INTERNATIONAL MIRE CONSERVATION GROUP

NEWSLETTER

issue 2011/2-3, December 2011

The International Mire Conservation Group (IMCG) is an international network of specialists having a particular interest in mire and peatland conservation. The network encompasses a wide spectrum of expertise and interests, from research scientists to consultants, government agency specialists to peatland site managers. It operates largely through e-mail and newsletters, and holds regular workshops and symposia. For more information: consult the IMCG Website: http://www.imcg.net

IMCG has a Main Board of currently 15 people from various parts of the world that has to take decisions between congresses. Of these 15 an elected 5 constitute the IMCG Executive Committee that handles day-to-day affairs. The Executive Committee consists of a Chairman (Piet-Louis Grundling), a Secretary General (Hans Joosten), a Treasurer (Francis Müller), and 2 additional members (Ab Grootjans, Rodolfo Iturraspe).

Fred Ellery, Seppo Eurola, Lebrecht Jeschke, Richard Lindsay, Viktor Masing (†), Rauno Ruuhijärvi, Hugo Sjörs (†), Michael Steiner, Michael Succow and Tatiana Yurkovskaya have been awarded honorary membership of IMCG.

Editorial

This double Newsletter compensates somewhat for the delay in producing a Newsletter in September. So many things are happening in global mire conservation that we did not manage to compile the reports you send us and to summarize our own involvements in time. We hope to behave better in 2012.

2011 was again a year with a rising profile for peatlands. Several European countries finished national inventories and strategies (we publish here some summaries for your inspiration). And although progress seems not to be fast enough, we reached some breakthroughs on the global front in the Climate Convention that will require more work from us on the national level in 2012.

Also the genus *Sphagnum* featured globally in 2011: with new species described from the Subantarctics, a new worldwide overview, and an international workshop on *Sphagnum* farming in Canada. Read about all this and other news in this Newsletter.

On an IMCG organisational level, we must start thinking about the 2012 events in the Andes. Our South American friends are still sorting out schedule, itinerary and costs. We hope to provide final outcomes in January. Meanwhile you can start thinking about issues to discuss at the General Assembly, compiling resolutions and considering whether the time is ripe for YOU to candidate for the IMCG Main Board for the next two years.

Michael Trepel is refreshing the IMCG website and has introduced a dynamic news site where we can provide more up-to-date information than the Newsletter is able to do. So keep an eye on it and send in news that you want to spread.

We plan to produce the next Newsletter at the end of March 2012, so please send in your contributions before March 21st.

For information, address changes or other things, contact us at the IMCG Secretariat.

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A note from the Chair

Dear fellow members

Summer is in the air in the Southern Hemisphere and our colleagues in the North are feeling the bite of winter – time has certainly moved on. Perhaps a good time to stand back and asses if we (the IMCG) in the forefront of mire and peatland conservation, will be achieving the goals we have set, not only for the IMCG as an organization, but also for ourselves. Our organization is only as strong and as successful as its members are – our individual achievements contribute to the success of the IMCG.

We as IMCG Executive Committee (EC) did not always achieve the goals we had set for ourselves, with delays in producing the Newsletters and in membership administration. National and global urgencies increasingly burden our individual workloads and adjustments are always lagging behind the challenges. Therefore we have started to have regular EC meetings on Skype. Some of the outcomes of our first EC Skype meeting are that Ab Grootjans will from now on assist Hans Joosten and John Couwenberg in editing and compiling the newsletter, that the Greifswald secretariat is going to expand with Susanne Abel to reorganize and improve membership administration, and that the Field Symposium, Congress and General Assembly planned for 2012 in South America is foreseen to go ahead as planned. We have given the organizers in consideration to schedule the meetings in the first weeks of September. Full details will – we hope - be available at the end of January 2012. We will keep you informed!

