCA) under the Convention, which should complete a long-term cooperative action process by 2009. Issues to be considered include a shared vision for long-term cooperative action, mitigation, adaptation, technology development and transfer as well as finance.¹⁵ Particularly relevant for forests that The Bali Action Plan will address mitigation action by considering “Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries”¹⁶.

26. To this end, the forest instrument can provide a framework for closer cooperation and collaboration between the Forum and the UNFCCC. Global objectives on forests 1 and 3 of the forest instrument aim respectively to “Reverse the loss of forest cover worldwide through sustainable forest management, including protection, restoration, afforestation and reforestation, and increase efforts to prevent forest degradation,” and to “Increase significantly the area of protected forests worldwide and other areas of sustainably managed forests, and increase the

¹³ Decision 17/CP.7, 3/CMP.1, 5/CMP.1, 6/CMP.1, 16/CMP.1
¹⁵ Decision 1/CP.13, Bali Action plan, paragraph 1-2
¹⁶ Decision 1/CP.13, Bali Action plan, paragraph 1(b) (iii).
proportion of forest products from sustainably managed forests”. Moreover, the IPF and IFF proposals for action and resolutions of the Forum provide a policy body of work which addresses the drivers of deforestation and forest degradation at the national and international levels that can contribute significantly to reducing emissions from deforestation and forest degradation and that can enhance forest carbon stocks due to sustainable forest management.

V. Importance of reducing emissions from deforestation and forest degradation (REDD)

27. Reducing emissions from deforestation and forest degradation as an agenda item was first addressed at COP11 of the UNFCCC in Montreal in 2005. As described under the previous title, two years later the UNFCCC COP adopted the Bali Action Plan. Already, in anticipation of an agreement at COP15, a number of activities with substantial financial resources have been initiated in pursuit of the REDD objectives since COP 13.

28. Decision 2/CP.13, entitled “Reducing emissions from deforestation in developing countries: approaches to stimulate action”, acknowledges that deforestation and forest degradation result in global anthropogenic greenhouse gas emissions and that such emissions need to be urgently addressed. It also notes that the reduction of emissions from deforestation and forest degradation in developing countries requires stable and predictable resources. The decision also requested the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UNFCCC to work on methodological issues – including estimating and monitoring changes in forest cover and associated carbon stocks and GHG emissions – related to a range of policy approaches and incentives for reducing emissions from deforestation and forest degradation in developing countries. The 29th session of SBSTA, held during the COP14, adopted a number of significant conclusions in this regard17, including, inter alia:

- requesting its Chair to organize an expert meeting to focus on methodological issues relating to reference emission levels for deforestation and degradation, the relationship among the reference emission levels and relevant reference levels, and the role and contribution of conservation, sustainable management of forests, changes in forest cover and associated carbon stocks and greenhouse gas emissions and the enhancement of forest carbon stocks to enhance action on mitigation of climate change and to the consideration of reference levels;
- recommended methodological guidance noting the importance of, inter alia, promoting readiness of developing countries, and further mobilization of resources, in relation to decision 2/CP.13 (REDD), as well as recognizing the need to promote the full and effective participation of indigenous people and local communities, taking into account national circumstances and noting relevant international agreements;
- recommended taking into account methodological guidance, including, inter alia: the use of the Revised 1996 IPCC Guidelines, and encouraging the use of the Good Practice Guidance for LULUCF, as appropriate.
- requested the Secretariat to prepare a technical paper on the cost of implementing methodologies and monitoring systems;

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17 Please refer to FCCC/SBSTA/2008/L.23 10 December 2008, and in due time, when available on the UNFCCC website the relevant meeting reports.
• invited parties and accredited observers to submit, if appropriate, their views on issues relating to indigenous people and local communities for the development and application of methodologies; and
• recognizing the importance of coordination among Parties, organizations and relevant non-governmental organizations, requested the Chair to explore ways of facilitating the coordination of the activities;
• concluded that guidance from the AWG-LCA would facilitate further progress on methodological issues.

