Asia-Pacific Network for Global Change Research

Assessment, synthesis and promotion / policy guidance related to integrated management of Tropical Peatlands to Reduce GHG Emissions and Increase Resilience to Climate Change

Final report for APN project: ARCP2007-15NSY

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Global Environment Centre

Global Carbon Project

Assessment, synthesis and promotion/policy guidance related to integrated management of Tropical Peatlands to Reduce GHG Emissions and Increase Resilience to Climate Change (revised title)

Project Reference Number: ARCP2007-15NSY

Final Report submitted to APN

Prepared by Faizal Parish, Suzana Mohkeri and Pep Canadell
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Overview of project work and outcomes

Non-technical summary

Degradation of tropical peatlands is a major and growing source of anthropogenic greenhouse gas emissions. By some estimates, current carbon dioxide emissions from peatland drainage, fires and exploitation are equivalent to at least 3,000 million tonnes per annum or equivalent to more than 10% of the global fossil fuel emissions. This project has strengthened understanding and partnership among stakeholders in relation to peatland and climate change in particular input to policy makers through dialogues and workshops, input to conventions deliberations and web based information dissemination.

Objectives

The main objectives of the project were:

1. To develop a web based policy support interface based on the best scientific understanding on impacts of changes in land use and climate on the net greenhouse balance in tropical peatlands

2. To strengthen understanding and partnerships among researchers, policy makers, government agencies and other key target groups working on peatlands and climate change in SE Asia

Amount received and number years supported

USD 40,000 (one year)

Activity undertaken

- Support the preparation of the global assessment on peatlands biodiversity and climate change
- Present talks and posters at the Convention on Biodiversity (CBD) SBSTTA 12 meeting in July 2007, and at the UNFCCC COP13 in December 2007 in Bali
- Review and update datasets on the extent and carbon content of peatlands particularly from Papua New Guinea, Indonesia and Malaysia
- Organise the workshop *"Minimising Impact from Oil Palm and Biofuel production in SE Asia on Peatlands, Biodiversity and Climate Change".*
- Re-establish and improve the Peat-Portal, a web base resource
- Support the finalization and submission of research synthesis papers to peer review journals stemming from the previous APN project on peatlands

The project partly supported the preparation of the global assessment on peatlands biodiversity and climate change which assessed the role of peatlands in relation to biodiversity, carbon storage, GHG flux, climate change and impacts to people drawing on the experiences in Asia as well as analysis of more than 3000 published reports and papers worldwide.

The APN project supported the presentation of the assessment at the CBD SBSTTA 12 meeting in July 2007. The meeting formally welcomed the assessment and recommended further consideration of the Assessment at CBD COP9 in May 2008. A poster exhibition on the Assessment on Peatlands Biodiversity and Climate Change and the ASEAN Peatland Management Initiative and presentations to the SBSTTA Working Group II and two side events were also organized during the meeting. The results and findings of the global assessment were further promoted and disseminated to the contracting parties at the UNFCCC COP13 in December 2007 in Bali through poster exhibitions and a side event. The Assessment was further promoted through side events and a press release at the CBD COP 9 and UNFCCC SB28 meeting and upcoming Climate Talks in April 2009.

The project continued to review and update information relating to the extent and carbon content of peatlands in South East Asia with new information from Papua New Guinea, Indonesia and Malaysia collated during the project period. The project also highlighted land use change issues as a major factor of tropical peatland degradation particularly from the expansion of oil palm plantations in Indonesia, Malaysia and Papua New Guinea.

For that reason it was decided that the technical focus of the project should be on the impact of palm oil/biofuel cultivation on peatlands. Input and contributions on peatlands and climate change were provided towards the preparation of the Malaysian National Interpretation of the Roundtable on Sustainable Palm Oil (RSPO) Principles and Criteria. As a result of greater awareness on the need to minimize degradation of peatland areas developed for oil palm and GHG emissions, a GHG working group is currently being considered by the RSPO members.

On 31st October – 2 November 2007, the project organised a workshop on *"Minimising Impact from Oil Palm and Biofuel production in SE Asia on Peatlands, Biodiversity and Climate Change"*. Forty climate change, peatland, oil palm and biofuel experts were invited to deliberate on ways to minimise impacts from palm oil and biofuel production in SE Asia. The meeting recognized that demand for vegetable oil for food, industries and biofuel is increasing worldwide and will be a stimulant for further expansion of palm oil in the SEA region and has recommended among others that best practices should be documented and made widely available and resources for research on GHG emission from oil palm development and ecological restoration of peatlands. Results of the technical meetings were shared with key stakeholders in the oil palm plantations industry, biofuel industry, government agencies and NGO at a stakeholder meeting on 2 November 2007. The meeting has strengthened partnerships for future joint research and peat management and restoration activities in the region.

The project supported the re-establishment and improvement of the Peat-Portal, a web based framework for information exchange on peatlands, climate change, carbon analysis and peatland management, climate and biodiversity issues. The Portal shares information on peatland management issues. Visitors to the portal are able to participate in the identification of problematic areas in peatland management, quick exchange of information, sharing of ideas and enhancing of global awareness of pertinent issues in peatland management. Currently over 500 portal members are using the web for sharing information and networking. The portal offers the latest news, techniques and information on peatland management and also serves as a platform in facilitating easy exchange of information and dialogues between interested groups.

Results

The following are results achieved by the project:

1. The Global Assessment on Peatland, Biodiversity and Climate Change has been widely disseminated to policy makers involved in discussions and deliberations on biodiversity (CBD) and Climate Change (UNFCCC) and has been directly used to prepare convention decisions and also to heighten understanding of the importance of peatlands.

2. The project has contributed effectively to the debate on the impact of oil palm cultivation on peatlands on GHG emissions and has contributed to policy decisions to restrict future conversion of peatlands for palm oil and biofuel.

3. Recommendations and expert findings on mitigation measures to minimise impact from palm oil developments on peat will support further collaboration and joint research activities between the plantation sector and peat and climate change experts

4. The project has further enhanced the understanding and partnerships among researchers, policy makers, government agencies and other key target groups working on peatlands, biodiversity, climate change and oil palm industry in SE Asia. A concrete example is the invitation to one of the two co-PIs of this project to serve in a review and technical support committee for the implementation framework of a $30 Million project by the Australian Government to recover degraded peatland in Central Kalimantan.

5. Improved awareness and information sharing on scientific understanding of impacts of changes in land use and climate on the net greenhouse balance in tropical peatlands to all stakeholders through the disseminate of project outputs and findings through the Peat Portal website (http://www.peat-portal.net)

6. The project has contributed to the establishment of a GHG working group under RSPO.

7. The project has contributed to policy decisions on palm oil .

8. It has also contributed to new peer reviewed science papers which will play critical roles in subsequent environmental assessments such as the IPCC.

Relevance to APN's Science Agenda and objectives

The project addressed four of the major research interest areas of APN. These are:

1. Climate change impacts, adaptation and vulnerability of peatlands ecosystem, predictive modeling and scenarios under Theme 1 – Climate ;
2. Influence of peatland land use on climate change under Theme 4 – Ecosystems, Biodiversity and Land use ;
3. Increased C fluxes from Peatlands that leads to increase of atmospheric Co2 concentrations under Theme 5 – Changes in Atmospheric Composition; and
4. Impact of climate change on peatlands and possible adaptation options under Theme 6 – Vulnerability and Adaptation to Global Change

Self evaluation

The project has been successful in providing essential information and understanding needed on tropical peatlands ecosystems in South East Asia especially related to GHG emissions and how its losses are further enhancing global climate change. Significant input and contribution has been made to Convention (CBD and UNFCCC) Decisions and the web based framework for information on peat and its relations to climate change is now providing both general and scientific information related to peatland, biodiversity and climate change to influence development of sound policies and decisions by stakeholders.

Potential for further work

In view of the pressure on peatlands for agricultural development in particular oil palm for food and biofuel, there is an urgent need for further research on the GHG emission from oil palm plantations and best management practices to reduce peat degradation. In addition, there is an urgent need to continue providing inputs into the palm oil certification through the RSPO certification mechanism. Strengthened cooperation is needed with government agencies responsible for climate change and also agriculture/plantation development. It can be an important intervention to ensure better management of peatland areas in the SEA region.

Publications

1. Parish, F., Sirin, A.,Charman., D., joosten, H., MinayevaT., Silviusm. and Strringer, L. (Eds) 2008. **Assessment on Peatlands, Biodiversity and Climate Change: Main report**

2. Report from the **Technical Meeting and Stakeholder Outreach Workshop on Minimizing Impacts of Palm Oil and Biofuel Production in Se Asia On Peatlands, Biodiversity and Climate Change**

3. Three research papers have been submitted to the journal of ECOSYSTEMS, two of them already accepted for publication:

- Takashi Hirano, Jyrki Jauhiainen,Takashi Inoue, Hidenori Takahashi (2008) **Carbon balance of tropical peatlands. Ecosystems (in press)**

- Page, Susan, Hosciło, Agata, Wösten, Henk, Jauhiainen, Jyrki , Silvius, Marcel, Rieley, Jack , Ritzema, Henk, Tansey, Kevin, Graham, Laura , Vasander, Harri, Limin, Suwido (2008) **Ecological Restoration of Tropical Peatlands – Current Knowledge and Future Research Directions (in press)**

- Aljosja Hooijer, Henk Wösten , Marcel Silvius , Susan Page , Jaap Kwadijk , Josep G. Canadell (2008) **Current and future CO_2 emissions from drained peatlands in Southeast Asia. Ecosystems (in review)**

Acknowledgments
In addition to the support from APN which made this project possible – we would like to thank the following organisations/institutions for their contribution and support to this project;

1. ASEAN Centre for Biodiversity (ACB), BP Biofuels, Global Carbon Project, Wetlands International, EU China Biodiversity Programme for co-funding on project activities related to palm oil and Peatlands in particular the Peat, Palm and Biofuel workshop. We also thank the Malaysian Palm Oil Association for their in-kind support toward to workshop;

2. UNEP-GEF for co-funding the work on the Assessment of Peatlands, Biodiversity and Climate Change; and

3. ASEAN Centre for Biodiversity (ACB) and Wetlands International for co-funding and support towards activities at the UNFCCC Cop 13 in Bali, Indonesia in December 2007, CBD COP 9, Bonn, Germany in May 2008 and UNFCCC SB28, Bonn Germany June 08.

GLOSSARY

APMI	ASEAN Peatlands Management Initiative
APMS	ASEAN Peatlands Management Strategy
COP	Conference of Parties
CBD	Convention for Biological Diversity
SBSTTA	Subsidiary Body for Scientific, Technical and Technological Advice
UNFCCC	United Nations Framework Convention on Climate Change
RSPO	Roundtable for Sustainable Palm Oil
GHG	Greenhouse Gas
CO2	Carbon Dioxide
M ton	Million ton
LULUCF	Land Use and Land Use Change Factor
IEA	International Energy Agency
EU	European Union
NPP	National Primary Productivity
UNEP	United Nations Environment Programme
IPCC	Intergovernmental Panel on Climate Change

Technical Report

Inappropriate management is leading to large scale degradation of peatlands in South East Asia with major environmental and social impacts. The sustainable management of peatlands in this region requires an integrated approach through development of common strategies for management of different uses within each peatland area. The requirements for biodiversity conservation, land rehabilitation and climate change mitigation/adaptation need to be incorporated into management strategies. Rehabilitation and integrated management of peatlands can generate multiple benefits including poverty alleviation, combating land degradation, maintaining biodiversity, and mitigating climate change. Close coordination between different stakeholders and economic sectors is critical.

1.0 Introduction

Tropical peatlands in SE Asia store at least 42,000 billions tonnes of soil carbon. This carbon is increasingly released to the atmosphere due to drainage and fires associated with plantation development and logging. Peatlands make up 12% of the SE Asian land area but account for 25% of current deforestation. Out of 27 million hectares of peatland, 12 million hectares (45%) are currently deforested and mostly drained. One important crop in drained peatlands is palm oil, which has been increasing in response to global demand for food and biofuel.

Most rapid peatland degradation presently occurs in SE Asia where the peatlands are being deforested, drained and burnt for development of oil palm and timber plantations, agriculture and logging. Apart from CO2 emissions, these developments are also a threat to the remaining biodiversity in SE Asia as the peatlands are an important habitat for many endangered species, including Orang Utan in Borneo and Sumatran Tiger in Sumatra. Furthermore, the peat fires cause regional haze (smog) problems that affect public health and economies in the SE Asian region

Peat soils, usually waterlogged in their natural state, need to be drained prior to planting. Drainage of peat enhances decomposition of the organic matter by microbiological oxidation and leads to shrinkage through unalterable water loss. Both the decomposition and shrinkage processes are irreversible, lower the soil surface and can only be stopped by renewed flooding (Wosten, Ismail, & Wijk, 1997). In some areas agricultural land had to be abandoned as soil surface subsided to ground water level as a consequence of these processes (Mutert et al., 1999). Decomposition of peat leads to the emission of CO2 and changes in the fluxes of N2O and CH4 balance (Inubushi, Furukawa, Hadi, Purnomo, & Tsuruta, 2003).

The environmental impact of oil palm plantation establishment may be categorized in three principal effects: change in the greenhouse gas balance, erosion and reduction of biodiversity by fragmentation, disturbance and destruction of natural habitats (Laidlaw, 2000)

While the world is confronted with increasing concerns about global warming and security of energy supply, renewable energy is promoted as one of the solutions to these challenges and one source of renewable energy being promoted is palm oil. Crude palm oil and its derivatives can be used to produce bio-diesel as well as to produce electricity and heat. However, there has been an increasing concern about the sustainability of palm oil production. It is feared that the large-scale consumption of palm oil by the energy sector may have negative effects, e.g. on the environment in producing countries.

Oil palm plantations feed a growing global demand for cheap vegetable oil used in the production of food, cosmetics and fuel. Compared to the year 2000, demand for palm oil is predicted to more than double by 2030 and to triple by 2050. With current business-as-usual logic, and industry's current expansion strategy, including taking advantage of concern about climate change to push palm oil as a source of bio-diesel, the ability to cut back on emissions is questionable.

2.0 Methodology

The main methodologies of the project were:

- Data gathering and synthesis on current status of tropical Peatlands, studies on GHG emissions and impacts to climate change ;
- Analysis and review of key factors leading to loss of tropical Peatlands;
- Discussions and deliberations between experts on peat, climate change, plantations and biofuel to exchange views and deliberate on issues and concerns and recommendation for joint actions.;
- Refinement and promotion of a web-based interface for use by policy and decision makers in the SEA region for assessing emission from peatland management and degradation and the effectiveness of mitigation and adaptation; and
- Providing input into conventions discussion and decisions

3.0 Results & Discussion

A. Finalisation and promotion of Assessment of Peatlands, Biodiversity and Climate Change.

The project supported the preparation of the Global Assessment on Peatlands, Biodiversity and Climate Change which was produced by an international multidisciplinary team of specialists between 2005 and 2008. The Assessment was prepared through a review of scientific information on the nature and value of peatlands in relation to biodiversity and climate change, the impact of human activities and potential sustainable management options. The project especially supported input to Chapter 9, integrated management of peatlands.

This publication assessed the role of peatlands in relation to biodiversity, carbon storage, GHG flux, climate change and people, drawing on the experiences in SE Asia as well as analysis of more than 3000 published reports and papers worldwide. It aims to contribute to international decision-making processes relating to global problems such as biodiversity conservation, climate change, desertification, pollution, poverty and health. It will enable the identification of appropriate management and adaptation strategies for peatlands which will bring both biodiversity and climate benefits. It is also intended to provide information to feed into the deliberations of the global environment conventions as well as contribute to deliberations at regional and national levels.

The assessment was presented (with specific support from the project) to CBD SBSTTA 12 in July 2007 which recommended further consideration of the Assessment at CBD COP 9 in May 2008. At SBSTTA 12, the CBD parties also mandated the Executive Secretary of the CBD to formally distribute the assessment to the contracting parties to the UNFCCC and promote the assessment at the UNFCCC COP13 in December 2007 in Bali. A side event was organized at the UNFCCC COP13 in Bali was aimed to raise awareness on key peatland issues especially in relation to the impact from development of oil palm plantations and biofuel on peatland. The project also supported side events to promote the assessment during CBD COP 9 in May 2008 and UNFCCC SB28 in June 2008.

The Assessment has been widely disseminated to policy makers involved in discussions and deliberations on Biodiversity and Climate change and has been directly used to prepare convention decisions and also to heighten understanding of the importance of peatlands.

The importance of peatlands for biodiversity and climate change has been significantly highlighted to the key policy makers.

The project has successfully influenced the Parties to the Convention on Biological Diversity (CBD) to be more concerned with the linkages between biodiversity and climate change for peatlands. This is confirmed by the fact that the Parties to the Convention at the CBD SBSTTA meeting in July 2007 formally welcomed the Assessment on Peatlands, Biodiversity and Climate Change and based on it made selected key recommendations for formal adoption by the CBD COP9 planned for May 2008. Copies of the Decision on Biodiversity and Climate Change from CBD SBSTTA 12 and CBD COP 9 are included in Appendix 6 and 8.

The overall findings of the assessment in relation to peat and climate are as follows:

- Peatlands are the most efficient terrestrial ecosystems in storing carbon. While covering only 3% of the World's land area, their peat contains as much carbon as all terrestrial biomass, twice as much as all global forest biomass, and about the same as in the atmosphere. They are the most important long-term carbon store in the terrestrial biosphere

- Degradation of peatlands is a major and growing source of anthropogenic greenhouse gas emissions. Carbon dioxide emissions from peatland drainage, fires and exploitation are estimated to currently be equivalent to at least 3,000 million tonnes per annum or equivalent to more than 10% of the global fossil fuel emissions.

- Peatland degradation affects millions of people around the world. Drainage and fires in SE Asian peat swamp forests jeopardise the health and livelihood of millions of people in several countries in the region. The destruction of mountain peatlands in Africa, Asia and Latin America threatens the water and food supply for large rural and urban populations.

- Climate change impacts are already visible through the melting of permafrost peatlands and desertification of steppe peatlands. In the future, impacts of climate change on peatlands are predicted to significantly increase. Coastal, tropical and mountain peatlands are all expected to be particularly vulnerable.

- Conservation, restoration and wise use of peatlands are essential and very cost-effective measures for long term climate change mitigation and adaptation as well as biodiversity conservation. Optimising water management in peatlands (i.e. reducing drainage) is the single highest priority to combat CO_2 emissions from oxidation and fires as well as address peatland degradation and biodiversity conservation.

- There is an urgent need to strengthen awareness, understanding and capacity to manage peatlands in most countries – to address peatland degradation, biodiversity conservation and climate change.