This issue of the newsletter is certainly taking stock of some of the challenges facing mire conservation today globally: - from new developments in various countries to the latest reports at the Climate Convention talks (Hans Joosten is giving us a first hand account of the events at CoP17 held in Durban, South Africa in November/December 2011. Various countries are dealing on a strategic level with mires: some realising the natural benefits of peatlands (such as Scotland), and others taking a step backwards and exploiting these miracles of nature more than before (such as Finland). Interesting developments are taking place in my own country: Justice for peatlands at last!

The South African minister of Department of Environmental Affairs signed a notice during CoP17 instructing all peat extraction activities to cease at the Gerhardminnebron peatland. The extraction company brought an urgent appeal early in December 2011 to have the minister's instruction set aside but the court ruled that extraction has to stop and the matter can be relooked at in 2012. I hope we can report in 2012 the closure of the remaining peat extraction operation in South Africa.

Two peat extraction companies are facing possible criminal charges for apparently extracting peat in portions of the Gerhardminnebron peatland without water use licences and for, it is alleged, not rehabilitating the excavated areas. On the other scale of incompetence we have seen officials from environmental departments preventing landowners to stop underground peat fires because the land owners should first do an impact assessment....??

Changing perceptions do not happen overnight and policies takes even longer. We say in Afrikaans, my home language: 'Eendrag maak mag' – together we are powerful!! And together we can do it. Remember: act local and win global!

Piet-Louis Grundling
South Africa

IMCG Field Symposium, Congress and General Assembly 2012 in the Andes

Our South-American colleagues are still busy organizing the IMCG 2012 events in the Andes, we hope that they can provide final information on costs, schedule and itinerary in January 2012.

One of the envisaged 2012 excursion sites: Chingaza (Colombia): Buitrago Sphagnum *bog with* Espeletia killipii *stemrosettes and* Chusquea tessellata *bamboos at about 3650 m. Isolated* Calamagrostis ligulata *clumps appear in a bryophytic mat in the foreground (photo: Antoine Cleef).*

On the IMCG General Assembly 2012 in the Andes only a limited number of IMCG members can be present, and only limited time will be available. Therefore we will arrange the discussions and decisions largely by internet and email, like we have done with earlier General Assemblies.

This Newsletter contains the preliminary agenda for this Assembly (that will be available on our website as well) and at the end of June 2012 we will produce a Newsletter containing the full documents for the Assembly and all information on how the voting per email or snailmail will be done. We will furthermore open a special site on our website where all drafts of discussion papers will be made available.

Therefore: provide the IMCG secretariat with additional (minor) agenda points and submit your background papers, concrete proposals, draft resolutions, contributions for discussion, nominations for the IMCG Main Board and for Honorary Life membership, etc. until 31 May 2012. Send the material in as soon as possible – the sooner the better – so that we can arrange the democratic procedures in a smooth way.

The *preliminary agenda* of the IMCG General Assembly is as follows:

1. Opening and Welcome
2. Minutes of the General Assembly of 17 July 2010, in Goniadz, Poland (available in IMCG Newsletter 2010/3)
3. Balance sheet and the statement of profit and loss
4. Biennial report (2010 – 2012) on the state of affairs in the IMCG.
5. IMCG Action Plan 2010 – 2014
6. IMCG Membership fee
7. Election of the Main Board (with associated elections of the Executive Committee members, incl. chair, by the MB)
8. Conference resolutions
9. Next venues
10. Nomination of Honorary Life Members
11. Any Other Business

IMCG Resolutions

The IMCG General Assembly in the Andes 2012 will again discuss and adopt resolutions. To streamline the procedure, IMCG members are requested to submit their draft resolution timely, i.e. as soon as possible, to the IMCG secretariat. This will enable to circulate the draft resolutions among the Main Board, to publish the necessary background information in the IMCG Newsletter of June 2012, and to put the drafts on our website so that everybody can send reactions (to the IMCG Secretariat).

Draft resolutions should identify the apparatus and bodies to which the resolution has to be directed or sent. Examples (phrasing and content) of resolutions can be found on the IMCG website (http://www.imcg.net/pages/publications/resolutions.php). Resolutions are not always taken at heart by the governments they are addressed to. Yet resolutions remain a strong tool to influence government policies, the more so with the increasing strength of IMCG on the global peatland front.