29. Accordingly, for REDD to take its final form further negotiations are needed including on technical, methodological and policy issues, such as rights of stakeholders, in particular Indigenous Peoples, and the opportunity costs of other land uses and forest management systems. There is also a concern that it should not put at a disadvantage those countries that have already taken steps to eliminate or reduce deforestation and to manage their forests sustainably, including through conserving carbon held in forests. Another concern repeatedly expressed by stakeholders is the need for recognition of a comprehensiveness of forests and sustainable forest management that goes beyond emission and carbon potentials of forests.

30. Most of the current investment and financial flows into the forest sector are not for addressing climate change and less than 25 percent is invested in developing countries and countries with economies in transition. Current financial and investment flows are far short of what is needed for sustainable forest management to contribute to poverty alleviation, sustainable economic growth and effective protection of critical environmental services in developing countries and countries with economies in transition.

31. The reduction of deforestation and forest degradation in the tropics has the biggest mitigation potential in the forest sector. The financial flow required for reducing deforestation and forest degradation is estimated as the opportunity cost of converting forests to other land uses, which can differ from one country to another according to the direct drivers (commercial agriculture, subsistence farming and wood extraction). Based on the FRA 2005 figure that 12.9 million hectares of forest cover were lost per year from 2000 to 2005, it is estimated that the opportunity costs for reducing deforestation and forest degradation for REDD is USD 12.2 billion per year. This would result in a reduction of emissions by 5.8 Gt CO₂ in 2030.

32. At Bali during COP13, the Norwegian Government announced its willingness to provide USD 600 million annually towards efforts to reduce carbon emissions from deforestation and forest degradation in developing countries. UNEP, UNDP and FAO have established the UN-REDD Collaborative Programme with an aim in the short term to work with countries in the development of national strategies to build monitoring, reporting and verification capacity. This collaborative programme is expected to provide inputs on experiences gained for UNFCCC negotiations and the negotiation of a new international climate change agreement that includes emissions from deforestation and forest degradation, which should be concluded at the fifteenth session of the UNFCCC COP in Copenhagen in December 2009. The UN-REDD Collaborative

18UNFCCC (2007), Investment and Financial Flows to Address Climate Change, Bonn, p.78.
19 Ibid, pp. 80–81.
Programme is initiating Quick Start Actions for pilot projects in six developing countries—two each in Africa, Asia and Latin America.\textsuperscript{21}

VI. Opportunities and challenges for the forest sector

A. Opportunities

33. Forests provide great opportunities for adapting to climate change by increasing the resilience of people and ecosystems. They are also a major mitigation option over the next 30 to 40 years and a necessary transitional measure towards a low carbon economy. However, due to the wide range of goods and services provided by forests, mitigation and adaptation options in the forest sector need to be fully understood and used in the context of promoting sustainable development. Moreover, for forests to effectively contribute to climate change solutions, countries and the international community will need to address several critical governance issues affecting forests such as rights, tenure, access, land use planning, benefit sharing, institutional and cross-sectoral coordination and law enforcement.

34. The CPF provides a unique opportunity for a more comprehensive strategic approach to addressing every aspect of sustainable forest management, including those aspects related to climate change. The \textit{Strategic Framework for Forests and Climate Change} proposed by the CPF provides a strong argument in support of the strategic role that sustainable forest management can play in achieving long-term climate change mitigation and as a robust and flexible framework for effective adaptation to climate change.