The Executive Summary of the Assessment is included in Appendix 1

B. Importance of Peatlands in SE Asia for carbon storage and GHG regulators

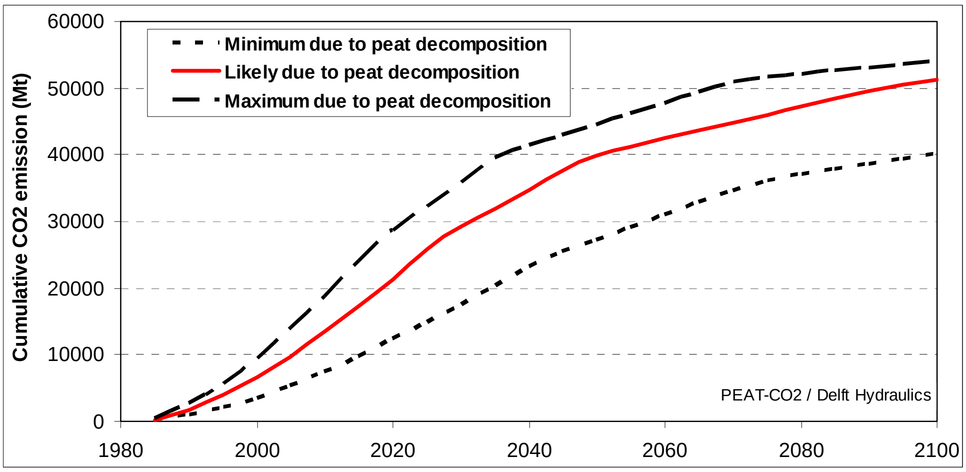
Peatlands are responsible for all three main greenhouse gases – carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). All three of the main greenhouse gases (GHG) – carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) are related to peatlands, which act as a valuable key source and sink. Together with other GHGs, including the most important, water vapour, they absorb infrared radiation emitted from the Earth and thus decrease the Earth's radiation. Peatlands remove CO_2 from the atmosphere via photosynthesis and the carbon not held in biomass or stored in accumulating peat is returned back to the atmosphere as CO_2. Anaerobic conditions typical for peaty soils are highly favourable for the production of methane and nitrous oxide (KA Smith et al. 2003)

The table below describes how peatlands compare with other carbon stores

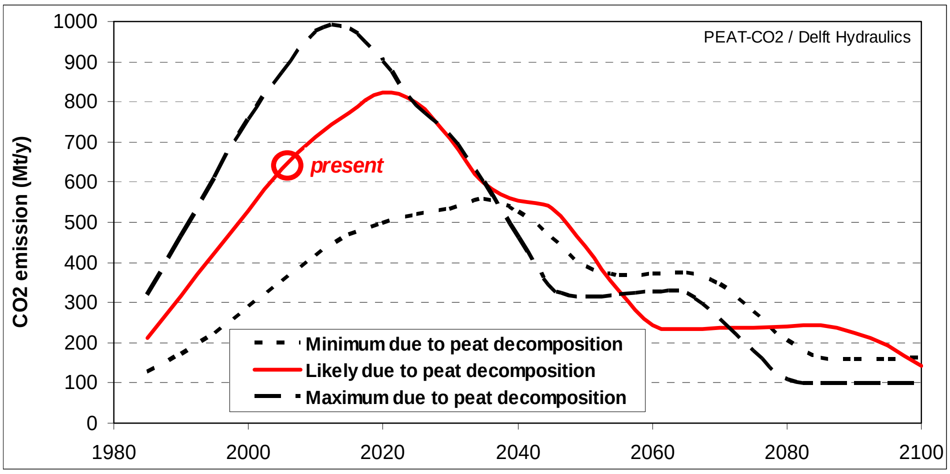
Storage / area characteristic	Statistic
Area covered by peatlands	400 million ha (Joosten 2002)
Carbon stored by peatlands	550-650 billion tonnes (IPCC, 2001)
Carbon stored by all global plant biomass	694 billion tonnes
Carbon stored in the world's soils (including peat)	1,600 billion tonnes
Carbon in the atmosphere	700 billion tonnes (Gorham 1995)

Peatlands play a dual role in greenhouse gas radiative forcing of climate, affecting the atmospheric burdens of carbon dioxide, methane and nitrous oxide. The role of peatlands as global GHG sinks and sources has often been mentioned, but both positive (e.g. and negative feedbacks of GHG emissions following utilization and/or global warming have been suggested. Peatlands could have both cooling and warming impacts on the climate system through their influence on atmospheric burdens of CO_2 and CH_4. Carbon sequestration in peat lowers the atmospheric CO_2 burden, and thus causes a negative radiative forcing of climate (i.e. cooling); methane emissions from peatlands increase the atmospheric CH_4 burden, and thus cause a positive radiative forcing (warming). A positive input could also be made by N_2O.

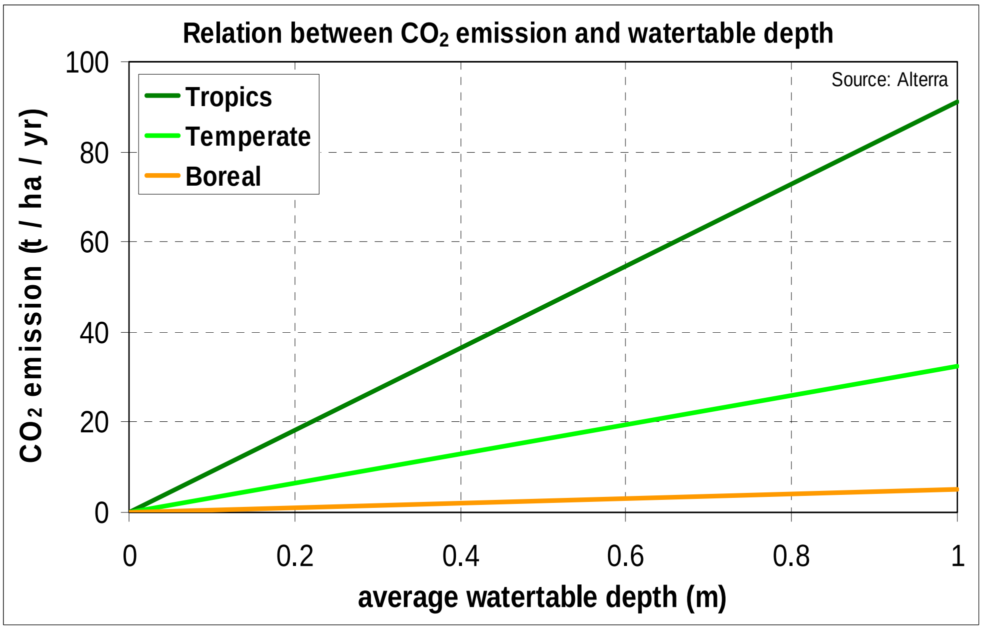
Peatland fires are one of the largest global point sources of greenhouse gas emissions from the land use sector. Fires in peatland are one of the largest global point sources of greenhouse gas emissions (Turetsky et al. 2002). Predictions of increased drought incidence and severity in many peatland regions due to climate change are likely to lead to an increase in carbon losses due to fire. The fires in Southeast Asia are linked with the large-scale development of agriculture and settlement schemes in the 1980s and 1990s, as well as the large-scale development of oil palm and pulpwood plantations over the past 10 years. The estimated emissions from fires in Southeast Asia over the past 10 years are between 14-40 billion tones (Hooijer et al. 2006).



The above figure describes cumulative CO2 emissions from SE Asia. Note that total storage is at least 155,000 Mt CO2 (42,000 Mt carbon) which means that A) CO2 emission through drainage alone can continue for centuries, and B) even if fire emissions are included in the projections, i.e. not stopped in the near future, the resulting higher emissions will continue for many centuries.



The above figure provides historical, current and projected CO2 emissions from peatlands, as a result of drainage (fires excluded). The increase in emissions is caused by progressive deforestation and drainage of peatlands. The decrease after 2020 which is the 'likely' scenario is caused by shallower peat deposits being depleted, which represent the largest peat extent. The stepwise pattern of this decrease is explained by the discrete peat thickness data available (0.25m, 0.75m, 1.5m, 3m, 6m, and 10m).



The protection of remaining peatlands is one of the most important and cost-effective management strategies for minimising CO_2 emissions. Peatland degradation is becoming one of the most important global sources of CO_2 emissions from the Land Use and Land Use Change (LULUCF) sector. Emissions from tropical peatlands in Southeast Asia alone (covering 0.2% of the world's land area) are estimated to be approximately 2 billion tonnes of carbon dioxide per year, or about 7% of global fossil fuel emissions (Hooijer et al. 2006). Given the high density of carbon in peatlands, their degradation leads to disproportionately high carbon emissions. Since emissions from peatlands are almost always as a result of human induced degradation, the protection of peatlands may be a very important management strategy.

Analysis has shown that investment in peatland fire prevention and control is one of the most cost effective ways of reducing global GHG emissions, as fire in peatlands release very large amounts of greenhouse gases (over 2000 tonnes of CO_2/ha for a severe fire in tropical peatlands). Fires can be often prevented through better water management and enhanced vigilance and fire control measures. In Indonesia, fire prevention activities have involved the blocking of abandoned agricultural or forestry drainage channels, revegetation of degraded sites, fire awareness campaigns with local communities, and the provision of equipment and training for local volunteer fire prevention and control teams. No single measure will be effective in reducing the risk of fire in peatlands. However, sustainable land preparation methods can help protect peatlands from fires. In doing so, a reduction in fires can reduce the emission of GHGs from peatlands.

Improved water management is a fundamental step to support the sustainable management of peatlands. Water is probably the most fundamental component of a peatland, with most peatlands being approximately 90% water. The extent, nature and depth of the peat are frequently a function of water extent and depth. Drainage thus has one of the most important and long-lasting impacts on peatlands. Drainage of temperate and tropical peatlands which lowers the water table by 1m, leads to a CO_2 emission of between 30 and 100 tonnes of CO_2/ha/year respectively (Wosten 2002, 2006). Drainage also increases vulnerability to fire; one of the most significant courses of peat degradation and GHG emissions.

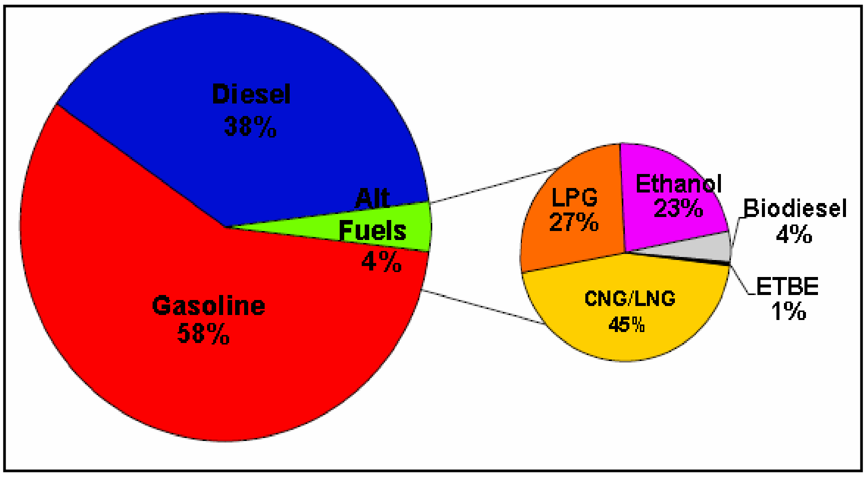
C. Review of Climate Impact of Biofuel development

Tropical peatlands in SE Asia store at least 42,000 billion tonnes of soil carbon. This carbon is increasingly released to the atmosphere due to drainage and fires associated with plantation development and logging. Peatlands make up 12% of the SE Asian land area but account for 25% of current deforestation. Out of 27 million hectares of peatland, 12 million hectares (45%) are currently deforested and mostly drained. One important crop in drained peatlands is palm oil, demand for which is increasing for both food and biofuel sectors.

A report published by the United Nations Environment Programme (UNEP), in 2007, acknowledges that expansion of palm oil plantations are now the leading cause of forest destruction in Malaysia and Indonesia. Indonesia has destroyed over 28 million hectares of forest since 1990, largely land conversion activities for plantations and currently 9 million hectares of these has been converted for oil palm or pulp wood plantations.

It has been shown that much of the current and predicted expansion oil palm plantations are taking place on peatlands which are among the world’s most concentrated carbon stores. Ten million of the 22.5 million hectares of peatland in Indonesia have already been cleared of forest and have been drained, resulting in a substantial and continuing increase in GHG emissions as peat soils dry out, oxidise and burn. The area of peatland in Riau, Indonesia is just 4 million hectares, but Riau’s peatlands store 14.6Gt of carbon and could lead to GHG emissions equivalent to one year’s total global emissions if destroyed.

Compared to the year 2000, demand for palm oil is predicted to more than double by 2030 and to triple by 2050. Continued strong demand for palm oil for vegetable oil and biofuel source will continue to drive the degradation of Peatlands in the SE Asia region and create various environmental and social impacts. Expansion of oil palm industry has already been cited as one of the main causes for peatland deforestation and degradation in SE Asia. GHG emissions from peatlands are set to rise by at least 50% by 2030 if predicted expansion proceeds.



World Transport Fuel Demand (2005)

Courtesy of Gernot Klepper; Source: Hart's World Refining and Fuels Service 2006; IAI projections

In 2005, alternative fuels accounted for 4% of world transport fuel consumption and the share of biofuel was only 1%. The IEA projected that the biofuels share could increase to about 7% by 2030. Among the biofuels, world production of bioethanol in 2005 was 45 million m^3 with South America and North & Central America producing about 35% and 41% respectively. World biodiesel production in 2005 was 3.8 million tonnes, of which 85% or 3.2 million tonnes were produced in the EU. Germany is the largest producer, accounting for more the 50% of EU's production.

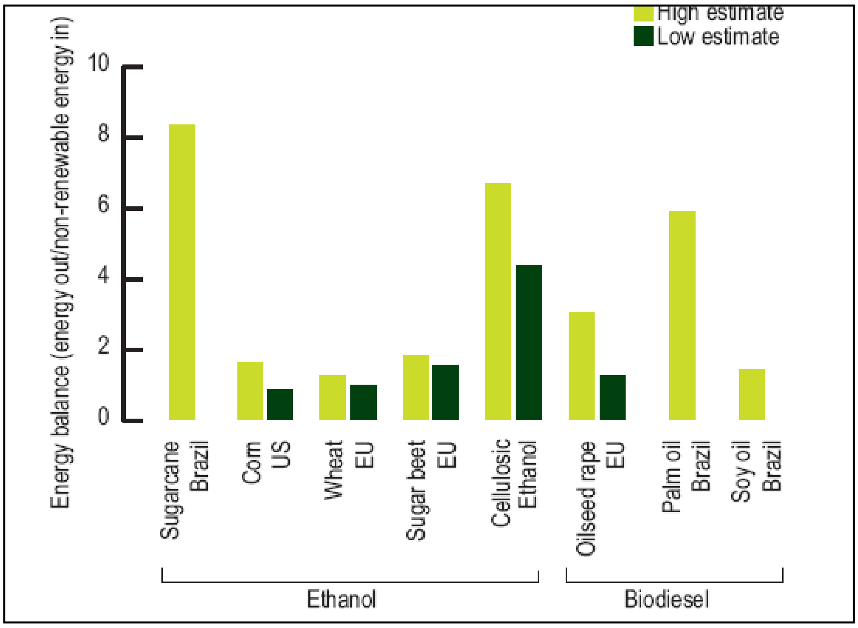
In terms of Net Primary Productivity (NPP), the NPP of crop land is 13% of the estimated total world NPP of 52 billion tonnes of carbon per year while pasture land was 22%. The NPP from abandoned land was less than 2% of the global total. Assuming that ALL global harvests of corn, sugarcane, soy and palm oil are converted into liquid fuels, using current technology, the total fuel energy that could be provided would account for less that 3% of global use.

The demand for palm oil as a biofuel source stems from the belief that carbon emissions would be lower than fossil fuels. However, this may not be so if biofuels are derived from oil palm cultivated on peatlands as the degradation of peat would result in significant CO^2 emissions. Although plantation biomass and accumulation of soil organic matter act as a sink for atmospheric carbon, establishment of oil palm plantations on peat causes emission of GHGs by drainage, biomass burning and decomposition, loss of soil carbon and decomposition of peat.

The conversion of forest into oil palm plantations causes an emission in a range of less than 650 to over 1,300 Mg ha−1, depending on soil type, within the considered 25-year time frame. Despite the large potential deviation, the emission values calculated emphasises that conversion of forest is in many cases a significant source of GHG. Decomposition of organic matter in peat soil is likely to exceed GHG emissions derived from forest biomass.

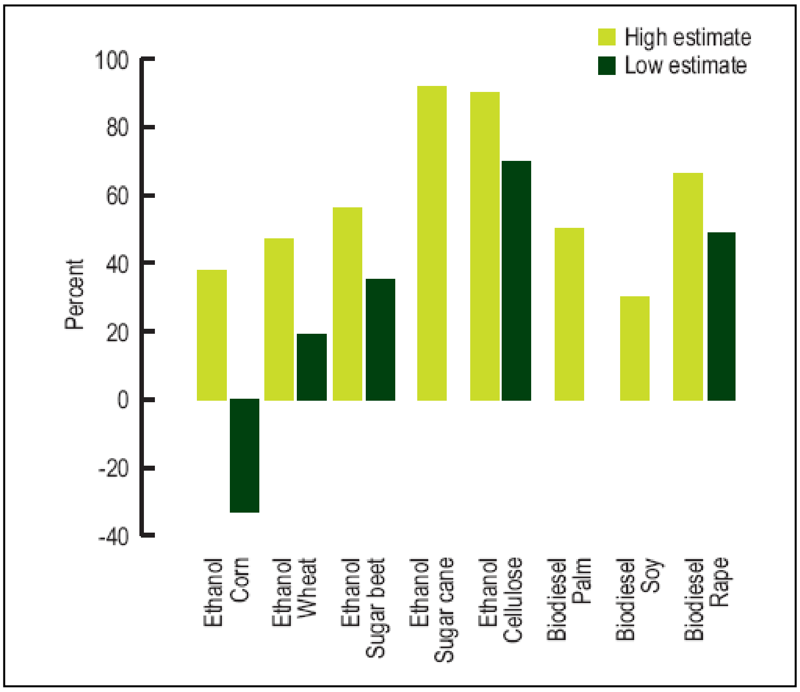
The biofuel targets for reductions of GHG emissions from fossil fuel are high with EU wanting to replace 10% of fossil fuels with biofuel by 2020 thus driving new concession developments in South-east Asia. If impact on peat is not taken into account and without an appropriate certification system, palm oil can not be used for 'green energy and the recent RSPO certification system will need to conduct a transparent and verifiable certification system to distinguish between - biofuels originating from peatlands and other biofuels. In both producing and importing countries, biofuels from peat soils should be excluded from subsidies and policies should change to provide disincentives for biofuels on/from peat.

Comparing the energy balance of various biofuels (energy out: non-renewable energy in), the highest results were obtained form bioethanol produced form sugarcane and cellulosic ethanol. Among biodiesel sources, palm oil had the highest energy balance, followed by biodiesel from oilseed rape and soyoil.



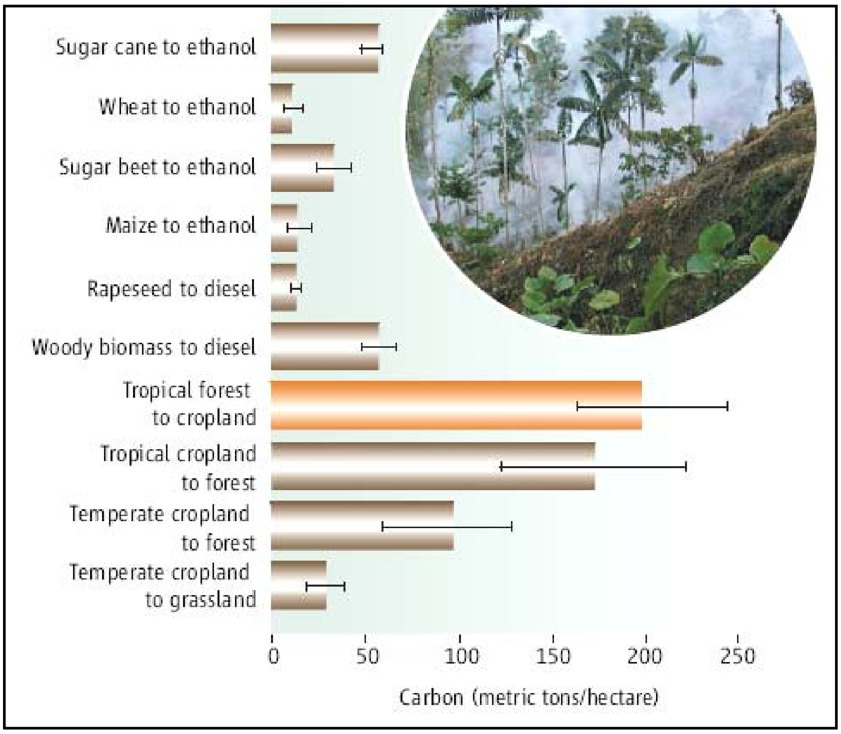
Energy balance estimates for various biofuel
(energy out / non-renewable energy in; well to wheels) (source: Thow & Warhurst, 2007)

In terms of biofuel GHG emissions reduction (relative to conventional fuels), the largest reductions (based on the high estimates) were provided by ethanol from sugar cane and cellulose, followed by rape biodiesel, sugar beet ethanol and palm biodiesel. The lowest GHG emission was from soy biodiesel.