Nominations for the IMCG Main Board

On our General Assembly in Colombia we have to elect a new IMCG Main Board. In order to guarantee an effective democratic election process involving all members, nominations have to be submitted to the Secretariat before 31 May 2012, so that ballots can be sent out in time to allow email and postal voting. Please send your nomination (incl. a short description of your backgrounds, your activities in, and vision on mire conservation) to the Secretariat as soon as possible: info@imcg.net.

Recent achievements on the peatland/climate front

by Hans Joosten

Peatlands are the most concentrated and most important carbon reservoirs of the terrestrial biosphere. They play an important role in global climate regulation by keeping huge amounts of carbon from being released to the atmosphere (Parish et al. 2008). Drained peatlands are currently responsible for some 6% of the global anthropogenic CO_2 emissions (Joosten 2009). These facts were until recently neglected in the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. Since 2006 peatland conservation groups have actively lobbied the Climate Convention (Joosten 2011a, b). This year, after preparatory meetings in Bangkok (April), Bonn (May) and Panama (October), the first tangible results were achieved at the UNFCCC Conference of Parties in December 2011 in Durban. A report from the deep inside.

Peatlands under REDD+

In tropical peat swamp forests, the natural forest provides the plant material and facilitates the wet conditions for peat formation, carbon sequestration and carbon storage. When drained, deforested or degraded, peat swamp forests release the peat carbon much faster than it has been sequestered (Couwenberg et al. 2010, Dommain et al. 2010, 2011).

Fig. 1: Recent peat swamp deforestation in Damani (Panama). Photo's: Jorge Hoyos (1-3) and Hans Joosten (4).

Deforested and degraded peat swamp areas in the tropics with their continuously emitting drained peat soils are responsible for half of the peatland emissions worldwide (Joosten 2009), tendency increasing (cf. fig. 1). It is clear that tropical peat swamp forests should be a priority for the UNFCCC REDD+ mechanism (Reducing Emissions from Deforestation and forest Degradation) under development.

With respect to REDD+, the UNFCCC in Durban took an important decision 'on guidance on systems for providing information on how safeguards are addressed and respected and modalities relating to forest reference emission levels and forest reference levels as referred to in decision 1/CP.16, appendix I' (http://unfccc.int/files/meetings/durban_nov_2011/decisions/application/pdf/cop17_safeguards.pdf).

The decision deals on the one hand with 'safeguards', which must guarantee that REDD+ activities and policies do not negatively impact on biodiversity and the rights of indigenous peoples. The other element of the decision relates to 'reference levels': the way REDD+ emissions reductions have to be reported and accounted for. The latter is no simple discussion at all...

Reference levels

Emission reductions must be assessed against a reference level (reduced compared to what?). The Kyoto Protocol, for example, generally uses the historical reference level of 1990 (the 'base year'). This means that reductions are achieved when the emissions in the reporting period are lower than those in 1990. A historical reference can, instead of a year, also use a period (e.g. 2000-2010).

In contrast, some mechanisms of the Kyoto Protocol (i.c. Joint Implementation and the Clean Development Mechanism) as well as the voluntary carbon market (cf. the Verified Carbon Standard VCS elsewhere in this newsletter) use a forward-looking reference level. A forward looking reference level is a hypothetical scenario that considers the emissions that would have occurred without implementing the climate change mitigation project or policy.

The different approaches may produce substantial differences in accounted emissions reduction volumes (and thus in 'carbon credits'). Forward-looking reference levels, although more correct in not awarding reductions that anyhow would happen, introduce considerable complications. For a peatland used as oil palm plantation, for example, we could assume (a) that current use will be continued or (b) that the area will be abandoned and will spontaneously rewet to some extent or (c) that use and drainage will be intensified. The differences between those scenarios in terms of assumed future GHG emissions and potential emissions reductions are substantial (cf. Couwenberg *et al.* 2011, fig. 2).