<table>
<thead>
<tr>
<th>Key Messages of the CPF Strategic Framework for Forests and Climate Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Message 1:</strong> Sustainable forest management provides an effective framework for forest-based climate change mitigation and adaptation</td>
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<td><strong>Message 2:</strong> Forest-based climate change mitigation and adaptation measures should proceed concurrently</td>
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<tr>
<td><strong>Message 3:</strong> Inter-sectoral collaboration, economic incentives, and the provision of alternative livelihoods are essential for reducing deforestation and forest degradation</td>
</tr>
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</table>

\textsuperscript{21} Communication to the Office of the Secretary-General from the Permanent Mission of Norway to the United Nations, 21 July 2008.
35. Several CPF member organizations, including the World Bank, ITTO, FAO, UNEP and UNDP, are already mobilizing substantial funds in preparation for and in implementing REDD. At the same time, however, the forest community needs to intensify its efforts to coordinate on addressing gaps and identifying solutions. In this context, closer collaboration and cooperation between the UNFF and other CPF members would be desirable.

B. Constraints and challenges

36. The issue of forests and climate change is complicated and requires closer collaboration among leading players. For example, SBSTA 29 in December 2008 emphasized the need for further coordination of activities among Parties, organizations and civil society. As stated in the CPF Strategic Framework: “Intersectoral collaboration, economic incentives, and the provision of alternative livelihoods are essential for reducing deforestation and forest degradation.”

37. Opportunities for synergies with REDD should be explored with a view to reinforce the implementation of mitigation measures for reducing deforestation and forest degradation, and the promotion of sustainable forest management in developing countries22.

38. One principal concern about REDD is, as raised in the preceding paragraphs, that when one single good or service, among the many covered by sustainable forest management, attracts significant finance, there is a risk that this can distort or skew the goals of sustainable forest management to the detriment of other goods and services.

39. As indicated earlier, the possible development of a REDD mechanism must be based on sound methodologies for estimating and monitoring changes in forest cover and associated carbon stocks and GHG emissions, incremental changes due to sustainable management of forests, and reduction of emissions from deforestation and forest degradation. While such a methodological challenge is less complicated with emissions from deforestation, it has proven to be much more difficult for forest degradation. A workshop, organized by the UNFCCC Secretariat on methodological issues related to REDD in developing countries held in Tokyo in 2008 concluded that addressing emissions from forest degradation was more difficult than addressing emissions...

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22 On this subject please also refer to chapter V of the Note by the Secretariat entitled “Financing for sustainable forest management: mobilizing financial resources to support the implementation of the non-legally binding instrument on all types of forests and to promote sustainable forest management”, E/CN.18/2008/2
from deforestation. It was also noted that there are different types of forest degradation and some may be easier to measure than others.\textsuperscript{23}

40. Many developing countries would need extensive capacity building and training activities on monitoring, reporting and verification in order to be able to effectively apply the methodologies for estimating and monitoring carbon emissions from deforestation and forest degradation under REDD. Such undertaking would require adequate financial resources. In addition, capacity building, institutional development and training are needed for countries not able to meet even the minimum requirements for sustainable forest management in the context of the REDD objectives, much less those that are closer to achieving the capacity to incorporate monitoring, reporting and verification into their national processes.

41. The forest and climate change issue affects a wide range of stakeholders who need to be taken into account. The Forest Dialogue has brought many of these together, who in a joint statement expressed their concern that the implementation of measures for forest-related climate change mitigation and adaptation provides both opportunities and risks for Indigenous Peoples and other marginalized groups.\textsuperscript{24} Five principles were listed that should be considered in guiding post-2012 arrangements on climate change:

- Ensure that forest-related climate change options support sustainable development in both forest-rich and forest-poor countries;
- Tackle the drivers of deforestation that lie outside the forest sector;
- Support transparent, inclusive and accountable forest governance;
- Encourage local processes to clarify and strengthen tenure, property and carbon rights, giving full recognition to Indigenous Peoples, small forest owners, the forest workplace and local communities; and
- Provide substantial additional funding to build the capacity to put the above principles in practice.