Biofuel lifecycle GHG emissions reduction
(relative to conventional fuels) Thow & Warhurst, 2007

The future of biomass energy could depend largely on technology and opportunities for using new plant and microbe varieties and emerging biomass-to-fuel conversion process. It is clear that the current land devoted to biofuel production needs to be increased many folds but the challenge is to find more land for biofuels. To avoid conflict with land required for food production and forest and biodiversity conservation, the solution for future biofuel production lies in the utilization of abandoned, degraded and marginal land. It has been estimated that there are about 531 million hectares of abandoned land globally. Assuming that these lands have a potential NPP of 7.1 tonnes biomass per ha per year, the NPP that could be available globally is 2.6 billion tonnes of biomass per year. The energy that could be provided by the aboveground biomass is about 20 EJ per year which is equivalent to about 5% of the global primary energy consumption.



Cumulative avoided emissions over 30 years
(Source Righelato and Spracklen, Science, 2007)

The chart above compares the cumulative avoided emissions per hectare over 30 years for a range of biofuels compared with the carbon sequestered over 30 years by changing cropland to forest and the loss of carbon to the atmosphere by conversion of forest to cropland. The research indicates that land would sequester 2 to 9 times more carbon over 30-years than the emissions avoided by the use of biofuels.

Production of biofuels worldwide will contribute to increased energy security, agricultural development, poverty alleviation, and to some extent climate change amelioration. With current technology and crop genetic availability, and if biomass energy is to be managed to reduce net warming of climate, avoid competition with food, and not displace forests, a maximum 5% of the world primary energy could come from plant biomass, and replace a few % of current fossil fuel usage. Second generation of biofuels has the potential to push this % substitution many times higher and revolutionize the biofuels contribution to energy security and climate protection. Until this comes, the climate change driver for increased biofuel production will be small given there are many other cheaper and more effective options for carbon mitigation.

D. Review of impact / mitigation options for palm oil cultivation and Peatlands.

Background

In the past five years increasing focus has been placed on the sustainability of palm oil and other crops. Several new and emerging issues have been raised in relation to peatlands management including the need to prevent peatlands fires and associated transboundary haze and also the issue of carbon storage and climate change. Peatlands in Se Asia have recently been identified as one of the largest carbon stores in the region – storing more than 40 billion tonnes of carbon. At the same time, concerns have been raised from some stakeholders on the rapid expansion of plantations on peatlands in some parts of the region and the potential impact that may have on the long term carbon stocks and carbon emissions.

To estimate changes in soil carbon, the IPCC guidelines (IPCC, 1997) suggested the application of the following formula: ***SCM = SCN x base factor x tillage factor x input factor*** where SCM is the amount of soil carbon after land use change and SCN is the amount of soil carbon under native vegetation. The 'base factor', the principal factor accounting for soil carbon changes, is .7 for long-term cultivated land and .5 for degraded land. In no-till systems the 'tillage factor' is 1.1 and the 'input factor' is 1.0 where crop residues are retained. For sites where forest is converted into plantation land, the multiplication of the base and tillage factors gives a value very close to the average carbon loss of 30% found in a review of over 100 different studies, most of them conducted in tropical environments (Murty, Kirschbaum, McMurtrie, & McGilvray, 2002).

Applying the above formula, the conversion of natural forest into an oil palm plantation on mineral soil reduces the initial soil organic carbon stock of 120 ± 60 Mg C ha−1 by 40.8 ± 20.4 Mg C ha−1, while the increase of soil organic matter under plantations established on rehabilitated grassland leads to a net fixation of 13.2 ± 6.6 Mg C ha−1. The magnitudes are consistent with findings from Mutuo, Cadisch, Albrecht, Palm, and Verchot (2005) who estimate the potential of agroforestry for carbon sequestration. In the case of forest conversion these changes caused an emission of 150 ± 75 Mg CO2 ha−1, while grassland rehabilitation leads to a fixation of 48 ± 24 Mg CO2 ha−1 through the augmentation of soil carbon.

The IPCC gives annual rates for carbon dioxide emissions from decomposition of organic tropical soils. The default carbon loss under crop cultivation is quoted at 20 Mg C ha−1 a−1 (IPCC, 1997). This value is reconfirmed by measurements of the CO2 flux on Malaysian peat that showed an annual carbon loss of up to 19 Mg C ha−1 (Murayama & Bakar, 1996b). It is assumed that the carbon loss through peat decomposition after drainage under pasture and forest is 25% of that under arable land (IPCC, 1997).

The calculations of CO^2 emissions caused and carbon sequestered in response to oil palm establishment clearly show the advantage of grassland rehabilitation over forest clearance. Regulations and incentives steering the expansion of the oil palm industry are thus potential tools to reduce emissions through prevention of new plantation establishment in forest areas, especially on organic soils. In addition, promoting grassland rehabilitation for oil palm plantings could contribute to carbon sequestration.

The 'United Nations Framework Convention on Climate Change' flexibility mechanism could offset additional costs for plantation establishment on grassland. The purpose of these mechanisms is to assist developed countries in pursuing least-cost options to meet their target commitments through the generation of certified credits from projects undertaken in developing countries. While details of implementation are yet to be settled, it may involve the establishment of plantations. With global emission trading becoming a reality, emitters unable to meet their own targets could pay off through carbon sequestration in oil palm plantations. Currently the price for carbon dioxide emission credits traded on the European market is above 27 Euro per metric tonne (PointCarbon, 2006). At this price the rehabilitation of grassland through establishment of oil palm plantations would value above 4.000 Euro per hectare. Besides the refinement of the primary data used in the emission estimates, there is a need for a detailed cost benefit analysis of oil palm plantation establishment on rehabilitated grassland. Also, the secondary impacts on local communities, biodiversity and environment need further assessment.

Based on the GHG-analysis performed by Ecofys, the following conclusions can be drawn:

- When palm oil production does not lead to Land Use Change and does not take place on drained peat soils, the use of CPO leads to a significant reduction in GHG emissions compared to Heavy Fuel Oil and Natural Gas.

- When palm oil originates from plantations on drained peat soils, or other soils vulnerable to large GHG-emissions, the GHG emissions of CPO are significantly higher than those of Heavy Fuel Oil and Natural Gas. RSPO does not address this issue sufficiently as it only states that "plantings on extensive areas of peat soils (>3 m in depth) and other fragile soils should be avoided" (RSPO 2006a).

- The effects of changes in above ground carbon stocks from Land Use Change strongly depend on the original vegetation. The effects range from very positive to very negative. RSPO does not address this risk sufficiently as its main criterion on Land Use Change is focussed on the conservation of primary forests and areas with one or more High Conservation Values. RSPO does not address changes in (above ground) carbon stock resulting from Land Use Change.

Workshop
In view of the urgent need for sharing of views between stakeholders on the interrelated issues of peatlands, plantation, biofuel and climate change, the project organised a two-day technical meeting on 31st October and 1st November, 2007 involving 40 experts from Malaysia, Indonesia, Philippines as well as experts from Australia to update and synthesize information on sustainability issues relating to peatlands. Key findings from the technical meeting were presented at a stakeholder workshop on 2nd November 2007 to share and seek input from the palm oil and biofuel industries and other agencies/organisations.

The main objectives of the workshops were to share information on the nature and impacts of development of peatlands for palm oil plantation on biodiversity and climate change and implications for biofuel production, share experiences and best practices to minimize impacts and maintain production of oil palm plantation on Peatlands and review options to rehabilitate degraded peatlands for production and conservation purposes. Fifteen technical presentations were made and three working group sessions were held on 1) the nature and options for reducing GHG Emission from drained peat; 2) best management practices (BMP) for palm oil/biofuel production on peatlands; and 3) options for restoration and utilisation of degraded peatlands and associated biodiversity.

Selected findings
The meeting acknowledged that tropical peatlands in SE Asia are globally important carbon stores; containing as much as 70 billion tons compared to world's peatland carbon content which is estimated to be 550 Pg. This amount is probably underestimated due to the lack of information on peat depth. It is likely that some parts of peat ecosystems are net carbon sinks, others are no longer accumulating, and others are losing carbon. However, the overall net carbon balance of undisturbed peat ecosystems is positive, that is, it removes more CO^2 from the atmosphere than it releases.

Subsidence rate is an indicator of peat carbon loss as the result of i) carbon oxidation (carbon loss), ii) shrinkage (reduced volume due to water loss), and iii) compaction (due to human actions). The three processes contribute differently to the overall subsidence rate under different management practices and peat types. This results in different rates of carbon loss. Based on peat subsidence rates over decades, oil palm plantations on peat have a negative greenhouse gas balance, that is, they have a net loss of carbon to the atmosphere. The rate of carbon loss is varied and depends on peat type and management conditions. Long - term measurements are relatively few so carbon loss rates have significant uncertainties. In contrast - well managed oil palm plantations on mineral soils are reported to have a net positive carbon balance, that is, they accumulate carbon over time.

Peatlands developed for oil palm plantations lose their stored carbon through GHG emissions with the rate of net loss depending on the peat type and management conditions. Options to reduce emissions from peatlands include improved water management and fire prevention in existing plantations, conserving and restoring peat swamp forest, and development of sustainable oil palm plantations in severely degraded peatlands which may not be possible to be restored to natural ecosystems

In addition, oil palm management practices that could reduce carbon emissions from peat soils 1) include good water management which is vital for reducing carbon losses, 2) maintaining relatively high water table to reduce emissions from decomposition and fire and 3) maintaining ground cover to retain moisture and, reduces emissions, 4) proactive management to prevent fire or control fires.

Management practices to reduce biodiversity impacts includes maintaining natural buffers around plantations to capturing carbon and nutrients lost in water and reduce impacts on adjacent land. Clearing of land leads to loss of habitat and drainage canals cause habitat fragmentation and limits wildlife movement. Prioritization of sites and setting of objectives for restoration should be conducted at the landscape level prior to restoration efforts. Restoration should consider the peat basin as an ecological unit. Restoration of the hydrological functions is a key first step for peatland restoration.

Restoration or rehabilitation projects can help reduce carbon emissions, conserve biodiversity and generate benefits for local communities. It is extremely difficult to restore severely degraded peatlands to its original natural state. Peatland areas which are severely degraded and which may not be possible to be restored to natural ecosystems could be considered for conversion to palm oil plantations or other crops.

Key recommendations from technical meeting included: 1) to urgently collate and document case studies and best practices for the management and restoration of peatlands, 2) further improve R&D in existing plantations and BMPs to enhance productivity and sustainability and identify other R&D in specific areas.

The meeting urged relevant experts and stakeholders to continue working together and develop collaborative programmes and to actively involve local communities in the programmes.

On certification of sustainable palm oil, RSPO is encouraged to include greenhouse gas emissions of palm oil production as one of its key Principles or Criteria. The meeting requested that emissions from land use change and Peatland degradation to be considered as an integrated element of the RSPO process through the establishment of a GHG Working Group under RSPO.

The meeting discussed some of the options of financing mechanisms to support the protection and rehabilitation Peatlands and developing alternative socio-economic development for local communities. It was recommended that a Global Peatland Fund can be a potential mechanism.

4.0 Conclusions

The project was able to make significant progress in collating for the first time information on the importance of peatlands for biodiversity and climate change through the preparation of a global assessment on this subject which was formally welcomed by the Convention on Biological Diversity and officially promoted by the CBD to the parties to the UNFCCC.

The project concluded that

- Peatland issues should be better incorporated into international frameworks (e.g. CBD, Ramsar, UNFCCC, CCD and so on) as well as regional policy processes Conservation and rehabilitation of peatlands provides a major opportunity to reduce current global greenhouse gas emissions.
- Policy and management frameworks often fail to recognise the special eco-hydrological characteristics of peatlands that are so important for their sustainable management.
- Strict protection of intact peatlands is critical for the conservation of biodiversity and will maintain their carbon storage and sequestration capacity and other associated ecosystem functions
- Relatively simple changes in peatland management (such as better water management and fire control in drained peatlands) can both improve the sustainability of land use and limit negative impacts on biodiversity and climate.
- Optimising water management in peatlands (ie reducing drainage) is the single highest priority to combat carbon dioxide emissions from peat oxidation and fires as well as address peatland degradation and biodiversity conservation.
- Enhancing awareness and capacity, addressing poverty and inequity, and removing perverse incentives are important to tackle the root causes of peatland degradation.
- The emerging carbon market provides new opportunities for peat swamp forest conservation and restoration and can generate income for local communities.

5.0 Future Directions

The following are selected key future directions recommended for follow- up action and research.

1. Continued promotion of importance of peatlands for biodiversity and climate change at International policy fora and convention meetings (especially UNFCCC and CBD).
2. Promotion and support for the implementation of CBD COP9 decision on biodiversity and climate change with focus on elements related to peatlands.
3. Continued support for work on conservation and sustainable use tropical peatlands in Se Asia in line with the project findings and the decision of CBD SBSTTA 12 based on project input.
4. Implementation of control measures to enhance the protection of peatlands and minimize their degradation and conversion in relation to biofuel production.
5. Expanded assessment of the options and practices for rehabilitation of peatlands as cost effective climate mitigation measures which also support climate adaptation strategies.

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Appendices

1. Executive Summary: Global Assessment on Peatland, Biodiversity and Climate Change
2. Summary Report of the Technical workshop on Peatlands, Biofuel, Palm Oil, Biodiversity and Climate Change
3. Summary report of the Stakeholder Workshop on Peatlands, Biofuel, Palm Oil, Biodiversity and Climate Change
4. Programme of the Side Event held at the UNFCCC COP13
5. Photographs of the workshops and exhibition at UNFCCC COP 13
6. Statements made, Posters presented and Extract of Report and Decision on Biodiversity and Climate Change CBD SBSTTA 12, July 2007
7. Statement made at UNFCCC Climate Talks, Bangkok, April 2008
8. Extract of Decision on Biodiversity and Climate Change, CBD COP 9, May 2008
9. Statement on Peat and Climate Change made at CBD COP 9, May 2008

APPENDIX 1

Assessment of Peatlands, Biodiversity and Climate Change

Executive Summary

This Executive Summary presents the key findings of the global Assessment on Peatlands, Biodiversity and Climate Change. The Assessment was prepared through a review of scientific information on the nature and value of peatlands in relation to biodiversity and climate change, the impact of human activities and potential sustainable management options. It responds to decisions by a range of global environmental conventions, including the Convention on Biological Diversity (CBD) (programmes of work on inland water, forest and mountain biodiversity as well as the cross cutting issue on biodiversity and climate change), the Ramsar Convention on Wetlands (Guidelines for global action on peatlands). It is also a contribution to the UN Framework Convention on Climate Change (UNFCCC) and the UN Convention to Combat Desertification (UNCCD). The Assessment has been specifically welcomed by the Conference of Parties of the CBD.

The Assessment was prepared in the period 2005-2007 under the coordination of a multidisciplinary international team of peatland, biodiversity and climate change specialists. Its preparation was supported by UNEP-GEF and a range of other supporters.

Major overall findings

Peatlands are important natural ecosystems with high value for biodiversity conservation, climate regulation and human welfare. Peatlands are those wetland ecosystems characterized by the accumulation of organic matter (peat) derived from dead and decaying plant material under conditions of permanent water saturation. They cover over 4 million km^2 worldwide, occur in over 180 countries and represent at least a third of the global wetland resource.

Inappropriate management is leading to large-scale degradation of peatlands with major environmental and social impacts. Rehabilitation and integrated management of peatlands can generate multiple benefits including decreasing poverty, combating land-degradation, maintaining biodiversity, and mitigating climate change. Concerted action for the protection and wise use of peatlands should therefore be a global priority linking work at global regional and local levels.

Some of the major overall findings of the assessment are:

- Peatlands are the most efficient terrestrial ecosystems in storing carbon. While covering only 3% of the World's land area, their peat contains as much carbon as all terrestrial biomass, twice as much as all global forest biomass, and about the same as in the atmosphere.
- Peatlands are the most important long-term carbon store in the terrestrial biosphere. They sequester and store atmospheric carbon for thousands of years.
- Peatlands are critical for biodiversity conservation and support many specialised species and unique ecosystem types, and can provide a refuge for species that are expelled from non-peatland areas affected by degradation and climate change.
- Peatlands play a key role in water resource management storing a significant proportion of global freshwater resources. Peatland degradation can disrupt water supply and flood control benefits.
- Degradation of peatlands is a major and growing source of anthropogenic greenhouse gas emissions. Carbon dioxide emissions from peatland drainage, fires and exploitation

are estimated to currently be equivalent to at least 3,000 million tonnes per annum or equivalent to more than 10% of the global fossil fuel emissions.

- Peatland degradation affects millions of people around the world. Drainage and fires in SE Asian peat swamp forests jeopardise the health and livelihood of millions of people in several countries in the region. The destruction of mountain peatlands in Africa, Asia and Latin America threatens the water and food supply for large rural and urban populations.
- Climate change impacts are already visible through the melting of permafrost peatlands and desertification of steppe peatlands. In the future, impacts of climate change on peatlands are predicted to significantly increase. Coastal, tropical and mountain peatlands are all expected to be particularly vulnerable.
- Conservation, restoration and wise use of peatlands are essential and very cost-effective measures for long term climate change mitigation and adaptation as well as biodiversity conservation.
- Optimising water management in peatlands (i.e. reducing drainage) is the single highest priority to combat CO_2 emissions from oxidation and fires as well as address peatland degradation and biodiversity conservation.
- There is an urgent need to strengthen awareness, understanding and capacity to manage peatlands in most countries – to address peatland degradation, biodiversity conservation and climate change.

Key characteristics of peatlands

Peatlands are wetland ecosystems that are characterized by the accumulation of organic matter (peat), which is derived from dead and decaying plant material under conditions of permanent water saturation. There are many different types of peatland, depending on geographic region, terrain and vegetation type. A major distinction is between bogs (which are fed only by precipitation and are nutrient-poor) and fens (which are fed by surface or ground water as well as precipitation and tend to be more nutrient rich). Peatlands may be naturally forested or naturally open and vegetated with mosses, sedges or shrubs. Peat formation is strongly influenced by climatic conditions and topography. In northern latitudes or high altitudes the temperature may be high enough for plant growth but too low for vigorous microbial activity. Significant areas of peatlands are found in tropical and sub-tropical latitudes where high plant productivity combines with slow decomposition as a result of high rainfall and humidity. In some cases peatlands were formed during wetter climatic periods thousands of years ago but, in the drier prevailing climate, no longer accumulate peat.