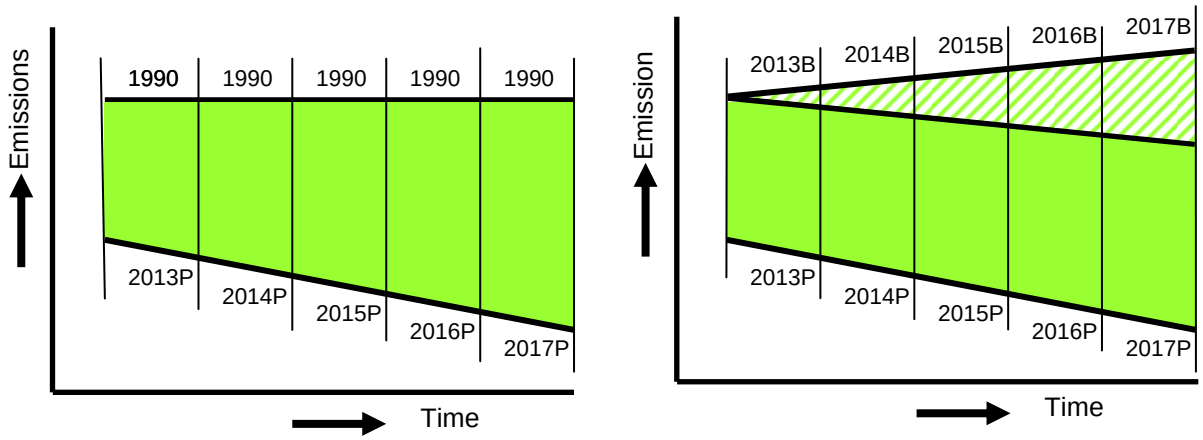


Fig. 2: Comparison of two reference level concepts: the historical reference year (left) and the forward-looking reference level (right). In both cases the decrease in GHG emissions by rewetting over the project period (P) of 5 years (2013P-2017P, lower line) is identical. The example assumes a small spontaneous rising of the water level (2013B-2017B) and a consequent reduction of emissions without the rewetting project. As a result the forward-looking reference level concept in our example generates less carbon credits (green plane) than the historical reference level concept. The striped area shows the additional carbon credits that could be generated when it could be made plausible that without project implementation the project area would be drained deeper. The historical reference level concept does not have such 'flexibility', because the past is (largely) known and cannot be changed.

All significant pools included

In its 'Annex: Guidelines for submissions of information on reference levels', the Durban REDD+ decision states:

'Each developing country Party aiming to undertake the actions listed in decision 1/CP.16, paragraph 70 [i.e. REDD activities mentioned in the Cancun agreements, HJ] should include in its submission transparent, complete, consistent with guidance agreed by the Conference of the Parties (COP), and accurate information for the purpose of allowing a technical assessment of the data, methodologies and procedures used in the construction of a forest reference emission level and/or forest reference level. The information provided should be guided by the most recent Intergovernmental Panel on Climate Change guidance and guidelines, as adopted or encouraged by the COP, as appropriate, and include:

(a) Information that was used by Parties in constructing a forest reference emission level and/or forest reference level, including historical data, in a comprehensive and transparent way;

(b) Transparent, complete, consistent and accurate information, including methodological information, used at the time of construction of forest reference emission levels and/or forest reference levels, including, inter alia, as appropriate, a description of data sets, approaches, methods, models, if applicable and assumptions used, descriptions of relevant policies and plans, and description of changes from previously submitted information;

(c) Pools and gases, and activities listed in decision 1/CP.16, paragraph 70, which have been included in forest reference emission levels and/or forest reference levels and the reasons for omitting a pool and/or activity from the construction of forest reference emission levels and/or forest reference levels, noting that significant pools and/or activities should not be excluded;

(d) The definition of forest used in the construction of forest reference emission levels and/or forest reference levels and, if appropriate, in case there is a difference with the definition of forest used in the national greenhouse gas inventory or in reporting to other international organizations, an explanation of why and how the definition used in the construction of forest reference emission levels and/or forest reference levels was chosen.'