C. Promoting mitigation and adaptation to climate change in national forest programmes

42. For mitigation and adaptation options in the forest sector to be successful, they need to be fully understood and used in the context of promoting sustainable development.\textsuperscript{25} Both mitigation and adaptation strategies in response to climate change will need to be developed and integrated into national forest programmes and, in turn, into national development strategies. Innovative and emerging solutions, supported by economic policy instruments and public and private sector investments in sustainable forest management technologies and carbon sequestration approaches,

\begin{footnotesize}
\textsuperscript{23} UNFCCC, SBSTA (2008), Report on the workshop on methodological issues relating to reducing emissions from deforestation and forest degradation in developing countries (FCCC/SBSTA/2008/11), p. 11.
\textsuperscript{24} The Forests Dialogue (2008), Beyond REDD: The Role of Forests in Climate Change, 11 pp.
\end{footnotesize}
many of which are already being used, are required. The Forum with the support of the Collaborative Partnership on Forests could contribute to such a process.

43. The IPCC defines mitigation as “An anthropogenic intervention to reduce the anthropogenic forcing of the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks.” Mitigation measures for reducing emissions from deforestation and forest degradation in the forest sector are promising. The IPCC has identified a number of technologies and practices that are available:

- Afforestation,
- Reforestation,
- Forest management,
- Reduced deforestation,
- Harvested wood production management,
- Use of forest products for bioenergy and to replace fossil fuels,
- Tree species improvement to increase biomass production and carbon sequestration,
- Improved remote sensing technologies for analysis of vegetation/soil carbon sequestration potential, and
- Mapping land use change.

44. Policy measures required are financial incentives to increase forest area, reduce deforestation, rehabilitate degraded forests, maintain and sustainably manage forests; and land use regulation and enforcement. The opportunity provided by these policies and corresponding mitigation measures would be the contribution that they would make to poverty alleviation.

45. Adaptation is defined by the IPCC as “Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects.” Adaptation is divided into three principal types. Anticipatory adaptation refers to actions taken before the impacts of climate change are observed. Autonomous adaptation, also known as spontaneous adaptation, is not a conscious response but one that is prompted by ecological changes in natural systems or in human systems. Planned adaptation is the product of deliberate policy decisions, based on an awareness of changing conditions, that actions are required to return to, maintain or reach a desired state. While mitigation measures aim to fix and maintain carbon, adaptation seeks to increase the resilience of people and ecosystems.

46. According to IPCC, key vulnerabilities exist in the short term for forests in the form of drought, insects and fire. Models used by IPCC indicate that there will be a significant forest

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28 Ibid, p. 76.
dieback towards the end of this century and beyond in tropical, boreal and mountain areas, accompanied by the loss of key services. Losses of biodiversity are projected, particularly in tropical forest diversity hotspots such as northeastern Amazonia and tropical Africa. Mountain forests are being affected, with a loss of high altitude habitats.

47. Adaptation practices fall under three different temporal levels: responses to current variability, which can take advantage of lessons learned from past adaptations; responses to observed medium and long-term climate trends; and anticipatory planning in response to model-based scenarios of long-term climate change. Most in the forest sector fall under the first and include, among others:

- season climate forecasting as in the case of El Nino-Southern Oscillation (ENSO),
- disease surveillance systems,
- regulation and rationing of the usage of water provided by forests,
- strategies for drought and coastal management,
- strategies for preventing and combating forest fires, including the construction of fire lines and controlled burning,
- reforestation of mangroves,
- Utilization of drought and fire-resistant tree species, such as teak, in tropical forest plantations,
- Establishment of biological reserves and ecological corridors for protecting ecosystems from the impacts of climate change,
- Compensation paid to forest owners for environmental services provided by those forests to society.

48. Adaptive capacity—the ability or potential of a system to respond successfully to climate change—is a prerequisite for the design and implementation of effective adaptation strategies. For most developing countries, capacity-building and technology transfer will be required. Achieving successful adaptation to climate change is complex and can be difficult. Policy and planning processes need to take into account that capacities for adaptation and the processes by which they occur differ greatly within and across regions, countries, sectors and communities. Adaptation can be limited by the extent and rate of climate change, as well as by technological limits, financial barriers, informational and cognitive barriers and social and cultural barriers. In most cases, adaptation is undertaken as part of broader social and development initiatives.