- The major characteristics of natural peatlands are permanent water logging, development of specific vegetation, the consequent formation and storage of peat and the continuous (upward) growth of the surface.
- Peatland distribution and peat formation and storage are primarily a function of climate, which determines water conditions, vegetation productivity and the decomposition rate of dead organic material.
- Peatlands are found in almost every country, but occur primarily in the boreal, subarctic and tropical zones as well as appropriate zones in mountains. More detailed assessment of their extent, nature and status is needed. Many peatlands are not recognised as such but are classified as marshes, meadows, or forests.
- As a result of different climatic and biogeographic conditions, a large diversity of peatland types exists. However because of similar ecohydrological processes, they share many ecological features and functions.
- In northern regions and highlands, peatlands and permafrost are mutually dependent.
- The complex relationship between plants, water, and peat makes peatlands vulnerable to a wide range of human interference.

Peatlands and people

Peatlands and people are connected by a long history of cultural development. Humans have directly utilised peatlands for thousands of years, leading to differing and varying degrees of impact.

For centuries, some peatlands worldwide have been used in agriculture, both for grazing and for growing crops. Large areas of tropical peatlands have in recent years been cleared and drained for food crops and cash crops such as oil palm and other plantations. Many peatlands are exploited for timber or drained for plantation forestry. Peat is being extracted for industrial and domestic fuel, as well as for use in horticulture and gardening. Peatlands also play a key role in water storage and supply and flood control.

- Many indigenous cultures and local communities are dependent on the continued existence of peatlands, but peatlands also provide a wealth of valuable goods and services to industrial societies such as livelihood support, carbon storage, water regulation and biodiversity conservation.
- The many values of peatlands are generally poorly recognised and this is one of the root causes of degradation or avoidable conflicts about uses.
- The main human activities that impact peatlands include drainage for agriculture and forestry, land clearing and burning, grazing, peat extraction, infrastructure and urban development, reservoir construction, and pollution.
- Deterioration of peatlands has resulted in significant economic losses and social impacts, and has created tensions between key stakeholders at local, regional and international levels.
- Peatlands are often the last expanses of undeveloped land not in private ownership, so they are increasingly targeted by development that needs large areas of land, such as airports, plantations, windfarms and reservoirs.

Peatlands and past climate change

The form and function of peatlands and the distribution of peatland species depend strongly on the climate. Therefore climate exerts an important control on ecosystem biodiversity in peatlands.

Climate change is a normal condition for the Earth and the past record suggests continuous change rather than stability. The last 2 million years of Earth history (the Quaternary period) are characterised by a series of cold glacial events with warmer intervening interglacial periods. Peatlands expanded and contracted with changes in climate and sea-level. Many current peatlands started growth following the warming after the last glacial maximum. The initiation of new peatlands has continued throughout the postglacial period in response to changes in climate and successional change.

- Climate is the most important determinant of the distribution and character of peatlands. It determines the location and biodiversity of peatlands throughout the world.
- The earth has experienced many climate changes in the past, and peatland distribution has varied in concert with these changes. Most peatlands began growth during the current postglacial period. Peatland extent has increased over the course of the last 15,000 years.
- In the constantly accumulating peat, peatlands preserve a unique record of their own development as well as of past changes in regional vegetation and climate .
- Records show that the vegetation, growth rate (carbon accumulation) and hydrology of peatlands were altered by past climate change. This information helps in making predictions of future impacts of climate change.

- Peatlands affect climate via a series of feedback mechanisms including: sequestration of carbon dioxide, emission of methane, change in albedo and alteration of the micro- and mesoclimate
- Natural peatlands were often resilient to climate changes in the past. However, the rate and magnitude of predicted future climate changes and extreme events (drought, fires, flooding, erosion) may push many peatlands over their threshold for adaptation.
- Some expected impacts of recent climate change are already apparent in the melting of permafrost peatlands, changing vegetation patterns in temperate peatlands, desertification of steppe peatlands, and increased susceptibility to fire of tropical peatlands.
- Human activities such as vegetation clearance, drainage and grazing have increased the vulnerability of peatlands to climate change.

Peatlands and biodiversity

Peatlands are unique, complex ecosystems of global importance for biodiversity conservation at genetic, species and ecosystem levels. They contain many species found only or mainly in peatlands. These species are adapted to the special acidic, nutrient poor and water-logged conditions of peatlands. They are vulnerable to changes resulting from direct human intervention, changes in their water catchment and climate change, that may lead to loss of habitats, species and associated ecosystem services. The biodiversity values of peatlands demand special consideration in conservation strategies and land use planning.

Peatlands play a special role in maintaining biodiversity at the species and genetic level as a result of habitat isolation and at the ecosystem level as a result of their ability to self-organise and adapt to different physical conditions.

- Although species diversity in peatlands may be lower, they have a higher proportion of characteristic species than dryland ecosystems in the same biogeographic zone.
- Peatlands may develop sophisticated self-regulation mechanisms over time, resulting in high within-habitat diversity expressed as conspicuous surface patterns.
- Peatlands are important for biodiversity far beyond their borders by maintaining hydrological and micro-climate features of adjacent areas and providing temporary habitats or refuge areas for dryland species.
- Peatlands are often the last remaining natural areas in degraded landscapes and thus mitigate landscape fragmentation. They also support adaptation by providing habitats for endangered species and those displaced by climate change.
- Peatlands are vulnerable to human activities both within the peatland habitats themselves and in their catchments. Impacts include habitat loss, species extinction and loss of associated ecosystem services.
- The importance of peatlands for maintaining global biodiversity is usually underestimated, both in local nature conservation planning and practices, as well as in international convention deliberations and decisions.

Peatlands and carbon

Peatlands are some of the most important carbon stores in the world. They contain nearly 30 percent of all carbon on the land, while only covering 3 percent of the land area. Peatland ecosystems contain disproportionately more organic carbon than other terrestrial ecosystems.

Peatlands are the top long-term carbon store in the terrestrial biosphere and - next to oceanic deposits – Earth's second most important store. Peatlands have accumulated and stored this carbon over thousands of years, and since the last ice age peatlands have played an important role in global greenhouse gas balances by sequestering an enormous amount of atmospheric CO_2.

Peatlands in many regions are still actively sequestering carbon. However the delicate balance between production and decay easily causes peatlands to become carbon sources following human interventions. Anthropogenic disturbances (especially drainage and fires) have led to massive carbon losses from peatland stores and generated a significant contribution to global anthropogenic CO2 emissions. Peatland restoration is an effective way to maintain the carbon storage of peatlands and to re-initiate carbon sequestration.

- While covering only 3% of the World's land area, peatlands contain at least 550 Gt of carbon in their peat. This is equivalent to 30% of all global soil carbon, 75% of all atmospheric C, equal to all terrestrial biomass, and twice the carbon stock in the forest biomass of the world. This makes peatlands the top long-term carbon store in the terrestrial biosphere.
- Peatlands are the most efficient carbon (C) store of all terrestrial ecosystems. Peatlands contain more carbon per ha than other ecosystems on mineral soil: in the (sub) polar zone, 3.5 times, in the boreal zone 7 times, in the tropical zone 10 times as much.
- Peatlands store carbon in different parts of their ecosystem (biomass, litter, peat layer, mineral subsoil layer), each with their own dynamics and turn-over.
- The peat layer is a long-term store of carbon. Peatlands have accumulated and stored this carbon over thousands of years. Permanent waterlogging and consequent restricted aerobic decay is the main prerequisite for continued long-term storage of carbon in peatlands.
- Most coal and lignite and part of the 'mineral' oil and natural gas originated from peat deposits in previous geological periods.
- Peat growth depends on a delicate balance between production and decay. Natural peatlands may shift between carbon sink and source on a seasonal and between-year time scale, but the accumulation of peat demonstrates that their long-term natural balance is positive.
- Human interventions can easily disturb the natural balance of production and decay turning peatlands into carbon emitters. Drainage for agriculture, forestry and other purposes increases aerobic decay and changes peatlands from a sink of carbon to a source. Peat extraction (for fuel, horticulture, fertilizers, etc.) transfers carbon to the atmosphere even more quickly.
- Peatland drainage also facilitates peat fires, which are one of the largest sources of carbon released to the atmosphere associated with land management.
- Fluxes of dissolved (DOC) and particulate (POC) organic carbon constitute important carbon losses from peatlands that may substantially increase as a result of human impact and climate change
- Carbon dioxide emissions from peatland drainage, fires and exploitation are estimated to currently be at least 3000 million tonnes a year equivalent to more than 10% of the global fossil fuel emissions.
- Peatland conservation and restoration are effective ways to maintain the peatland carbon store and to maximise carbon sequestration with additional benefits for biodiversity, environment and people.

Peatlands and greenhouse gases

The world's peatlands influence the global balance of three main greenhouse gases (GHG) – carbon dioxide, methane and nitrous oxide (CO_2, CH_4, and N_2O). In their natural state, peatlands remove CO_2 from the atmosphere via peat accumulation and they emit methane. The long-term negative effect of methane emissions is lower than the positive effect of CO_2 sequestration. By sequestering and storing an enormous amount of atmospheric CO_2 peatlands have had an increasing cooling effect, in the same way as in former geological eras, when they formed coal, lignite and other fossil fuels.

When peatlands are disturbed, they can become significant sources of carbon dioxide and at the same time do not totally stop emitting methane which is still intensively released from drainage ditches and under warm wet conditions even from milled peat surfaces and peat stockpiles. Drained peatlands, especially after fertilization, can become an important source of nitrous oxide. Peatland restoration reduces net GHG emissions to the atmosphere, certainly on the long-term.

- Natural peatlands affect atmospheric burdens of CO_2, CH_4 and N_2O in different ways and so play a complex role with respect to climate.
- Since the last ice age peatlands have sequestered enormous amounts of atmospheric CO_2.
- GHG fluxes in peatlands have a spatial (zonal, ecosystem, site and intersite) and temporal (interannual, seasonal, diurnal) variability, which needs to be considered in assessment and management.
- Small changes in the ecology and hydrology of peatlands can lead to big changes in GHG fluxes through influence on peatland biogeochemistry.
- In assessing the role of peatlands in global warming, the different time frame and radiative forcing of continuous CH_4 emission and CO_2 sequestration should be carefully evaluated rather than using simple global warming potential calculations.
- Anthropogenic disturbances (especially drainage and fires) have led to massive increases in net emissions of GHG from peatlands, which are now a significant contribution to global anthropogenic emissions.
- Peatland drainage leads to increased CO_2 emissions in general and a rise of N_2O release in nutrient rich peatlands. It may not always significantly reduce CH_4 emissions.
- Because of the large emissions from degraded peatlands, rewetting and restoring them is one of the most cost-effective ways of avoiding anthropogenic greenhouse gas emissions.

Impacts of future climate change on peatlands

The strong relationship between climate and peatland distribution suggests that future climate change will exert a strong influence on peatlands. Predicted future changes in climate of particular relevance to peatlands include rising temperatures, changes in the amount, intensity and seasonal distribution of rainfall, and reduced snow extent in high latitudes and in mountain areas. These changes will have significant impacts on the peatland carbon store, greenhouse gas fluxes and biodiversity.

- Global temperature rises of 1.1-6.4 ^{0}C will be higher in northern high latitudes where the greatest extent of peatlands occurs.
- High latitudes are likely to experience increased precipitation while mid latitudes and some other regions may have reduced precipitation at certain times of the year. All areas may be susceptible to drought due to increased variability in rainfall.
- Increasing temperatures will increase peatland primary productivity by lengthened growing seasons. Decay rates of peat will increase as a result of rising temperatures, potentially leading to increased CH_4 and CO_2 release. Changes in rainfall and water balance will affect peat accumulation and decay rates.
- Tree lines in northern peatlands will shift poleward as a result of higher summer temperatures, and hydrological changes may result in increased forest extent on open peatlands. The resulting reduced albedo will positively feed back on global warming.
- Increased rainfall intensity may increase peatland erosion. This may be amplified by anthropogenic drainage and overgrazing.
- Greater drought will lead to an increase of fire frequency and intensity, although human activity is expected to remain the primary cause of fire.
- Hydrological changes, combined with temperature rise, will have far-reaching effects on greenhouse gas exchange in peatlands. Drier surfaces will emit less CH_4, more N_2O and more CO_2, and the converse for wetter surfaces.

- Melting permafrost will probably increase CH_4 emissions and lead to increased loss of dissolved organic carbon in river runoff.
- Inundation of coastal peatlands may result in losses of biodiversity and habitats, as well as in increased erosion, but local impacts will depend on rates of surface uplift.
- The combined effect of changes in climate and resultant local changes in hydrology will have consequences for the distribution and ecology of plants and animals that inhabit peatlands or use peatlands in a significant part of their life cycles.
- Human activities will increase peatland vulnerability to climate change in many areas. In particular, drainage, burning and over-grazing will increase the loss of carbon from oxidation, fire and erosion.

Management of peatlands for biodiversity and climate change

Integrated management requires the integration of approaches for biodiversity, climate change and land degradation and close coordination between different stakeholders and economic sectors.

The Assessment has found that:

- The current management of peatlands is generally not sustainable and has major negative impacts on biodiversity and climate.
- Strict protection of intact peatlands is critical for the conservation of biodiversity and will maintain their carbon storage and sequestration capacity and associated ecosystem functions.
- Changes in peatland management (such as better water and fire control in drained peatlands) can reduce land degradation and can limit negative impact on biodiversity and climate.
- Restoration of peatlands can be a cost-effective way to generate immediate benefits for biodiversity and climate change by reducing peatland subsidence, oxidation and fires.
- New production techniques such as wet agriculture ('paludiculture') should be developed and promoted to generate production benefits from peatlands without diminishing their environmental functions.
- A wise use approach is needed to integrate protection and sustainable use and to protect peatland ecosystem services from increasing pressure from people and changing climate.
- Peatland management should be integrated into land use and socio-economic development planning by a multi-stakeholder, ecosystem, river basin and landscape approach.
- Enhancing awareness and capacity, addressing poverty and inequity, and removing perverse incentives are important to tackle the root causes of peatland degradation.
- Local communities have a very important role as stewards of peatland resources and should be effectively involved in activities to restore and sustain the use of peatland resources.
- The emerging carbon market provides new opportunities for peat swamp forest conservation and restoration and can generate income for local communities.

APPENDIX 2

Technical Workshop on
Minimizing Impacts of Palm Oil and Biofuel Production in Se Asia
On Peatlands, Biodiversity and Climate Change
31 October – 1 November 2007, Kuala Lumpur
Summary Statement

The Workshop on Minimizing Impacts of Palm oil and Biofuel Production in SE Asia on Peatlands, Biodiversity and Climate Change was held on 31 October – 1 November 2007 in Kuala Lumpur. It was organized by the Global Environment Centre, Wetlands International, Global Carbon Project, BP and the ASEAN Centre for Biodiversity with support from the Asia Pacific Network on Global Change Research (APN). It was held in association with the Malaysian Palm Oil Association (MPOA). It was attended by more than 40 experts on peatland, climate change, oil palm and biofuel from seven countries.

The Workshop Objectives were to:
1. Share information on the nature and impacts of development of peatlands for palm oil plantation on biodiversity and climate change and implications for biofuel production.
2. Share experiences and best practices to minimize impacts and maintain production of oil palm plantation on peatlands.
3. Review options to rehabilitate degraded peatlands for production and conservation purposes

Fifteen technical presentations were made and three working group sessions were held on: the nature and options for reducing Greenhouse Gas (GHG) Emission from drained Peat; Best Management Practices (BMP) for palm oil/biofuel production on peatlands; and options for restoration and utilisation of degraded peatlands and associated biodiversity.

The meeting recognised that:

- Peatlands are the most extensive natural wetland ecosystems in Se Asia covering 30 million ha
- Peatlands are of global significance for carbon storage, climate regulation and biodiversity as well as great importance for local communities.
- Degradation of peatlands in the region has led to a loss of natural benefits as well as significant problems with fire, local and transboundary smoke haze as well as major GHG emissions
- Oil Palm is one of the major crops in the region that contributes significantly to socio-economic development.
- Oil palm oil is preferably grown on mineral soils – however in Malaysia about 10% of the 4.2 million ha planted area is currently on peat
- Demand for vegetable oil for food, industrial and biofuel is increasing worldwide and that this is likely to act as a stimulant for further expansion of palm oil in the region.
- The RSPO Principals and Criteria for Sustainable Palm oil form a key basis for promoting sustainable palm oil production

The workshop had the following specific findings:

Nature and options for reducing GHG Emission from drained Peat

- Peatlands in SE Asia are globally important carbon stores, and undisturbed peat swamp forests remove more CO_2 from the atmosphere than they release.
- Peatlands developed for oil palm plantations lose their stored carbon through GHG emissions with the rate of net loss depending on the peat type and management conditions.
- Options to reduce emissions from peatlands include:
    - Improved water management and fire prevention in existing plantations,
    - Conserving and restoring peat swamp forest, and
    - Development of sustainable oil palm plantations in severely degraded peatlands.

Best Management Practices (BMP) for palm oil/biofuel production on peatland

- BMP for plantations on peatlands begins with proper site selection and Social and Environmental Impact assessment (SEIA).
- There is a need for wider assessment and distribution of knowledge on peatland types suitable or unsuitable for oil palm cultivation
- Good implementation of effective water and fertiliser management and Integrated Pest Management are essential.
- There is a need for clear policy, planning and execution at the national, regional and local level on peatlands
- There are still many challenges with regards to oil palm cultivation on peatlands and so further R&D and continuous training are important.

Options for restoration and utilization of degraded peatlands and associated biodiversity

- Clearing of land leads to loss of habitat and drainage canals cause habitat fragmentation and limits wildlife movement.
- It is extremely difficult to restore severely degraded peatlands to its original natural state.
- Prioritization of sites and setting of objectives for restoration should be conducted at the landscape level prior to restoration efforts
- Restoration should consider the consider the peat basin as an ecological unit
- Restoration of the hydrological functions is a key first step for peatland restoration
- Restoration or rehabilitation projects can help reduce carbon emissions, conserve biodiversity and generate benefits for local communities
- Peatland areas which are severely degraded and which may not be possible to be restored to natural ecosystems could be considered for conversion to palm oil plantations or other crops.

The Workshop Recommended

- Case studies and best practices for the management and restoration of peatlands should be documented and made widely available

- Efforts should be further improved as soon as possible for existing plantations on peatlands to implement RSPO P&C as well as other best management practices to help enhance productivity, ensure sustainability and minimize any impacts on biodiversity and climate change.

- Options for carbon financing and other new mechanisms to fund the protection and rehabilitation of peatlands should be developed further.
- Resources should be allocated to undertake further R&D and to assess and monitor the role of peatlands in GHG emission/carbon storage and to guide ecological restoration of peatlands, enhancement of carbon storage as well as sustainable management of plantations in peatland areas.

- Oil palm, peatland and environmental experts as well as local communities and other stakeholders should continue to work together to develop collaborative programmes to promote sustainable use of peatlands.

APPENDIX 3

Workshop Report

Stakeholder Workshop on Minimizing Impacts of Palm Oil and Biofuel Production in South East Asia on Peatlands, Biodiversity and Climate Change

2 November 2007, Kuala Lumpur

Organised by

Global Environment Centre

Wetlands International

bp

ASEAN Centre for Biodiversity

Global Carbon Project

Supported by

APN

Asia-Pacific Network for Global Change Research

Introduction

Peatlands are one of the most important natural ecosystems in SE Asia. They cover 30 million ha and provide many benefits for industry and communities in Se Asia through timber and non-timber forest products, water resource management and flood control as well as carbon storage and climate regulation. They are also important for biodiversity conservation.

In the past 30 years, some peatlands in the region have been developed for agricultural purposes including for plantation crops such as palm oil as well as other crops. Oil palm is now a major contributor to the economy of several countries. Although a relatively small proportion of palm oil in countries like Malaysia is on peatlands at present (about 6%) there are proposals to expand palm oil on peatlands in the future.