Two elements are relevant in this annex:

1) The provision under (c) 'noting that significant pools and/or activities should not be excluded'. We managed to get this addition into the text only in the very last minutes of the negotiations. The addition was crucial to block the option that some countries were pursuing to exclude peat soils entirely from REDD+, because they would be too complicated to handle. Excluding peat soils might solve an accounting problem, but it would also lead to perverse developments. Deforestation would then concentrate on peat swamp forests where the above ground biomass contains less carbon than forests on mineral soils. The associated huge carbon losses from the peat soils would simply be ignored…
2) The reference to 'historical data' under (a). This implies that historical data (deforestation rates and trends) should play an important role in constructing reference levels.

Peat swamp complexity

Indeed, the construction of reference levels for peat swamp forests is not simple. The issue had already been raised at an expert meeting of the UNFCCC's Subsidiary Body for Scientific and Technological

Advice (SBSTA) in November 2011 in Bonn, where (on invitation of the SBSTA co-chair and the UNFCCC secretariat) I had tried to explain the peculiarities of tropical peat swamps (http://unfccc.int/files/methods_science/redd/application/pdf/reference_levels_for_peatswamp_forests_final.pdf). As fig. 3 shows, peat swamp soils behave completely different from forest biomass and this behavior has enormous consequences for reference level setting and accounting of emissions reductions.

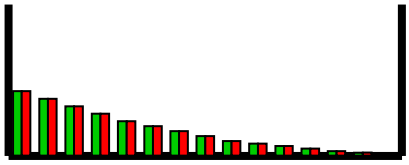
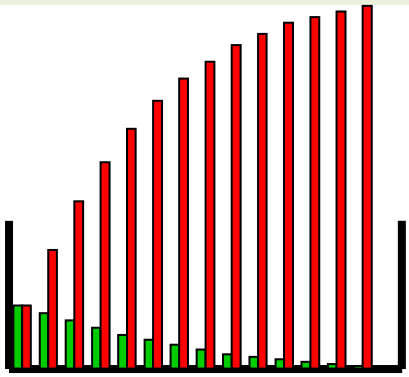
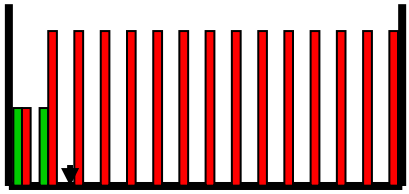
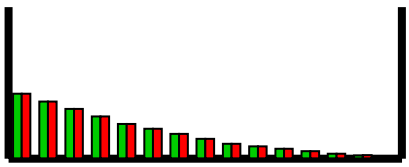
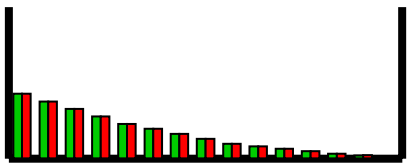
Forest biomass	**Peatland soil**
1 	2 
A **decreasing** rate of deforestation and forest degradation **decreases** annual GHG emissions.	A **decreasing** rate of peatland conversion and drainage ***increases*** annual GHG emissions because the emissions from newly drained peatland add to those of already drained peatland.
3 	4 
Stopping deforestation and forest degradation **stops** GHG emissions.	**Stopping** peatland conversion and drainage expansion does not decrease GHG emissions because existing drained peatlands will ***continue*** emissions at the same level.
5 	6 
Decreasing the **rate of deforestation** is indeed Reducing Emissions from Deforestation and forest Degradation.	But only ***decreasing the absolute area*** of drained peatland is Reducing Emissions from Deforestation and Degradation.
REDD+: STOP DEFORESTATION!	**REDD+: STOP NEW DRAINAGE + REWET!**

Fig. 3: The relation between annual land use change ([1]-[5]) / land use ([6]) (ha/year, green) and total annual emissions (ton/year, red) when considering forest biomass (left) and peat soil (right).

If you, for example, would extrapolate the historical trend of peat swamp deforestation/drainage and associated emissions into the future, the reference level would – because of the cumulative character of the emissions - sky-rocket upward. A small deviation of that trend would provide substantial REDD+ credits, whereas the emissions would still be massively increasing (cf. fig. 3.2).