49. Much of the focus on adaptation to climate change has been in energy demand, sea-level rise and coastal protection, water management, agriculture and infrastructure. Less attention has been paid to the forest sector. However, the eighth session of the Forum will be afforded the opportunity to address this important issue in depth for the first time. Through the CPF Global Forest Expert Panel (formerly; Joint Initiative on Science and Technology) led by IUFRO, with the participation of FAO, UNEP, the Secretariat of the Convention on Biological Diversity (CBD), the Center for International Forestry Research (CIFOR), the World Agroforestry Centre (ICRAF) and the UNFF Secretariat, and following consultations during the seventh session of the Forum in 2007 and the twelfth session of the Subsidiary Body for Scientific, Technical and Technological Advice of the CBD that same year, an Expert Panel on Adaptation of Forests to Climate Change

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32 Ibid., pp. 733-736.
has been established. The task of the Expert Panel has been to assess the state of knowledge on the adaptation of forests and forest dependent people to climate change. The assessment report, which includes current knowledge on environmental and socioeconomic impact and vulnerabilities as well as policy and management options for adaptation, has been prepared as a contribution to the discussion at the eighth session of the Forum of the agenda item on “Forests in a changing environment”, specifically under “forests and climate change”.33

VII. Conclusions

50. There is increasing evidence that climate change is seriously affecting forests throughout the world. Boreal, temperate, subtropical and tropical forests, including mangroves, are at risk throughout the world.

51. Forests are important for sustainable development, societal well-being and the provision of key environmental services. Climate change imposes additional stresses on millions of people on the Earth who depend on forests to different degrees for their livelihoods, shelter, food and water and in particular on forest dependent poor who are already highly vulnerable.

52. Carbon is thought to be a leading element contributing to global warming that is stored in large amounts in forest ecosystems, which in 2005 were estimated to contain 638 billion tonnes (Gt) of carbon. The carbon in forests is more than the amount of carbon now in the atmosphere.

53. Deforestation and forest degradation are the primary drivers of carbon emissions from forests, accounting in 2004 for 17.4 percent of total human-generated CO₂ emissions.

54. By contributing to forest degradation and deforestation, climate change is also exacerbating the release of carbon dioxide and further compounding global warming.

55. Although forests can play an important role in addressing climate change, agreement on that role has been a continuing process in the negotiations and implementation of the UNFCCC and the Kyoto Protocol. Forests have a large potential to contribute to overall climate change strategy.

56. More recently, forests are drawing attention in the climate change negotiations, in particular on the need for emission reductions in developing countries due to deforestation and forest degradation, which account for 35 percent of emissions in developing countries and 65 percent in least developed countries.

57. The Bali Action Plan has noted the importance of forests in mitigation of and adaptation to climate change. The UNFCCC COP15 in 2009 is expected to agree on issues relating to reducing emissions from deforestation and forest degradation in developing

countries, which will have long-term impact on forest management and financial flows to forests in the future.

58. In addressing the issue of forests and climate change, care must be taken to consider the full scope of forests in sustainable development. Forests provide much more than the carbon sequestration valued in the context of climate change and care should be taken so that this one issue does not dominate the global forest agenda.

59. The best opportunity for the Forum and its Member States to contribute to the global climate change agenda appears to be through the promotion of sustainable forest management, including mitigation and adaptation measures related to climate change. Sustainable forest management can also contribute to addressing other environmental, social and economic challenges. In this context, the outcome of the negotiations under the Forum on financing sustainable forest management could contribute substantively to the ongoing climate change negotiations.

60. The CPF provides a unique opportunity for a more comprehensive strategic approach to addressing every aspect of sustainable forest management, including those aspects related to climate change.