In the past five years increasing focus has been placed on the sustainability of palm oil and other crops. Several new and emerging issues have been raised in relation to peatlands management including the need to prevent peatlands fires and associated transboundary haze and also the issue of carbon storage and climate change. Peatlands in Se Asia have recently been identified as one of the largest carbon stores in the region – storing nearly 50 billion tonnes of carbon. At the same time, concerns have been raised from some stakeholders on the rapid expansion of plantations on peatlands in some parts of the region and the potential impact that may have on the long term carbon stocks and carbon emissions.

There is a need for sharing of views from different stakeholders on these issues. Towards this end, two workshops were organised in Kuala Lumpur, the first was a two-day technical meeting on 31st October and 1st November, 2007 of about 40 experts to update and synthesize information on sustainability issues relating to peatlands. This was followed immediately by a one day stakeholder outreach workshop to share key findings from the technical meeting to seek input from of the palm oil and biofuel industries and other stakeholders. This report presents the output from the stakeholder workshop on 2nd November, 2007.

Workshop Objectives

1. Share information on the nature and impacts of development of peatlands for palm oil plantation on biodiversity and climate change and implications for biofuel production.

2. Share experiences and best practices to minimize impacts and maintain production of oil palm plantation on peatlands.

3. Review options to rehabilitate degraded peatlands for production and conservation purposes.

Organisers

The stakeholder workshop was organised by: the Global Environment Centre (GEC), Wetlands International, Global Carbon Project, BP and the ASEAN Centre for Biodiversity with support from the Asia Pacific Network on Global Change Research (APN). It was held in association with the Malaysian Palm Oil Association (MPOA).

Participation

74 participants from diverse stakeholder groups registered for the workshop; the main stakeholder groups present were representatives of the oil palm industry (38%), NGOs (14%), biofuel industry (10%) and academia (10%).

Workshop Agenda
The programme of the stakeholder workshop is appended as Attachment 1.

The workshop commenced with opening remarks from the co-organisers followed by the Opening Speech by YBhg Datuk Peter Wentworth, Chief Executive Officer, BP Asia Pacific (Malaysia). (Attachment 2) Salient points from his address are:

- BP is convinced that biofuels will make a major strategic contribution to global energy supplies in this century.

- Biofuels will need to be big and a material part of the solution: BP is optimistic that technology can get us there, to approximately 25% of the world fuel mix by 2030. However, for biofuels to be big and material, it has to overcome 4 hurdles – Cost, Availability, Availability and Sustainability.

- While the future is bright, the challenge is navigating the journey between now and the future. There is a need for an economically viable industry that will attract enlightened and smart investment, allow for innovation, and encourage sustainable exploitation of the resource base.

- BP's effort on development and promotion of advanced biofuels is seen in the establishment of a dedicated global biofuels business unit in 2006 and the plans to invest $500m over 10 years in establishing and maintaining an Energy Biosciences Institute. Hosted by a consortium of the University of California at Berkley, the University of Illinois and the Lawrence Berkley Laboratories, this institute will lead in developing new molecules, creating new conversion technologies that enable greater proportions of crops to be used, and also exploring new species of plants that increase the yield of fuel energy obtained from each acre of land.

- In the EU and the US, BP continued to lobby for the introduction of effective policies to support the development and wider availability of biofuels for transport. BP is seeking to ensure that the crops used in biofuel production are produced in a sustainable manner and that by encouraging standards for the production of biofuel feedstocks we are preventing negative environmental and social impacts.

- BP believes that the most pragmatic way forward to source biofuels consistent with the above principles is to work with voluntary schemes that consist of certification process and verification structures that have been developed through multi-stakeholder engagement, rather than by developing such standards on a unilateral basis or indeed simply by not engaging in the key stakeholder in biofuels sector at all.

An overview of the results and key findings from the Technical Workshop held on 31st October and 1st November, 2007 by YB Dato' James Dawos Mamit, Member of Parliament and Environment Advisor to the Sarawak Government. Recommendations from the Technical Workshop are as follows:

- Case studies and best practices for the management and restoration of peatlands should be documented and make widely available.

- Measures should be further improved as soon as possible for existing plantations on peatlands to implement RSPO P&C as well as other best management practices to help enhance productivity and ensure sustainability and help minimize any impacts on biodiversity and climate change.

- Options for carbon financing and other new mechanisms to fund the protection and rehabilitation of peatlands should be developed further.

- Resources should be allocated to undertake further R&D and to assess and monitor the role of peatlands in GHG emission/carbon storage and to guide ecological restoration of peatlands, enhancement of carbon storage as well as sustainable management of plantations in peatland areas.

- Oil palm peatland and environmental experts as well as local communities and other stakeholders should continue to work together to develop collaborative programmes to promote sustainable use of peatlands

The Stakeholder Workshop consisted of 3 technical sessions on the following topics which were also the topics for the working groups for the Technical Workshop that was held in the proceeding two days.

A. Plantations, peatlands and sustainability
B. Peatlands, biodiversity and Climate Change
C. Minimising GHG emissions from biofuel production

Besides the presentation of invited papers, key points from the working groups from the preceding Technical Workshop were presented in the respective sessions.

The workshop concluded with an interactive panel discussion with panellists representing:

- Roundtable on Sustainable Palm Oil (RSPO)
- PT TH Gambut Plantations (PT THGP)
- Global Environment Centre (GEC)
- BP Biofuels UK
- WWF Malaysia

Session A: Plantations, Peatlands and Sustainability
Chairperson: M.R. Chandran, Group Advisor, Platinum Energy Sdn Bhd

Presentations

A.1 Roundtable on Sustainable Palm Oil (RSPO)

- Dr Simon Lord of the RSPO provided an overview of the global multi-stakeholder approach to address sustainability issues related to the palm oil industry, through the Roundtable on Sustainable Palm Oil (RSPO)

- Palm oil is major vegetable oil that accounted for 24% of the world's production of oils and fats in 2006. Continued global demand for palm oil has stimulated a very rapid increase in production, particularly in Malaysia and Indonesia which today accounts for about 86% of global production. In recent years, the production of palm oil has been boosted by the strong demand by the biofuel sector.

- Although the productivity of palm oil per unit land area is superior to other major vegetable oils, for instance, being 10 times more productive than soyoil, there have been several concerns associated with the continued development of land for oil palm. Principal issues include
-
    - Deforestation and loss of remaining tropical forests
    - Loss of biodiversity especially *orang utans* and elephants
    - Global warming from emissions of greenhouse gases resulting from forest fires and conversion of peatlands.
    - Social conflicts with local communities
    - Engagement of smallholders

- The RSPO was formally established in April 2004 to promote the growth and use of sustainable palm oil products through credible global standards and engagement of stakeholders. As a multi-stakeholder organisation, RSPO's membership comprises 7 major stakeholder sectors in the palm oil supply chain:

    - Oil palm producers or growers
    - Palm oil processors and traders
    - Consumer goods manufacturers
    - Retailers
    - Banks and investors
    - Environmental or nature conservation NGOs
    - Social or developmental NGOs.

- According to the RSPO definition, 'sustainable palm oil production is comprised of legal, economically viable, environmentally appropriate and socially beneficial management' which are delivered through the RSPO Principles & Criteria.

- Progress achieved by RSPO since its formation was highlighted in the presentation. Within the brief span of 4 years, RSPO put in place multi-stakeholder processes for the certification and trade in sustainable palm oil. Elements of the certification scheme are:

    - Certification standard - the RSPO Principles & Criteria for Sustainable Palm Oil Production
    - Accreditation requirements of independent certifying bodies
    - Certification process requirements for evaluating compliance to the certification standard.

A.2 Best Management Practices (BMPs) for Palm Oil /Biofuel Production on Peatlands

- Mr Chew Jit Seng of the Malaysian Palm Oil Association (MPOA) presented the outputs of Working Group B of the Technical Meeting that preceded this Stakeholder Workshop. The Working Group addressed the problems and constraints with regard to oil palm development on peatlands and considered possible solutions to overcame the impediments.

- Problems and constraints identified by Working Group B are as follows:

  - Development of oil palm on peat may have significant environmental and social impacts
  - Not all peat is suitable for oil palm cultivation
  - Higher cost of initial development on peatlands compared to mineral soils
  - Adverse impact of peat subsidence (palm leaning, flooding etc)
  - Pest and diseases, particularly termites and *Ganoderma* disease.
  - Difficulty in infrastructure development
  - Higher training requirements to ensure correct implementation of BMPs
  - Lack of integrated infrastructure development at the landscape level for effective water management
  - Risk of peat fire
  - Higher labour to land ratio due to longer carry distance and soft ground conditions
  - Difficulty in land application of palm oil mill effluents, empty fruit bunches and other by-products from the palm oil, mill
  - Nutrient imbalance and low soil fertility

- Members of the group brainstormed for potential solutions to address the problems identified. However, given the rather limited time for the group work, the solutions provided were generic in nature and were based mainly on the experience of the members present. An effort was made to align the proposed solutions to the requirements of the RSPO Principles & Criteria for Sustainable Palm Oil Production. For example, to address the potential environmental and social impacts of development of oil palm on peatlands, Group B recommended the conduct of comprehensive and participatory independent Social and Environmental Impact Assessment (SEIA) as require by RSPO Criterion 7.1 under Principle 7 on responsible development of new plantings.

- The key findings and recommendations by Group B on BMPs for oil palm planting on peatlands are as follows:

  - The BMP for plantations on peatlands begins with proper site selection and Social and Environmental Impact assessment (SEIA).
  - There is a need for wider distribution of definition of peatlands types suitable or unsuitable for oil palm cultivation
  - Good implementation of effective water and fertilizer management and Integrated Pest Management are essential.
  - There is a need for clear policy, planning and execution at the national, regional and local level on peatlands
  - There are still many challenges with regards to oil palm cultivation on peatlands and so further R&D and continuous training are important.

A.3 Best Management Practices for Planting Oil Palm on Peat

- Dr Peter Lim Kim Huan of PT. TH Gambut Plantations (PT. THGP) shared their experiences on oil palm cultivation on peatlands in the Riau Province in Sumatra, Indonesia. PT. THGP, a subsidiary of Lembaga Tabung Haji, Malaysia has planted about 70,000 ha of oil palm under peat since 1997 which represents about 85% of the total area of peatlands In Riau Province. About 80% of the planted area on PT.THGP is under deep peat with peat depths exceeding 1.5 m. Prior to development, the entire area was in a water-logged state.

- Development of peatlands for oil palm has been found to be challenging, the main limitations being the inherent chemical and physical characteristics of peat soils, namely:

    - Chemical
        - Low soil pH, affecting nutrient availability and root development
        - Nutrient antagonism due to high Mg and Ca contents which interfere with K uptake
        - Nutrient imbalance with regard to N and K
        - High fixation of micronutrients, Cu and Zn especially in over drained areas
    - Physical
        - Low bulk density (0.10 - 0.15 g/cm^3)
        - High porosity (85 - 90%), resulting in high nutrient leaching
        - Very soft ground conditions
        - High rate of peat subsidence which is estimated to be 30 – 50 cm during the initial 2 years

- Through a series of slides, Dr Lim showed how the above constraints are addressed by the application of appropriate agronomic practices. Among these, effective water management is considered the key success factor for oil palm cultivation under peat. BY maintaining the water table consistently of 50 – 75 cm from the surface, PT. THGP has obtained oil palm yields of about 27MT fresh fruit bunches (FFB) per hectare. It was stressed that flooding is problematic while over-drainage must be avoided at all times.

- Maintaining optimum palm nutrition is another critical aspect, from the nursery to all stages of production, emphasis being on adequate and balanced nutrition, particularly with regard to K, Cu and Zn uptake.

- The lack of materials for the construction of roads was overcome by , the use of barges for the transportation of FFB, fertilisers and other supplies along a systematic network of canals.

- Large scale development of oil palm on peat soils is prone to attacks by pests, particularly termites as the abundance of woody and organic materials provides a conducive environment for the pest. However, infestations by termites and other pests such as the *Tirathaba* bunch moth and leaf eating caterpillars are mitigated through the use of Integrated Pest Management measures.

- Based on experience to-date, Dr Lim concluded that oil palm cultivation on peat is sustainable provided that careful site selection, good and preparation and proper planting are carried out. After planting, implementation of the best available agro-management practices is emphasised, particularly in respect of water management and balanced plant nutrition.

Salient points from discussion session

1. The depth of peatlands planted with oil palms in Riau was a point of contention. While Dr Lim stated that the depth of peat planted in PT. THMP varied from 1.5 to 3.0 m, Wetlands International – Indonesia was of the view that the average depth of peat in Riau exceeds 4m which according to the Presidential Decree No 32/1990 must not be developed; such areas must be protected. Dr Lim stated that according to the results of the soil survey undertaken abut 10 years ago, only 30% of the peat areas were deeper than 3 m. However, with subsidence over time, the peat depth in most areas is now about 3 m.

2. From a climate change perspective, Wetlands International – Indonesia opined that if the 200, 000 ha planted under oil palms in Riau subsided by 50 cm through drainage, about 10 million tonnes of CO^2 are emitted each year. This is equivalent to the release of 100 tonnes of CO^2 per hectare per year. If this could be avoided, the carbon credit could be traded through the proposed mechanism for Reducing Emissions from Deforestation (REDD). However, Dr Lim contended that economic spin-offs from sustainable development of oil palm on peat would be significantly than the value from carbon trading.

3. The reliability of some data relating to emissions was questioned. For example, the emission of 100 tonnes of CO^2 per hectare per year cited by Wetlands International – Indonesia was apparently incorrect. The figure is likely to vary from 26 to 80 tonnes of CO^2 per hectare per year, the higher figure being based on data for temperate peatlands in Europe. According to experience at United Plantations Berhad, the CO^2 emission is likely to be about 30 tonnes/ha/yr, provided proper water management is done.

4. The workshop noted that there was a need to provide better clarity on many terms that have been used now without proper definitions; for example, degraded and severely degraded peat, depth of deep peat and what constitutes 'logged over forests'.

5. On options for utilization of degraded peatlands, Dr Lord stated that under Principle 7 of the RSPO Principles & Criteria, it is necessary to undertake an independent Social and Environment Impact (SEIA) assessment before land development can proceed. It is necessary to assess if any of the six High Conservation Values are present in the area being considered for development. The same requirement would also apply to development of logged over forests. However, Dr Lim maintained the view that once a peat forest has been logged, further degradation and loss of biodiversity is inevitable, particularly if illegal logging and hunting of wildlife are prevalent. In his opinion, oil palm plantations using appropriate best management practices is the best alternative to reducing the impact of peatland degradation and CO^2 emissions.

6. WWF Malaysia questioned the assumption that degraded peatlands or logged over peat areas can be used for cultivation of oil palm as there are no more conservation values. For example, almost all the *Orang Utan* in Malaysia and Indonesia live in degraded forests. Thus it is important that a proper assessment of the High Conversion Values should be undertaken before proceeding with any development.

7. Instead of using degraded peatlands or logged over peat forest, it was suggested that serious consideration be given to utilization of idle land on mineral soil that have already been deforested. Satellite imagery surveys have shown that there are 7 to 8 million hectares of degraded land is present in Kalimantan. Assuming 60% could be suitable for oil palm cultivation, 4 to 5 million hectares would be available

for development. These areas are unlikely to have High Conservation Values as they are mainly under *alang-alang* grass vegetation.

Session B: Peatlands, Biodiversity and Climate Change
Chairperson: Aireen Goraz-Tuminbang, Research& Policy Specialist, ASEAN Centre for Biodiversity

Presentations

B.1 Peatlands, Climate Change, Biodiversity and Plantations

- This paper by the Global Environment Centre (Faizal Parish & Chee Ting Yiew) and Wetlands International (Sarala Aikanathan & Marcel Silvius) focused on the importance of peatlands as a carbon sink and the impacts of their degradation on global climate change.

- Climate change is the most serious global environmental problem that is caused by emissions of Greenhouse Gases (GHG) such as carbon dioxide from industry, land clearing and agriculture. Higher GHG levels means higher global temperatures which results in higher sea levels, increased flooding, fires and haze on a regional and global scale.

- Actions that could be taken to address climate change include:

    - Reduction of emission of Greenhouse gases (GHG):
        - Renewable energy eg solar, wind, biomass, biofuels
        - Energy efficiency, public transport etc
        - Stop clearing of forests and peatlands
        - Manage agriculture and plantations to reduce emissions

    - Absorption of Greenhouse gases
        - Maintain natural carbon sinks such as forests and peatlands
        - Rehabilitate degraded forests and peatlands

- Peatlands store large amounts of carbon; it has been estimated that 550,000 million tonnes of carbon are stored in peat globally. However, this massive carbon sink is under threat of degradation by drainage and fire. Degradation of peatlands results in increased CO^2 emissions and global warming. CO^2 emissions attributable to peatland drainage and fires has been estimated at about 3.5 billion tonnes per annum.

- Peatlands are also rich in biodiversity and supports communities and have important hydrological functions in providing water and prevention of floods.

- Continued strong demand for palm oil as a vegetable oil and more recently as a biofuel source has driven the rapid expansion of areas under oil palm cultivation; significant areas have been planted in peatlands, particularly in Indonesia. Development of oil palm on peat has a number of environmental and social impacts and it has been cited as one of the main causes for peatland deforestation and degradation in SE Asia. There is also a linkage between drainage of peatlands for oil palm and fires and haze that have occurred annually, particularly in Indonesia.

- The demand for palm oil as a biofuel source stems from the belief that carbon emissions would be lower than fossil fuels. However, this may not be so if biofuels are derived from oil palm cultivated on peatlands as the degradation of peat would result in significant CO^2 emissions.

- The need for protection and rehabilitation of peatlands is recognized by the governments in SE Asia and the ASEAN Peatland Management Initiative (APMI) is currently implementing a strategy and action plan for sustainable management of peatlands in ASEAN member countries. Activities include the rehabilitation of degraded peatlands through blocking abandoned drainage and the encouragement of natural regeneration of degraded peatlands.

B.2 Options for Reducing GHGs Emissions from Drained Peat

- Dr Pep Canadell of the Global Carbon Project presented the outputs of Working Group A of the Technical Meeting that preceded this Stakeholder Workshop. The Working Group addressed issues relating to trends in natural systems on carbon stocks and fluxes, role of oil palm in GHG emissions (net GHG source or sink?) and measures to reduce carbon emissions from peatlands.

- Tropical peatlands in SE Asia are globally important carbon stores, containing as much as 70 Pg (billion tons). The world's peatland carbon content is estimated to be 550 Pg. This amount is probably underestimated due to the lack of information on peat depth. It is likely that some parts of peat ecosystems are net carbon sinks, others are no longer accumulating, and others are losing carbon. However, the overall net carbon balance of undisturbed peat ecosystems is positive, that is, it removes more CO^2 from the atmosphere than it releases.

- Subsidence rate is an indicator of peat carbon loss as the result of i) carbon oxidation (carbon loss), ii) shrinkage (reduced volume due to water loss), and iii) compaction (due to human actions). The three processes contribute differently to the overall subsidence rate under different management practices and peat types. This results in different rates of carbon loss.

- Based on peat subsidence rates over decades, oil palm plantations on peat have a negative greenhouse gas balance, that is, they have a net loss of carbon to the atmosphere. The rate of carbon loss is varied and depends on peat type and management conditions. Long - term measurements are relatively few so carbon loss rates have significant uncertainties. In contrast - well managed oil palm plantations on mineral soils are reported to have a net positive carbon balance, that is, they accumulate carbon over time.