If you, alternatively, would take the average rate of drainage of the past – say 10 – years, the associated cumulative emissions would produce a reference level that would render it impossible for a country to achieve real reduction unless *all* further peatland drainage would be stopped *and* substantial areas would be rewetted.

Also a reference year 0 (e.g. 2012) chosen at the beginning of a REDD+ compliance period would require an immediate and complete moratorium of further peatland drainage *and* additional peatland rewetting.
REDD+ reference levels for peat swamp forests must thus balance between the Scylla of severe perversity (in rewarding substantial increases of emissions that would be accounted as reductions) and the Charybdis of lacking incentives (that would prevent a country to gain REDD+ credits in spite of large efforts).
I have no good idea yet how this problem can be solved, and neither did any of the peat and climate experts I consulted. It is, however, clear that many plausible reference level approaches, when undifferentiatedly applied to forests on both mineral and organic soils, may frustrate the application of REDD+ in countries with substantial peat occurrences (cf. fig. 4).

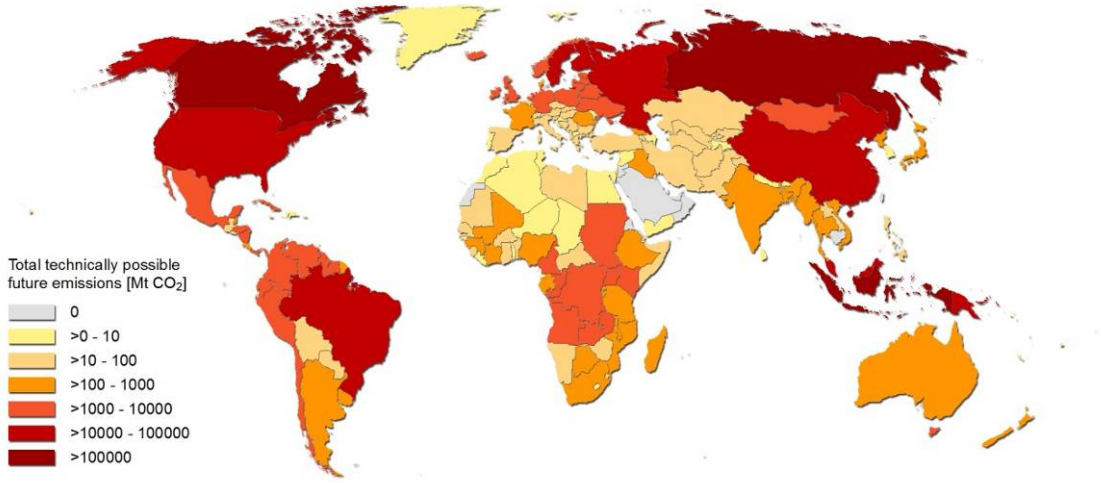


Fig. 4: Technically possible emissions from peatlands per country (in Mtonnes CO_2). Data: IMCG Global Peatland Database, map: Stephan Busse.

A solution might be found in the stratification of a country into areas with and areas without peat soils and to apply different types of reference levels to the different strata. Our aim was to keep this option open in case it would become necessary. The phrasing in the main body of the decision text makes that possible:
‘11. *Acknowledges* that subnational forest reference emission levels and/or forest reference levels may be elaborated as an interim measure, while transitioning to a national forest reference emission level and/or forest reference level. And that, interim forest reference emission levels and/or forest reference levels of a Party may cover less than its entire national territory of forest area;’.
In the coming year(s) the rules and modalities (and the financing!) of REDD+ will further need to be elaborated.

Peatlands included in the Kyoto Protocol!
The efforts until Cancun (December 2010) to get peatland rewetting included as a new art. 3.4. activity in the Kyoto Protocol have been described in extenso by Joosten (2010) and earlier IMCG Newsletters. In Cancun, unanimity had been reached among LULUCF negotiators on the definition and content of an activity called ‘Rewetting and drainage’ (FCCC/KP/AWG/2010/CRP.4/Rev.4):
‘“Rewetting and drainage” is a system of practices for rewetting and draining on land with organic soil that covers a minimum area of 1 ha. The activity applies to all lands that have been drained and/or rewetted since 1990 and that are not accounted for under any other activity as defined in this appendix, where drainage is the direct human-induced lowering of the soil water table and rewetting is the direct human-induced partial or total reversal of drainage.’
However, 2011 brought some new complications. China announced in Bangkok and confirmed again in Bonn that it had domestic problems with the definition and that it could not support the activity unless the term ‘wetland’ was again mentioned in the name of the activity. There had been serious reasons to change the name of the proposed activity from the original ‘wetland management’ to the ‘rewetting and drainage’ phrasing reached in Cancun. The solution of the new problem thus required creative thinking and substantial consultation with other parties. Following the Shakespeare wisdom ‘What’s in a name? That what we call a rose. By any other word would smell as sweet’ (Romeo and Juliette II, ii, 1-2), the problem of China could finally be accommodated in Panama by renaming the activity to ‘Wetland drainage and rewetting’. In Durban some further smaller adjustments followed, e.g. to exclude any possible doubt on which lands would be included under the activity. And finally the following definition was adopted by the Conference of Parties in its decision on Land Use, Land Use Changes and Forestry
(http://unfccc.int/files/meetings/durban_nov_2011/decisions/application/pdf/awgkp_lulucf.pdf):

‘”Wetland drainage and rewetting” is a system of practices for draining and rewetting on land with organic soil that covers a minimum area of 1 hectare. The activity applies to all lands that have been drained since 1990 and to all lands that have been rewetted since 1990 and that are not accounted for under any other activity as defined in this annex, where drainage is the direct human-induced lowering of the soil water table and rewetting is the direct human-induced partial or total reversal of drainage.’

In the LULUCF decision, Article 3, paragraph 4 of the Kyoto Protocol was furthermore amended to read:
‘A Party included in Annex I may choose to account for anthropogenic greenhouse gas emissions by sources and removals by sinks resulting from any or all of the following activities: revegetation, cropland management, grazing land management, and wetland drainage and rewetting.’ and
‘All Parties included in Annex I shall account for anthropogenic greenhouse gas emissions by sources and removals by sinks resulting from the following: any activity under Article 3, paragraph 4, elected in the first commitment period, and forest management.‘
The first sentence implies that countries (‘parties’) may *choose* to account for ‘wetland drainage and rewetting’, they are *not obliged* to do so. Once the activity has been elected, the party, however, has to continue accounting for it.
In contrast to the first commitment period (2008-2012), ‘forest management’ was made mandatory for accounting in the second commitment period (2013-2017). This means that drainage of peatlands for forestry and rewetting of formerly drained forested peatlands must now be accounted for under the Kyoto Protocol. In practice this does bring little for climate mitigation, as most parties with extensive peatland forestry had already elected ‘forest management’ for the first commitment period (CP) and thus anyhow have to account for it in the second CP. The decision will only have some consequences for the remaining countries, including Belarus, Canada (who since Durban has withdrawn from the Kyoto Protocol…), Estonia, Iceland, Ireland, Latvia, and the Netherlands.
The second reason that the forest management decision will bring little for the climate is that the Annex 1 parties (the developed countries) had managed to reach such flexible forward looking approach to forest management reference setting, that they earn credits even when their emissions from forest management are higher than those in 1990. Rightfully the developing countries thus put a cap on the amount of credits that developed countries can earn by forest management.