- Appropriate oil palm management practices that could reduce carbon emissions from peat soils include:

    - Water management is vital for reducing carbon losses but this will vary depending on different land uses.
        - Maintaining relatively high water table reduces emissions
        - Maintaining ground cover to retain moisture also reduces emissions
    - Proactive management to prevent fire or control fires can significantly reduce carbon emissions
        - Good water management reduces fire risk (above)
        - Enforcement of zero burn policies
        - Adequate fire suppression capability
    - Recycling organic matter from the crop biomass to the soil surface.
    - Maintaining natural buffers around plantations
        - Capturing carbon and nutrients lost in water
        - Reducing impacts on adjacent land

- While the Working Group recognised that the Principles and Criteria of the RSPO provide a framework for sustainable management of oil palm on peatlands, the issue of GHGs emissions has not been adequately covered. Thus, the Working Group welcomes the proposed establishment of a RSPO Working Group to develop appropriate criteria for minimizing greenhouse gas emission from plantations in peatlands.

- Specific recommendations for reduction of emissions from peatlands include:

  - Peatlands classified from the perspective of agricultural development, as "marginal" (low drainability, excessive woodiness, etc) should be avoided for the development of oil palm plantations.
  - Options to rehabilitate severely degraded peatland to reduce carbon emissions through the development of sustainable agriculture/forestry, including oil palm plantations, should be explored further
  - Carbon financing options including from the voluntary market, Kyoto Protocol mechanisms and proposed Reduced Emission from Deforestation and Degradation (REDD) Mechanism should be explored

B.3 Options for Restoration and Utilisation of Degraded Peatlands and Associated Biodiversity

Mr Nyoman N. Suryadiputra of Wetlands International – Indonesia, presented the outputs of Working Group C of the Technical Meeting that preceded this Stakeholder Workshop. The Working Group addressed issues relating to restoration and utilisation of degraded peatlands.

- Experiences on restoration of degraded peatlands and associated biodiversity

  - Current knowledge shows that it is extremely difficult to restore severely degraded peatlands to its original natural state.
  - Efforts are currently focused on restoring hydrological functions and carbon sequestration to restore carbon balance.
  - There is a need to define the term 'degraded' and 'restoration'.
  - Adequate emphasis must be placed on developing and promoting incentives/disincentives for peatland restoration.
  - Indonesia has experiences in restoring degraded peatlands – restoring hydrological functions and returning forest cover through canal blocking and planting.
  - It is preferable that prioritization of areas for restoration, at the landscape level, be conducted, prior to restoration efforts.

- Principal threats to peatlands biodiversity from the development and operation of plantations

  - Fire has huge impacts on biodiversity.
  - Clearing of land leads to loss of habitat and drainage canals cause habitat fragmentation and limit wildlife movement.
  - Peat loss continues under plantations.
  - Peatlands support unique and endangered biodiversity and plantations make wildlife more vulnerable to conflict with humans
  - Hydrological changes in neighbouring peat
  - Pollution from fertilizer affects fish production
  - Drainage canals may lead to forest fragmentation and restrict wildlife movement
  - Uncoordinated land use will promote further threats to biodiversity.

- Constraints to restoration of peatlands for biodiversity

- Currently there is a lack of documentation on model/success stories, resources (labour, money, capacity etc.)
  - Poor awareness on the importance of peatland ecosystems leads to lack of long term commitment.
  - Unclear land tenure
  - Lack of leverage on alienated land (incentives, disincentives)
  - Lack of research and information about peatland ecosystems and restoration
  - Poor implementation planning for plantations
  - Carbon credits and money – if you want to get a willing buyer you need to make the land more appealing and have linkage to community involvement
  - Replanting costs, lack of infrastructure etc

- Options to combine restoration of peatland biodiversity with sustainable plantations, agriculture and livelihoods

  - Research and monitoring is needed to guide ecological restoration of peatlands and enhancement of carbon storage.
  - Prior to implementation of any restoration efforts, prioritization of land use at the landscape/catchment level (buffer zones, 'wildlife crossings', mapping)
  - Areas which are severely degraded, which may not be possible to be restored to natural ecosystems, can be considered for rehabilitation to palm oil plantations or other crops.
  - Multi-stakeholder consultation should be conducted.

- Key Recommendations

  - Address knowledge gaps in restoring hydrology and ecological functions of peatlands.
  - Conduct peatland inventory and develop management planning at the catchment level.
  - Retain existing biodiversity and prevent further alienation and fragmentation.
  - Resources are needed to undertake further research and development and to assess and monitor the role of peatlands in GHG emission/ carbon storage and guide ecological restoration of peatlands, enhancement of carbon storage as well as sustainable management of plantations on peatland areas.
  - Oil palm, peatland and environmental experts as well as local communities and other stakeholders should continue to work together to develop collaborative programmes to promote sustainable use of peatlands.

Salient points from discussion session

1. On the areas planted with different crops, Mr Parish stated that of the 30 millions of peatlands in SE Asia, about 8 million hectares are under agriculture. One million hectares have been developed for the proposed mega rice project in Kalimantan but this has since been abandoned. 1.5 to 2 million hectares are under oil palm while pineapples, vegetables and other annual crops use a relatively small area of peatlands. The general impact of agriculture on peatlands is drained peatlands are vulnerable to fires and has been a major cause of transboundary haze.

2. Besides emissions from the organic matter in the peat profile, there is a need to study the impact of water draining from peat areas on the impact on climate change. Regardless of whether it is pristine peatlands or under oil palm cultivation, the drainage water would have high organic and humic contents and their eventual fact needs to be determined. In response, Dr Canadell stated that any carbon in the

water form peat areas would eventually end up in the atmosphere. Mr Nyoman added that water in peat areas can contain dissolved carbon or carbon in the particulate form. The latter can be trapped and filtered out in dams and canals that are constructed for the rehabilitation of abandoned peat swamps.

3. Mr Nyoman's assertion that fish populations in rivers have been reduced because of pollution by pesticides used on oil palm plantations was challenged. Dr Lim of PT. THGP stated that the reduction is due to over fishing by the plantation workers and their families as it was the main source of cheap protein. The demand for fish had increased with the population growth following the development of plantations in Riau.

4. There was a misperception that peat fires and haze have been the result of climate change through droughts caused by El Nino. It was explained that El Nino events are the result of natural climate variability and not climate change but it has been observed that El Nino events are becoming more frequent and intense. Droughts associated with El Nino events often result in fires with GHG emissions that contribute towards climate change.

Session C: Minimizing GHG Emissions from Biofuel Production

Chairperson: Sarala Aikanathan, Director, Wetlands International Malaysia

Presentations

C.1 How Climate Protective are Biofuels?

- Dr Pep Canadell from the Global Carbon Project (a project of the Earth System Science Partnership, Australia) discussed the present contribution of biofuels and their comparative performance and the future of biomass energy.

- In 2005, alternative fuels accounted for 4% of world transport fuel consumption and the share of biofuel was only 1%. The IEA projected that the biofuels share could increase to about 7% by 2030. Among the biofuels, world production of bioethanol in 2005 was 45 million m^3 with South America and North & Central America producing about 35% and 41% respectively. World biodiesel production in 2005 was 3.8 million tonnes, of which 85% or 3.2 million tonnes was produced in the EU. Germany is the largest producer, accounting for more the 50% of EU's production.

- In terms of Net Primary Productivity (NPP), the NPP of crop land is 13% of the estimated total world NPP 52 billion tonnes of carbon year while pasture land was 22%. The NPP from abandoned land was less than 2% of the global total. Assuming that ALL global harvests of corn, sugarcane, soy and palm oil are converted into liquid fuels, using current technology, the total fuel energy that could be provided would account for less that 3% of global use.
- The future of biomass energy could depend largely on technology and opportunities for using new plant and microbe varieties and emerging biomass-to-fuel conversion process. It is clear that the current land devoted to biofuel production needs to be increased many folds but the challenge is to find more land for biofuels. To avoid conflict with land required for food production and forest and biodiversity conservation, the solution for future biofuel production lies in the utilization of abandoned, degraded and marginal land. It has been estimated that there are about 531 million hectares of abandoned land globally. Assuming that these lands have a potential NPP of 7.1 tonnes biomass per ha per year, the NPP that could be available globally is 2.6 billion tonnes of biomass per year. The energy that could be provided by the aboveground biomass is about 20 EJ per year which is equivalent to about 5% of the global primary energy consumption.

- Comparing the energy balance of various biofuels (energy out: non-renewable energy in), the highest results were obtained form bioethanol produced form sugarcane and cellulosic ethanol. Among biodiesel sources, palm oil had the highest energy balance, followed by biodiesel from oilseed rape and soyoil.

- In terms of biofuel GHG emissions reduction (relative to conventional fuels), the largest reductions (based on the high estimates) were provided by ethanol from sugar cane and cellulose, followed by rape biodiesel, sugar beet ethanol and palm biodiesel. The lowest GHG emission was from soy biodiesel.

- Second generation biofuels has the potential to push the substitution of fossil fuels and revolutionise the biofuels contribution to energy security and climate protection. Dr Canadell concluded that until this comes, the climate change driver for increased biofuel production will be small given there are many other cheaper and more effective options for carbon mitigation.

C.2 BP Biofuels – a Growing Alternative

- The presentation by Mr Bob Saunders from BP Biofuels, UK focused on EU initiatives in GHG reductions through legislation and carbon and sustainability standards and certification.

- Transport energy demand is expected to double by 2050. As transport contributes to about 21% of CO2 emissions, a variety of technologies can reduce GHG emissions in future. These include:

    - Improved vehicle efficiency
    - Biofuels and other renewable fuels
    - Reduction in demand

- EU is likely to mandate only sustainable biofuels may be used in future. The EU Biofuels Directive has set ambitious targets for substitution with biofuels, by 2% by energy content by 2005 (though not met) and 5.75% by 2010. In UK, the Responsible Transport Fuel Obligation (RTFO) will come into force in April 2008. Under the UK RTFO, obligated parties are retailers and importers of fossil fuels. Targets set out on the total transport fuel pool are:

    - 2008/09 – 2.5% by volume
    - 2009/10 - 3.75% by volume
    - 2010/11 – 5.0% by volume

- Environmental and social standards have been developed through the Low Carbon vehicle partnership:

    - Environmental Sustainability Standard (Ecofys)
    - Social and Ethical Standards (Ecofys)
    - GHG Certification (E4Tech)

- The UK Government has developed the carbon and sustainability reporting standards (www.dft.gov.uk/roads/RTFO) which defines the C&S reporting requirements for fossil suppliers monthly and annual against specified targets. The standard covers issues regarding chain of custody, auditing and verification.

- The UK RTFO requirements and guidelines provide guidance on carbon calculation methodology. These include the carbon default values for various stages of the production of palm oil from Malaysia and Indonesia. The impact of land use change (LUC) on carbon intensity has also been estimated for several countries. It was recognised the default values may not reflect true GHG values and research is needed to better understand actual GHG emissions, particularly N^2O emissions and LUC.

- While RSPO has developed the Principles & Criteria to promote sustainable production of palm oil, emissions of GHG have not been adequately addressed.

- By 2010 GHG savings will be directly linked to targets, essentially rewarding best performing feedstock. An incentive scheme would link the award of certificates to GHG saving. The UK Government has proposed three policy options for linking GHG savings. Options being considered are:

  - Minimum GHG savings – 30%
  - Linear scale of reward. eg a 60% reduction versus a 30% base receives 2 credits. This is the preferred option.
  - A banded or stepped approach

C.3. GHG Quantification Using Life Cycle Inventory

- Dr S.S. Chen of the Environment & Bioprocess Technology Centre, SIRIM provided an overview of the project on life cycle inventory (LCI) for the production of crude palm oil (CPO). The study is part of the National LCA Project of Malaysia (2006-2010) that is being spearheaded by SIRIM. The primary objective is to develop LCI databases for primary industries to facilitate the conduct of Life Cycle Assessments (LCAs) by the respective industries with the view of promoting the adoption environmentally sound technologies and self-regulatory measures.

- The LCI study follows the framework set in ISO 14040 standards for life cycle assessment. The LCI systems boundary for the production of crude palm oil covers the nursery phase, plantations operations, milling processes and the treatment of palm oil mill effluent (POME).

- In the partition of CO^2 emissions, the capture or release of biogas during POME treatment is considered. In operating units where biogas is released from POME treatment (which is the prevailing practice in the industry), emissions from wastewater accounts for about 43% of the total CO^2 emissions while agricultural operations accounted for 55%. However, if the biogas is captured, agricultural operations will account for about 97% of the total CO^2 emissions.

- Some major considerations in the data treatment of the LCI for CPO production are:

  - Carbon dioxide emitted from the combustion of fibre and shell in the palm oil mills are not included in the inventory – carbon neutral concept
  - The system boundary did not included the GHG emission from land and sea transportation for delivery of agrochemicals etc.
  - Inclusion of carbon sequestration in the data treatment will reduce CO^2 value considerably but this is not permissible under the provisions of the present standards.

Salient points from discussion session

1. The workshop was informed that RSPO recognised that the Principles & Criteria for Sustainable Palm Oil production did not adequately cover the issue of GHG emissions. The P&C were originally developed for food production but with the

growing demand for palm oil as a biofuel, the RSPO has proposed to establish a working group to look into setting appropriate criteria for GHG emissions.

2. On default values set by UK RFTO for sustainability and social reporting, the yield of 18 tonnes fresh fruit bunches per ha is very low and can be easily achieved. Mr Saunders explained that the initial default data were intentionally set low in order to encourage plantation owners to report. If high values or even industry values are used, many not participate in the reporting process. However, these values will be revised over time and by 2010 the default values are expected to reflect the actual data.

3. Carbon sequestration by oil palm and its relevance to GHG emission stimulated much discussion. Although mature oil palms are said to sequester about 160 tonnes of CO^2 per ha, it was uncertain if carbon losses through respiration etc had been consideration. Further, the total amount of carbon sequestered could be regarded as temporary storage as they would be lost at replanting after the economic cycle of about 25 years. Dr Chen clarified that the carbon sequestration data were based on work by the Malaysian Palm Oil Board over the span of an oil palm planting cycle. She stressed that reliability of results of life cycle inventory assessments is dependent on clear definition of the systems boundaries.

4. It was observed that neither Mr Saunders nor Dr Chen considered the emissions from soil carbon in their presentations. This could be an important aspect when considering land use change, as there could be significant differences in converting forests on organic soils (peatlands) and mineral soils.

5. On the impact of biofuel on climate change, the workshop noted that reports by the International Institute of Sustainable Development and the OECD have shown no economic justification to move towards biofuel production. Among the biofuels, oilseed rape is considered the most damaging crop in terms of feritlizers and chemicals inputs. The fact that EU continues to favour biofuels from rape over palm biodiesel could possibly be linked to trade barriers rather than concerns over climate change. It was pointed out that there currently no WTO rulings for trade in biofuels. While Mr Saunders agreed that current technology is expensive, there is a need for technology development as GHG emissions from road transport demand are expected to double in coming decades. He was optimistic that with continuous improvement in technology; costs from advanced technologies are expected to come down. On the issue of trade barrier, Mr Saunders stated that his presentation on carbon sustainability should not be viewed in this context. It was meant to serve as a guide to developing sustainable products that consumers and stakeholders can accept.

6. Although the workshop was focused on biofuel production from palm oil, a call was made to consider other options for renewable energy such as hydro, wind, solar and biomass energy. Mr Saunders responded that BP which also stands for *Beyond Petroleum* has other alternative energy businesses that include use of solar energy, burning of biomass and wind power. The solar energy business has turned profitable for the first time in 25 years.

Session D: Panel Discussion

Chairperson: Teoh Cheng Hai, Chairman, RSPO RT5 Organising Committee

Panellists

1. *Dr Simon Lord, Vice-President IV, Roundtable on Sustainable Palm Oil*

2. *Dr Peter Lim, General Manager (Research) PT. TH Gambut Plantations*
3. *Mr Faizal Parish,Director, Global Environment Centre*
4. *Mr Bob Saunders, Policy Manager, BP Biofuels, UK*
5. *Mr Darrel Webber, Project Manager, WWF Malaysia*

Introduction

In view of the wide coverage of the topics during the stakeholder workshop, the Chairperson stated that there is a need for focus so that meaningful outputs can be derived from panel discussion. From a pre-meeting with the panellists, it was agreed that the scope of the panel discussion would principally cover the key findings and recommendations of the Technical Workshop. To kick off the discussion, panellists were asked if they agreed with the finding that *peatlands developed for oil palm plantations lose their stored carbon through GHG emissions with the rate of net loss depending on the peat type and management conditions.*

Salient Points the panel discussion

1. There was general agreement that peatlands developed for oil palm plantations lose their stored carbon through GHG emissions but there was no consensus on the extent of the rate of net loss or the significance to the emissions as this would depend on the peat type and management conditions.

2. Although the conclusions on the impact of peat degradation on carbon dioxide and potential impact on climate change from the recent report by Wetlands International in association with Delft Hydraulics and Altera have been widely accepted by stakeholders in Europe, the reliability of some of the data used, assumptions and methodology and the conclusions were questioned by many participants, particularly from the oil palm industry. Some of the data used were from temperate peat which would not be applicable or relevant to tropical peat. Dr Gurmit Singh (United Plantations) stated that the report should be based on sound science. Besides the rate of peat subsidence, bulk density and carbon contents of the peat should be primary parameters for determining carbon dioxide emissions. He also cited large variations in the estimates of CO^2 reported by Wetlands International and earlier publications such as the work by Dr Henson of Malaysian Palm Oil Board and Dr Lulie Melling of the Sarawak Department of Agriculture. Ms Sarala Akianathan (Wetlands International - Malaysia) clarified the Wetlands International report was science-based and the assumptions and systems boundaries have been stated in the report. Mr Parish stated that the report had more than 50 data sources on emissions studies and references. Mr M.R Chandran (Platinum Energy) stated that solid data is needed for entire peatland ecosystems for Kalimantan, Sumatra and Sarawak to reach sound data driven conclusions. In view of the lack of consensus on this issue, some plantation industry representatives called for more research to be undertake. Acceptance of the findings of the Wetlands International conclusions now would tantamount to a "death sentence for the oil palm industry on peatlands", as pointed out by Mr Shahrabah (Applied Agricultural Research).

3. Mr Faizal Parish responded that notwithstanding the differences in emissions for different peatlands, management systems etc, the basic reality is when there is peat subsidence, there will be emissions. If drainage is rapid, there is the risk of fires which will contribute to further emissions. There is no 'death sentence' if the industry takes cognizance of the potential risks of emissions from peatlands and address them appropriately. Dr Simon Lord concurred that there is no 'death sentence' but the present stakeholder concern over emissions should be taken as a 'wake up' call for the industry to address the issue of GHG emissions.

4. While agreeing that there will be GHG emissions after peat areas have been drained, Dr Peter Lim asserted that there are many management approaches to mitigate GHG emissions such as effective water management and maintenance of good ground cover. . Oil palm has been grown successfully and profitably on peatlands; the plantation development has brought about social and economic prosperity in rural areas in Malaysia and Indonesia, particularly in Riau Province. He stated that with proper agronomic management and further research on CO2 emissions and assimilation, it would be possible to achieve neutral carbon-sink source equilibrium. However, this view was challenged by Dr Pep Canadell (Global Carbon Project) who stated that regardless of depth, when peat is exposed to aerobic conditions and moisture, decomposition will take place, resulting in emissions. The rate of emissions would vary with the extent of drainage to support oil palm production and nothing can be done to balance out the emissions.

5. According to Mr Darrel Webber, climate change is an urgent global problem and markets are demanding actions by producers. As conduct of more elaborate research proposed would take time to yield meaningful or conclusive results, he urged the industry to adopt the precautionary approach to address the potential impacts from utilisation of peatlands on climate change. In concurring, Mr Bob Saunders stated that by following the precautionary approach, BP would not source palm oil produced from peatlands for biofuel production. Mr Chew Jit Seng (MPOA) stated that the precautionary principle is already embedded in the RSPO Principles & Criteria for sustainable palm oil production.

6. The Principles & Criteria (P&C) developed by the RSPO provides a good framework for sustainable production of palm oil. The criteria included measures to improvement management practices in existing peat areas such as water management and the prevention of use of deep peat or peatlands with High Conservation Values. However, it was acknowledged that there are insufficient indicators relating to emissions and climate change as the P&C were originally developed for food production. With the growing demand for palm oil as a biofuel feedstock, there is a pressing need for industry to address the issue of GHG emissions and their impact on global warming. Dr Lord informed the workshop that this emerging issue has been recognised by the RSPO and a working group has been established to develop appropriate criteria, indicators and guidelines.

7. It was noted that EU, UK the Netherlands and Germany are also coming up criteria for GHG emissions for biofuel production. Mr Chew cautioned that the multiplicity of standards could create confusion and problems for the palm oil industry. When the GHG emission requirements have been added to the RSPO P&C, he hoped the RSPO framework would be used as the basis for harmonization of the other standards.

8. On the present options for utilization of peatlands, Dr Geoffrey Hope (Australian National University) proposed the new approach of using carbon offsets to restore degraded peatlands within oil concessions or in their vicinity and allow them to become net carbon sinks again. Carbon credits earned through these offsets could be an attractive business proposition. Through this approach, it is possible to balance the net carbon loss from palm oil production with renewed sequestration by the restored peatlands. This option provides a long term and viable solution and merits due consideration by the oil palm and biofuel industries. The suggestion attracted much interest at the workshop. Mr Chew remarked that the present practice of maintaining buffer zones and riparian reserves, as required by law, is a way towards of creating offsets. As a strategy for potential oil palm growers for biofuels, Dr Lord suggested that the company acquires degraded peat land and plant the portion that is best suited of oil palm and restore the rest of the area as an offset. While Dr Gurmit expressed doubts over the practicality of restoring severely

degraded peatlands into carbon sinks again, Mr Parish prefer to look upon it as an opportunity rather than a negative issue. This was supported by Mr Webber who urged the oil palm industry to diversify their revenue streams and earning carbon credits from offsets could be a potential area that merits consideration.

Conclusion

Overall, the stakeholder workshop had met its objectives. It provided a platform for frank and free exchange of information among various stakeholders. It raised the awareness of participants on issues relating to palm oil and biofuel production on peatlands. While there was general agreement on the potential impact of development of peatlands for oil palm plantations on GHG emissions, there was no consensus on the extent or magnitude of the problem. Nevertheless, it was recognised that GHG emissions is an important emerging issue for the oil palm industry which would demand appropriate and early action. In fact some of the workshop participants stated that this is a 'wake-up' call for the oil palm and biofuel industries.

ATTACHMENT 1

Stakeholders Outreach Workshop

Minimising Impacts of Palm Oil and Biofuel Projection in Se Asia On Peatlands, Biodiversity and Climate change

2 November 2007
Istana Hotel, Kuala Lumpur

8.00 – 8.40	Registration
8.40 – 9.00	**Opening Remarks** Sarala Aikanathan, Director, Wetlands International, Malaysia Office Faizal Parish, Director, Global Environment Centre Dato' Mamat Salleh, Chief Executive Officer, Malaysia Palm Oil Association Datuk Peter Wentworth, Chief Executive Officer, BP Asia Pacific (Malaysia)
9.00 – 9.20	Summary of discussions and key findings from technical workshop. YB Dato' Dr. James Dawos Mamit.
9.20 – 10.35	**Session A: Plantations, Peatlands and Sustainability**
Paper 1	Measures being taken to promote sustainability of palm oil. Dr. Simon Lord, Vice President, Round Table on Sustainable Palm Oil
Paper 2	Presentation on key points from working group B of the technical workshop held on 31 Oct – 1 Nov on "Best Management Practices (BMP) for palm oil/biofuel production on peatlands."
Paper 3	Experience of plantations in Indonesia. Dr. Peter Lim. PT. TH Gambut Plantations.
	Q & A
10.35 – 10.50	Coffee Break
10.50 – 12.30	**Session B: Peatlands, Biodiversity and Climate Change**
Paper 4	International and Regional Frameworks for Peatlands, Biodiversity and Climate Change. Faizal Parish, Global Environment Centre
Paper 5	Presentation on key points from working group A of the technical workshop held on 31 Oct – 1 Nov on "Nature and options for reducing GHG emissions from drained peatlands."
Paper 6	Presentation on key points from working group C of the technical workshop held on 31 Oct – 1 Nov on "Options for restoration and utilization of degraded peatlands and associated biodiversity."
	Q & A
12.30 – 2.30	Lunch & Prayers

2.30 – 3.30	**Session C: Minimizing GHG Emissions from Biofuel Production**
Paper 7	How climate friendly protective are biofuels? Dr. Pep Canadell, Global Carbon Project
Paper 8	Drivers for carbon and sustainable reporting. Bob Saunders, BP Biofuels UK Policy Manager
Paper 9	Life cycle assessment on emissions of GHG from palm oil plantations. Dr. Chen Sau Soon. SIRIM
	Q & A
3.30 – 4.00	Coffee break
4.00 – 5.30	**Session D: Panel Session**
	Chairman: Mr. Teoh Cheng Hai, Chairman of RSPO RT5 Organising Committee Panel Members: Dr. Simon Lord Mr Bob Saunders Mr Faizal Parish Dr. Peter Lim Mr. Darrel Webber
5.30	End of workshop

Stakeholder Workshop on Minimising Impact from Palm Oil and Biofuel Production in SEA on Peatlands, Biodiversity and Climate Change

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APPENDIX 4

UNFCCC COP 13 Side Event

Climate and Sustainable Biofuels

Saturday 8th December 2007
1800 – 1930 hrs
Wind Room, Grand Hyatt

Organizers
Global Environment Centre (GEC)
Wetlands International (WI)

Supporters
ASEAN Centre for Biodiversity (ACB)
Asia Pacific Network for Global Change Research (APN)

Introduction

Biofuels are both a solution and as cause of climate change: Expansion of biofuel production may enhance GHG emission. Proper crops and site selection is needed to reduce net GHG emissions. UNFCCC, experts and industry need new standards. New options for sustainable solutions will be shared.

Programme

1800 Introduction/opening remarks
Hiroki Hashizume, Director of Asia Pacific Network on Global Change Research

1805 Overview on options and constraints for sustainable biofuel
Faizal Parish, Global Environment Centre

1820 Measures to promote sustainability of palm oil
Suzana Mohkeri, Global Environment Centre

1830 Palm oil, peatlands and climate change in Sumatra
Arief Wicaksono, Greenpeace

1840 Measures to ensure production of climate friendly biofuels
Petra Meekers, Biox

1850 Wetlands and biofuels; Need for certification
Sarala Aikanathan, WI Malaysia

1900 Panel discussion

1930 Closing

APPENDIX 5

Photos of GEC Exhibition Booth at the Bali International Conference Centre,

UNFCCC COP 13

Photos of participants during the Technical Workshop 31 October – 1 November 2007 at Vistana Hotel Kuala Lumpur

Stakeholder Workshop 2 November 2007 at ISTANA Hotel Kuala Lumpur

APPENDIX 6

EXTRACT FROM THE REPORT OF CBD SBSTTA 12

ITEM 5. SCIENTIFIC AND TECHNICAL ISSUES OF RELEVANCE TO THE IMPLEMENTATION OF THE 2010 TARGET

Item 5.1 Biodiversity and climate change: proposals for the integration of climate-change activities within the programmes of work of the Convention and options for mutually supportive actions addressing climate change within the three Rio conventions and summary of the findings of the global Assessment on Peatlands, Biodiversity and Climate Change

(a) Agenda item 5.1 was taken up by Working Group II at its 1st meeting, on 4 July 2007. In considering the item, the Working Group had before it notes by the Executive Secretary on biodiversity and climate change: proposals for the integration of climate change activities within the programmes of work of the Convention and options for mutually supportive actions addressing climate change within the three Rio conventions and summary of the findings of the global Assessment on Peatlands, Biodiversity and Climate Change (UNEP/CBD/SBSTTA/12/7), containing suggested recommendations to the Conference of the Parties; good practice examples for the integration of climate change activities within the programmes of work of the Convention (UNEP/CBD/SBSTTA/12/INF/14); a draft proposal from the Convention on Biological Diversity on options for mutually supportive activities for the secretariats of the Rio conventions, Parties and relevant organizations (UNEP/CBD/SBSTTA/12/INF/17); and the summary of an international meeting held at the Royal Society, London, on 12 and 13 June 2007, on biodiversity and climate change interactions: adaptation, mitigation and human livelihoods (UNEP/CBD/SBSTTA/12/INF/19).

(b) The Chair of the Working Group invited Mr Faizal Parish, Global Environment Centre, to make a presentation on the findings of the global Assessment on Peatlands, Biodiversity and Climate Change.

(c) Mr Parish said that the assessment had been carried out between 2005 and 2007 by a global multidisciplinary team; it had been coordinated by his own centre and Wetlands International, and financed by UNEP-GEF and other supporters. A key finding had been that the intense relationship between plants, water and peat make peatlands vulnerable to a wide range of human interference as well as climate change. These ecosystems provide a wealth of goods and services such as livelihood support, carbon storage, water regulation and biodiversity conservation. They control climate, have high diversity of specialized species and ecosystem types. They support and feed communities, provide water and prevent floods, and preserve history. Peatlands are the most space-effective carbon stocks of all terrestrial ecosystems, but drainage-facilitated peat fires are currently the largest single source of carbon released into the atmosphere from land-use and land-use change. The other main impacts of human activity are peat extraction, infrastructure construction, inundation, contamination and pollution. Because of the huge emissions of greenhouse gases, especially carbon dioxide, from degraded peatlands, restoration of degraded peatlands is one of the most cost-effective ways of avoiding anthropogenic greenhouse gas emissions. Climate-change scenarios predict major changes in temperature, precipitation and other phenomena that would have significant negative impacts on the peatland carbon store, greenhouse gas flux and biodiversity, as could some climate-mitigation measures, such as hydropower or biofuel production, if implemented on peatlands. The current management of peatlands is in many cases not sustainable and has a major negative impact on biodiversity and climate change; simple changes in that management could reduce that impact and improve the sustainability of land use. Peatland management should be effectively integrated into land use and socio-economic development planning by taking a multi-stakeholder, ecosystem, river basin and landscape approach. He said that there should be recognition of the role of peatlands ecosystems as the most important terrestrial carbon storage system; of the fact that the protection and rehabilitation of peatlands were important and cost-effective strategies for climate mitigation; of their vulnerability to climate change and their need to be considered in national adaptation and mitigation strategies; that further work could be considered by SBSTTA; and that assessment results could be commended to the United Nations Framework Convention on Climate Change (UNFCCC) and considered for possible collaborative activities between that body and the Convention on Biological Diversity.

(d) Statements were made by the representatives of Argentina, Australia, Belgium, Brazil, Canada, China, Colombia, the Czech Republic, Denmark, Finland, France, Germany, Ghana, Haiti, Indonesia, Kiribati, Malaysia, Mali, Mexico, Myanmar, the Netherlands, New Zealand, Norway, Palau, Senegal, Slovenia, Sweden, Switzerland, Thailand and the United Kingdom of Great Britain and Northern Ireland.

(e) Statements were made by representatives of the Council of Europe, the Food and Agriculture Organization of the United Nations (FAO), the Ramsar Convention on Wetlands, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Framework Convention on Climate Change (UNFCCC) and the World Meteorological Organization (WMO).

(f) Statements were made by the representatives of the ETC Group, the Global Biodiversity Information Facility and the International Alliance of Indigenous Peoples of the Tropical Forests.

(g) Following the statements, the Chair said that she would prepare revised suggested recommendations, taking into account comments and proposals made, for consideration by the Working Group at its 2nd meeting.

(h) At its 2nd meeting, on 5 July 2007, the Working Group considered a Chair’s text containing revised suggested recommendations.

(i) Statements were made by the representatives of Argentina, Australia, Bahamas (on behalf of small island developing States), Belgium, Brazil, Burkina Faso, Canada, China, Colombia, Denmark, Federated States of Micronesia, Finland, France, Germany, Haiti, Mexico, Netherlands, New Zealand, Norway, Slovenia, Sweden, the United Kingdom of Great Britain and Northern Ireland and Uzbekistan.

(j) A statement was made by the representative of the Indigenous Caucus.

(k) At its 3rd meeting, on 5 July 2007, the Working Group continued its consideration of the Chair’s text.

(l) Statements were made by the representatives of Australia, Bahamas (on behalf of the small island developing States), Belgium, Brazil, Germany and Norway.

(m) The Working Group authorized the Chair to consult the Executive Secretary as to the procedure by which SBSTTA could continue its discussion of the sub-item at its thirteenth meeting.

(n) The Chair said that she would prepare a revised text, taking account of comments made, for consideration by the Working Group at its next meeting.

(o) The Working Group took up consideration of the Chair’s revised text at its 4th meeting, on 6 July 2007.

(p) After an exchange of views, in which the representatives of Algeria, Argentina, Australia, Bahamas (on behalf of the small island developing States), Belgium, Brazil, Burkina Faso, Canada, China, Colombia, Denmark, Finland, France, Germany, Malawi, Mexico, Nepal, the Netherlands, New Zealand, Norway, Portugal, Senegal, Slovenia, Sweden, Thailand and the United Kingdom of Great Britain and Northern Ireland took part, the Working Group agreed to transmit the draft recommendation, as orally amended and including text that had not been agreed upon in square brackets, to the plenary as draft recommendation UNEP/CBD/SBSTTA/12/L.8.

(q) Due to delays in convening the Joint Liaison Group it had not been possible to produce a formal report as requested by the Conference of the Parties in paragraph 9 of its decision VIII/30 in time to meet the timeframe consistent with the *modus operandi* for submission of documents to SBSTTA. The Secretariat was able to provide an informal report (UNEP/CBD/SBSTTA/12/INF/17), some points of which were discussed by Working Group II during the first reading of the agenda paper. Noting that some Parties raised the issue of not having the matter included in a formal working document, the Chair of Working Group II proposed that the item should be placed on the agenda of the thirteenth meeting of SBSTTA for further deliberation to ensure its adequate consideration. The Chair would pass on the issues raised by Parties to the Secretariat for inclusion in the SBSTTA working document on biodiversity and climate change. The Chair's proposal was agreed to by the Working Group and the SBSTTA Bureau. The Working Group recognized the importance of mutually supportive activities between the conventions and the need to continue this discussion at the thirteenth meeting of SBSTTA.

Action by the Subsidiary Body

(r) At the 2nd plenary session of the meeting, on 6 July 2007, the Subsidiary Body took up revised draft recommendation UNEP/CBD/SBSTTA/12/L.8 on biodiversity and climate change.

(s) Following an exchange of views, the Subsidiary Body adopted the revised draft recommendation, as orally amended, as recommendation XII/5, the text of which is contained in annex I to the present report.

Annex : Recommendation Adopted by the subsidiary body on scientific, technical and technological advice at its twelfth meeting at UNESCO, Paris, 2-6 July 2007

XII/5. Proposals for the integration of climate change activities within the programmes of work of the Convention, options for mutually supportive actions addressing climate change within the Rio conventions and a summary of the findings of the global Assessment on Peatlands, Biodiversity and Climate Change

1. The Subsidiary Body on Scientific, Technical and Technological Advice *recommends* that the Conference of the Parties at its ninth meeting:

(a) *Decides* that, in conducting future in depth reviews of the programmes of work of the Convention, advice on potential climate-change impacts and [the impact of climate-change] response activities on biodiversity should be integrated into each programme of work where relevant, taking into account, *inter alia*, the reports and recommendations of the Third and Fourth Assessment Reports of the Intergovernmental Panel on Climate Change, Technical Series No. 10 and No. 25 of the Convention on Biological Diversity and the global Assessment on Peatlands, Biodiversity and Climate Change, and considering the following:

(i) Indications or predictions of climate-change impacts and [the impacts of climate change] response activities on relevant ecosystems;

(ii) The most vulnerable components of biodiversity;

(iii) The risks and consequences for ecosystem services and human well-being;

(iv) The threats and likely impacts of climate change and [the impacts of climate change] response activities on biodiversity and opportunities they provide for the conservation of biodiversity and its sustainable use;

(v) Monitoring of the threats and likely climate-change impacts and [the impacts of climate-change] response activities on biodiversity;

(vi) Appropriate monitoring and evaluation techniques, related technology transfer and capacity-building initiatives within the programmes of work;

(vii) Critical knowledge needed to support implementation, including inter alia, scientific research, availability of data, appropriate measurement and monitoring techniques technology and traditional knowledge; and

(viii) The ecosystem-approach principles and guidance and the precautionary approach;

(b) *Encourages* Parties to enhance the integration of climate-change considerations related to biodiversity in their implementation of the Convention, including:

(i) Identifying, within their own countries, vulnerable regions, subregions and ecosystem types, including vulnerable components of biodiversity within these areas;

(ii) Integrating concerns relating to climate-change impacts and [the impacts of climate change] response activities on biodiversity within national biodiversity strategy and action plans;

(iii) Assessing the threats and likely impacts of climate change and [the impacts of climate-change] response activities on biodiversity;

(iv) Identifying and adopting, within their own countries, monitoring programmes for regions, sub-regions and ecosystems affected by climate change and promote international cooperation in this area;

(v) Enhancing scientific tools, methodologies, knowledge and approaches to respond to climate change impacts and [the impacts of climate change] response activities on biodiversity, including socio-economic and cultural impacts;

(vi) Enhancing the methodology and the knowledge needed to integrate biodiversity considerations in climate change response activities, such as baseline information, scenarios, potential impacts on and risks to biodiversity, and resilience and resistance of ecosystems and species populations and communities/assemblages;

(vii) Increasing stakeholder involvement in the decision-making process relating to climate change impacts and [the impacts of climate change] response activities on biodiversity;

(viii) Applying the principles and guidance of the ecosystem approach such as adaptive management, the use of traditional knowledge, the use of science and monitoring;

(ix) Taking appropriate actions to address and monitor climate change impacts and the impacts of climate-change response activities on biodiversity;

(x) Enhancing cooperation with relevant organizations and among national focal points;

(c) *Urges* Parties, other Governments, donors and relevant organizations to support further action, such as the ones listed in the global Assessment of Peatlands, Biodiversity and Climate Change, that could contribute to the conservation and sustainable use of peatlands and assessment of their positive contributions to climate change response activities;

(d) *Encourages* Parties, other Governments, donors and relevant organizations to support capacity-building activities to enable developing countries, especially least developed countries and small island developing States and countries with economies in transition, to implement activities related to climate change impacts and [the impacts of climate change] response activities on biodiversity;

(e) *Requests* the Executive Secretary, subject to the availability of financial resources, to convene a workshop for small island developing States to support the integration of climate-change impacts and [the impacts of climate-change] response activities within programmes of work and national biodiversity strategy and action plans, with a view to holding similar capacity-building workshops in other groups of countries; and

(f) *Recognizes* the importance of wetlands, and in particular peatlands in the global carbon cycle, and the potential of their conservation and sustainable use as a cost-effective tool to address climate change and *welcomes* the findings of the global Assessment on Peatlands, Biodiversity and Climate Change.

(g) *Reiterates* that reduced deforestation provides opportunities for multiple benefits for biodiversity and reducing greenhouse gas emissions, and *requests* the Executive Secretary to continue to contribute to discussions on deforestation in the United Nations Framework Convention on Climate Change.

2. The Subsidiary Body on Scientific, Technical and Technological Advice:

(a) *Requests* the Executive Secretary, when preparing the in-depth review of the programmes of work on forest and agricultural biodiversity, to take into account an analysis to identify the elements of the guidance (subparagraphs 1 (a) (i)-(viii) above) already included in the existing programme of work and an assessment of the state of implementation, as well as the identification of gaps in implementation including a review of barriers and suggestions to overcome them;

(b) *Welcomes* the findings of the global Assessment on Peatlands, Biodiversity and Climate Change undertaken by Wetlands International and the Global Environment Centre and *requests* the Executive Secretary:

(i) To convey the message of the Assessment to the Conference of the Parties to the United Nations Framework Convention on Climate Change at its thirteenth meeting; and

(ii) In collaboration with the secretariats of relevant multilateral environment agreements and other relevant partners, review opportunities for further action to support the conservation and sustainable use of the biodiversity of tropical forested peatlands as well as other wetlands, and to report on progress to the ninth meeting of Conference of the Parties;

(c) *Requests* the Executive Secretary to develop proposals for mutually supportive activities as requested in decision VIII/30 paragraph 9, for consideration at the thirteenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, taking into account the views discussed by the Subsidiary Body at its twelfth meeting, bearing in mind that these views were not endorsed by Parties during that session because the report of the Joint Liaison Group meeting was not available and, therefore, was not discussed; and

(d) *Invites* Parties to submit their views on the draft options for mutually supportive activities for secretariats, Parties and other relevant organizations (UNEP/CBD/SBSTTA/12/INF/17) so as to include these views in the proposals to be presented to the thirteenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, referred to in paragraph 2 (c) above.

APPENDIX 7

Statement to the in-session workshop on LULUCF at the UNFCCC Climate Change Talks, Bangkok Thailand on 2 April 2008

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1. I am making this statement on behalf of Global Environment Centre and Wetlands International, who have been working together for the past 5 years with a range of other partners to implement a global programme on Integrated Management of Peatlands for Biodiversity and Climate Change and finalise a global Assessment on Peatlands, Biodiversity and Climate Change which was launched during COP 13. This programme has been implemented in conjunction with the governments of Russia, China, Indonesia, and other countries in the ASEAN region, with the support of UNEP-GEF, the governments of Canada and the Netherlands, The Asia Pacific Network on Global Change Research (APN), The ASEAN Center for Biodiversity (ACB) and other supporters.

2. I would like to make comments in relation to the questions posed by the Chair – namely whether LULUCF should continue to be considered under the Kyoto Protocol and UNFCCC mechanisms and whether modifications are required in the approach.

3. We believe that LULUCF should still be an important focus under the Protocol and the Convention. If LULUCF is 30% of the problem it should also be 30% of the solution. However modifications are needed to make it more effective.

4. We believe that there should be a holistic process – with full carbon accounting rather than selective accounting and partial crediting and debiting. Annex 1 countries should not be allowed to pick and choose between the sectors to assess LULUCF emissions under Article 3.4 taking on only those issues that will generate credits and ignoring those which may produce debits.

5. With proper approaches –LULUCF emissions in developing countries can sometimes be addressing can generate win-win situations – such as through sustainable land management strategies or rehabilitation of forests and peatlands. However appropriate incentives need to be provided to non-annex 1 countries so that they can address priority LULUCF issues in a manner that also generates local benefits.

6. As Brazil stated earlier today, there should be more care taken when allowing fungibility of credits between LULUCF and fossil fuel emissions. Emission reductions from LULUCF are generally of a different nature to those from reduction of fossil fuel emission and cannot necessarily be directly interchanged.

7. Annex 1 Parties also need to look seriously at the impacts that their climate change mitigation policies are having on LULUCF in Non-Annex 1 Parties. The prime example is the biofuel policies of a number of Annex 1 parties which are major drivers of LULUCF emissions in Non-annex 1 parties – yet under the Kyoto protocol these imported emissions are not counted. Instead we have been having discussions today on options to gain credits by importing Harvested Wood Products to make new carbon "stores".

8. Effort is also necessary to ensure appropriate linkages and synergies to related conventions and agreements especially the CBD and UNCCD. Joint work should be initiated with the CBD to provide guidance to avoid negative impacts on biodiversity from and explore options of synergy between ecosystem conservation and reducing LULUCF emissions.

9. Finally we have been talking a lot about forests and trees but it is extremely important that forests are not the most important ecosystems for carbon storage. Globally peatlands (a natural wetland ecosystem) are the largest carbon store in the terrestrial biosphere (with storage of at least 550 Gt C even though they only cover 3% of the land area). They store twice the carbon as the biomass of all the world's forests combined. The majority of peatlands globally are in the Annex 1 countries but relatively few Annex 1 countries have allocated significant climate change mitigation resources to maintain peatland carbon storage or reduce peatland emissions.

10. Emissions from the degradation of peatlands are one of the most important contributions to LULUCF emissions with an estimated 3.5 billion tonnes of global emissions of CO_2 from peatlands per annum compared to 5-6 billion tonnes from deforestation. However the majority of the peatland emissions are from a very small area of about 30-50 million ha (or 0.4% of the land area) and can be significantly reduced at much lower cost compared to halting global deforestation.

11. The WG III of the IPCC FAR highlighted that rehabilitation of peatlands was one of the most cost effective options to address climate change emissions. However little progress had been made in advancing this option

12 We recommend that special consideration is given to peatlands in any future measures to address LULUCF. We strongly suggest that a process is put in place to over the next few months to start to evaluate how peatland management can make a significant contribution to emission reduction in the LULUCF sector.

CBD

Convention on Biological Diversity

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Agenda item 4.5

BIODIVERSITY AND CLIMATE CHANGE

Extract from Draft decision submitted by the Chair of Working Group I

A. Proposals for the integration of climate-change activities within the programmes of work of the Convention

The Conference of the Parties

1. *Decides* that, in conducting future in depth reviews of the programmes of work of the Convention, climate change considerations should be integrated into each programme of work where relevant and appropriate, taking into account, *inter alia*, the Third and Fourth Assessment Reports of the Intergovernmental Panel on Climate Change, Technical Series No. 10 and No. 25 of the Convention on Biological Diversity and the global Assessment on Peatlands, Biodiversity and Climate Change, considering the following: [*]

(a) The assessment of potential impacts of climate change [1]/ and both the positive and negative impacts of climate change mitigation and adaptation activities on relevant ecosystems;
(b) The most vulnerable components of biodiversity;
(c) The risks and consequences for ecosystem services and human well-being;
(d) The threats and likely impacts of climate change 1/ and both the positive and negative impacts of climate change mitigation and adaptation activities on biodiversity and the opportunities they provide for the conservation and sustainable use of biodiversity;
(e) Monitoring of the threats and likely impacts of climate change, 1/ and both the positive and negative impacts of climate change mitigation and adaptation activities on biodiversity;
(f) Appropriate monitoring and evaluation techniques, related technology transfer and capacity-building support within the programmes of work;
(g) Critical knowledge needed to support implementation, including inter alia, scientific research, availability of data, appropriate measurement and monitoring techniques technology and traditional knowledge;

(h) The ecosystem-approach principles and guidance and the precautionary approach;
(i) The contribution of biodiversity to climate-change adaptation, and measures that enhance the adaptive potential of components of biodiversity;

1. *Requests* the Executive Secretary when preparing for the in depth review of the programmes of work of the Convention to take into account an analysis to identify the elements of the guidance (paragraph 1 above) already included in the existing programmes of work and an assessment of the state of implementation, as well as the identification of gaps in implementation including a review of barriers and suggestions to overcome them;

Requests the Executive Secretary, as far as possible in collaboration with the secretariats of the other two Rio conventions, to compile and synthesize information on interactions between acidification, climate change and multiple nutrient-loading as possible threats to biodiversity during the in-depth reviews of the programmes of work on inland water and marine and coastal biodiversity; [*]

2. *Urges* Parties to enhance the integration of climate-change considerations related to biodiversity in their implementation of the Convention with the full and effective involvement of relevant stakeholders and considering changing consumption and production models, including:

(i) Identifying, within their own countries, vulnerable regions, subregions and, where possible, ecosystem types, including vulnerable components of biodiversity within these areas, including with regard to the impacts on indigenous and local communities, in order to enhance national, regional and international cooperation;

(ii) Integrating concerns relating to the impacts of climate change [1]/ and both the positive and negative impacts of climate change mitigation and adaptation activities on biodiversity within national biodiversity strategy and action plans;

(iii) Assessing the threats and likely impacts of climate change [1]/ and both the positive and negative impacts of climate change mitigation and adaptation activities on biodiversity;

(iv) Identifying and adopting, within their own countries, monitoring and modelling programmes for regions, subregions and ecosystems affected by climate change and promote international cooperation in this area;

(v) Enhancing scientific tools, methodologies, knowledge and approaches to respond to the impacts of climate change, [1]/ and both the positive and negative impacts of climate change mitigation and adaptation activities on biodiversity, including socio-economic and cultural impacts;

(vi) Enhancing the methodology and the knowledge needed to integrate biodiversity considerations within climate change response activities, such as baseline information, scenarios, potential impacts on and risks to biodiversity, and resilience and resistance of ecosystems and selected species populations and communities/assemblages and encouraging the exchange of such knowledge at the national, regional and international level;

(vii) Increasing stakeholder involvement in the decision-making process relating to the impacts of climate change, [1]/ and both the positive and negative impacts of climate change mitigation and adaptation activities on biodiversity, as appropriate;

(viii) Applying the principles and guidance of the ecosystem approach such as adaptive management, the use of traditional knowledge, and the use of science and monitoring;

(ix) Taking appropriate actions to address and monitor the impacts of climate change of climate-change and both the positive and negative impacts of climate change mitigation and adaptation activities on biodiversity;

(x) Enhancing cooperation with relevant organizations and among national focal points;

3. *Encourages* Parties, other Governments, donors and relevant organizations to provide financial and technical support to capacity-building activities, including through raising public awareness, so as to enable developing countries, especially least developed countries, small island developing States, and countries with economies in transition, to implement activities related to the impacts of climate change, [1]/ and of the positive and negative impacts of climate change mitigation and adaptation activities on biodiversity;

4. *Requests* the Executive Secretary, subject to the availability of financial resources, to convene a workshop for small island developing States to integrate considerations on the impacts of climate change, [1]/ and both the positive and negative impacts of climate change mitigation and adaptation activities within programmes of work and national biodiversity strategy and action plans, with a view to holding similar capacity-building workshops in other groups of countries; [*]

D. Summary of the findings of the global Assessment on Peatlands, Biodiversity and Climate Change

1. *Recognizes* the importance of the conservation and sustainable use of the biodiversity of wetlands and, in particular, peatlands in addressing climate change and *noting with appreciation* the findings of the global Assessment on Peatlands, Biodiversity and Climate Change;

2. *Invites* the Global Environment Centre, subject to available resources, to translate into other United Nations languages, and further disseminate the global Assessment on Peatlands, Biodiversity and Climate Change;

3. *Encourages* Parties and other Governments to strengthen collaboration with the Ramsar Convention on Wetlands and promote the participation of interested organizations in the implementation of the Guidelines for Global Action on Peatlands and other actions, such as the ones listed in the global Assessment of Peatlands, Biodiversity and Climate Change, that could contribute to the conservation and sustainable use of peatlands;

4. *Welcomes* the initiative of the Scientific and Technical Review Panel of the Ramsar Convention to consider wetlands and climate change as an important emerging issue, *invites* the Secretariat and the Scientific and Technical Review Panel of the Ramsar Convention, subject to available resources, to further assess the contribution of biodiversity to climate-change mitigation and adaptation in peatlands and other wetlands and *further invites* the Secretariat and the Scientific and Technical Review Panel of the Ramsar Convention to make the reports on these assessments available, for example through its website;

5. *Requests* the Subsidiary Body on Scientific, Technical and Technological Advice to explore ways to engage with the Intergovernmental Panel on Climate Change in planning and preparing its next assessment reports and *invites* the Intergovernmental Panel on Climate Change to participate in the Convention on Biological Diversity and

[*] This paragraph has budgetary implications.

Ramsar processes of preparing future technical studies on climate change and biodiversity, particularly on wetlands;

6. *Requests* the Executive Secretary, in collaboration with the Secretariat of the Ramsar Convention, and subject to available resources, to conduct an analysis of the potential of incentive measures and funding mechanisms under climate-change adaptation and mitigation in supporting biodiversity conservation and sustainable use in wetlands as well as in supporting local livelihoods and contributing to poverty eradication and *further requests* the Executive Secretary to explore ways to engage with those national and international research centres (e.g. CGIAR centres) addressing climate-change adaptation and mitigation in relation to wetlands biodiversity; and [*]

7. *Invites* the Conference of the Parties to the Ramsar Convention, at its tenth meeting, to consider appropriate action in relation to wetlands, water, biodiversity and climate change in view of the importance of this subject for the conservation and sustainable use of biodiversity and human welfare.

Annex III

TERMS OF REFERENCE OF AN AD HOC TECHNICAL EXPERT GROUP (AHTEG) ON BIODIVERSITY AND CLIMATE CHANGE

1. The purpose of this AHTEG is to provide biodiversity-relevant information to the United Nations Framework Convention on Climate Change.

2. The AHTEG shall be guided by relevant outcomes from the Conference of the Parties and the Subsidiary Bodies of the UNFCCC, and on other bodies as appropriate and shall draw on Technical Series No. 10 and No. 25, the outcomes from the workshops convened by the Secretariat of the United Nations Framework Convention on Climate Change under the Nairobi work programme as well as the documents compiled under this programme, and other relevant documents including the reports of the Intergovernmental Panel on Climate Change and the Millennium Ecosystem Assessment,

3. The AHTEG shall be established in accordance with the procedures outlined in the consolidated modus operandi of SBSTTA (decision VIII/10, annex III) and considering the results presented by the group of experts on biodiversity and adaptation to climate change regarding ecosystem vulnerability to the impacts of climate change and climate change response measures within the framework of the programmes of work of the Convention on Biological Diversity and shall have the following terms of reference:

Provide scientific and technical advice and assessment on the integration of the conservation and sustainable use of biodiversity into climate change mitigation and adaptation activities through *inter alia*:

(i) Identifying relevant tools, methodologies and best practice examples for assessing the impacts on and vulnerabilities of biodiversity as a result of climate change;

(ii) Highlighting case studies and identifying methodologies for analysing the value of biodiversity in supporting adaptation in communities and sectors vulnerable to climate change;

(iii) Identifying case-studies and general principles to guide local and regional activities aimed at reducing risks to biodiversity values associated with climate change;

[*] This paragraph has budgetary implications.

(iv) Identifying potential biodiversity-related impacts and benefits of adaptation activities, especially in the regions identified as being particularly vulnerable under the Nairobi work programme (developing countries, especially least developed countries and small island developing States);

(v) Identifying ways and means for the integration of the ecosystem approach in impact and vulnerability assessment and climate change adaptation strategies;

(vi) Identifying measures that enable ecosystem restoration from the adverse impacts of climate change which can be effectively considered in impact, vulnerability and climate change adaptation strategies;

(vii) Analysing the social, cultural and economic benefits of using ecosystem services for climate change adaptation and of maintaining ecosystem services by minimizing adverse impacts of climate change on biodiversity.

(viii) Proposing ways and means to improve the integration of biodiversity considerations and traditional and local knowledge related to biodiversity within impact and vulnerability assessments and climate change adaptation, with particular reference to communities and sectors vulnerable to climate change.

(ix) Identifying opportunities to deliver multiple benefits for carbon sequestration, and biodiversity conservation and sustainable use in a range of ecosystems including peatlands, tundra and grasslands;

(x) Identifying opportunities for, and possible negative impacts on, biodiversity and its conservation and sustainable use, as well as livelihoods of indigenous and local communities, that may arise from reducing emissions from deforestation and forest degradation;

(xi) Identifying options to ensure that possible actions for reducing emissions from deforestation and forest degradation do not run counter to the objectives of the CBD but rather support the conservation and sustainable use of biodiversity;

(xii) Identifying ways that components of biodiversity can reduce risk and damage associated with climate change impacts;

(xiii) Identifying means to incentivise the implementation of adaptation actions that promote the conservation and sustainable use of biodiversity

4. The work of the AHTEG should be initiated as soon as possible in order to provide a completed report for consideration by the SBSTTA prior to the tenth meeting of the Conference of the Parties; and provide information on these deliberations to the relevant UNFCCC processes.

5. The selection of the experts shall be in accordance with annex III of decision VIII/10 and shall include representatives of indigenous and local communities.

6. Parties are encouraged to take into consideration, the need for scientific and technical expertise in the AHTEG also from, *inter alia*, UNFCCC and other relevant intergovernmental organizations and processes when nominating their experts.

7. In preparing documentation for the AHTEG meetings, especially noting the need to ensure scientific credibility and timely information to the UNFCCC processes, *inter alia*, the following steps should be taken subject to the availability of financial resources, (a) Parties, other Governments, relevant intergovernmental organization and processes, indigenous and local communities and other relevant stakeholders should be invited to submit their views, best practice examples and further relevant information on items included in the paragraph 1 above to the Executive Secretary and (b) an ad hoc internet-based discussion group or an online conference should be convened by the Executive Secretary in multiple languages, so as to support the AHTEG meeting identifying major issues related to the items included in its terms of reference in paragraph 3 above.

APPENDIX 9

Statement to the CBD COP 9 Working Group Session on Biodiversity and Climate change 23 May 2008

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1. I am making this statement on behalf of Global Environment Centre and Wetlands International, who have been working together for the past 5 years with a range of other partners to implement a global programme on Integrated Management of Peatlands for Biodiversity and Climate Change and to prepare a global Assessment on Peatlands, Biodiversity and Climate Change, the preparation of which was welcomed by CBD COP 7 and the output welcomed by CBD SBSTA 12 in July 2007. The assessment and the associated programme has been implemented in conjunction with the governments of Russia, China, Indonesia, and other countries in the ASEAN region, with the support of UNEP-GEF, the governments of Canada and the Netherlands, The Asia Pacific Network on Global Change Research (APN), The ASEAN Center for Biodiversity (ACB) and other supporters.

2. Key findings include
   i. *Peatlands are the most important terrestrial ecosystem for carbon storage (*with storage of at least 550 Billion tonnes of Carbon even though they only cover 3% of the land area). *- storing twice as much carbon as the biomass of all the world's forests combined.*
   ii. *Current peatland degradation contributes more than 3 billion tones of CO2/year equal to 10% of global fossil fuel emissions.*
   iii. *Peatlands are critical for the conservation of biodiversity and provide many important benefits to people.*
   iv. *Millions of people throughout the world are negatively affected by fires, floods and other negative impacts of peatland degradation.*
   v. *Conservation and restoration of peatland ecosystems are the most cost effective ways to reduce GHG emissions*
   vi. *Supposed climate mitigation projects such as biofuel feedstock development, hydropower and wind farms have significant negative impacts when conducted on peatlands .*
   vii. *Relatively small changes in peatland management (particularly to optimise water management) can lead to significant reductions of emissions while at the same time enhancing the value to biodiversity and local populations.*

3. The WG III of the IPCC FAR has also highlighted that rehabilitation of peatlands is one of the most cost effective options to address climate change emissions.

4. Unfortunately relatively little progress has been made in the enhanced protection and sustainable use of peatlands for biodiversity and climate change. We strongly encourage that the COP decision recognizes the importance of peatlands and calls for urgent action to enhance their conservation and rehabilitation. Mechanisms need to be put in place to enable the CBD to work actively with the UNFCCC to ensure that these issues are incorporated into the implementation of the Bali Action plan.

5. We call on parties to urgently take initial practical action to implement sustainable management of peatlands to generate benefits for biodiversity, climate change and local communities.

6. Finally copies of the assessment will be available at a side event on this topic at the Gustav Stresemann Institute at 18.15 today

7. We are submitting specific written comments on some issues.