Accounting peatland rewetting
Two decisions are furthermore relevant for accounting ‘wetland drainage and rewetting’:
‘10. For the second commitment period, accountable anthropogenic greenhouse gas emissions by sources and removals by sinks resulting from revegetation, cropland management, grazing land management, and wetland drainage and rewetting under Article 3, paragraph 4, shall be equal to anthropogenic greenhouse gas emissions by sources and removals by sinks in the commitment period, less the duration of the commitment period in years times the anthropogenic greenhouse gas emissions by sources and removals by sinks resulting from these eligible activities in the base year of that Party, while avoiding double accounting.’
This means that ‘wetland drainage and rewetting’ follows the principle of ‘net-net accounting’ using 1990 as the reference year. This is in general positive for Annex 1 countries, as since 1990 no substantial new peatland drainage has taken place in these countries. In 1990 the collapse of the Soviet Union and associated states has changed the entire global peatland picture. In the East, major drained peatland areas were abandoned and no economic or political incentive existed anymore to drain peatland. In the West higher productivity on mineral soils led to a retreat of agriculture and forestry from the peatlands to the better mineral soils.
Only in the last few years we see a rapidly growing renewed attention for peatlands as a result of the demand for biofuels (a loophole that we – without success - had wanted to address by making the activity mandatory…).
The subsequent paragraph reads: ‘11. Accounting for wetland drainage and rewetting shall be based on estimation methodologies for wetlands, lands converted to wetlands and land use on drained organic soils in the Intergovernmental Panel on Climate Change guidelines most recently adopted or encouraged by the Conference of the Parties, and any subsequent clarifications agreed by the Conference of the Parties.’
This provision shows where technical guidance for reporting and accounting for peatland rewetting can be found. The phrasing ‘adopted or encouraged’ was included to address the restriction in art. 5.2 of the Kyoto Protocol that ‘Any revision to methodologies or adjustments shall be used only for the purposes of ascertaining compliance with commitments under Article 3 in respect of any commitment period adopted subsequent to that revision.‘ With this provision it will be possible to use the new ‘2013 Supplement to the 2006 IPCC Guidelines: Wetlands’ (see elsewhere in this Newsletter) as soon as they are ready and adopted or encouraged.
The invitation to the IPCC and the SBSTA to develop and consider supplementary guidance was expressed in articles 8 and 9 of the decision text:
‘8. *Invites* the Intergovernmental Panel on Climate Change to review and, if necessary, update supplementary methodologies for estimating anthropogenic greenhouse gas emissions by sources and removals by sinks resulting from land use, land-use change and forestry activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, related to the annex to this decision, on the basis of, inter alia, chapter 4 of its *Good Practice Guidance for Land Use, Land-Use Change and Forestry*; ‘

9. *Requests* the Subsidiary Body for Scientific and Technological Advice to consider, following the completion of methodological work by the Intergovernmental Panel on Climate Change outlined in paragraph 8 above, any supplementary methodologies related to the annex to this decision, with a view to forwarding a draft decision on this matter to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol for adoption at its tenth session;

But as we can read elsewhere in this Newsletter, IPCC had already started working on the "2013 Supplement to the 2006 IPCC Guidelines: Wetlands"

What to do now?

In the coming year 2012, countries will have to decide whether to elect 'wetland drainage and rewetting' as a Kyoto Protocol accounting activity for the second commitment period 2013-2017. Election would allow countries that already have implemented peatland rewetting to capitalize these efforts. It would also stimulate the initiation of new and ambitious peatland rewetting programmes. The discussions in the last years have, however, shown that many countries are reluctant to do so. Most important reason for this hesitation is insufficient orientation on the possibilities of monitoring, reporting and verifying emissions from organic soils. Within UNFCCC the issue has hardly been discussed because most negotiation time was spend on rules and modalities of accounting for 'forest management'.

Substantial lobbying and political pressure will therefore be necessary to guarantee that the decision taken in Durban does not remain a paper tiger and that the new activity is effectively used to bring peatland conservation and climate mitigation forward. In the next IMCG Newsletter we address this issue further.

News from UNEP

CELEBRATING TWENTY YEARS
GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

At the occasion of celebrating 20 years Global Environment Facility (GEF), the United Nations Environmental Programme (UNEP) has elected the project 'Integrated Management of Peatlands for Biodiversity and Climate Change: The Potential of Managing Peatlands for Carbon Accumulation While Protecting Biodiversity' to one of the '20 Projects to Showcase 20 Historic Years of Environmental Finance', i.e. to one of the best projects they ever financed. The project was elected with the following motivation:

'Before the start of this project, millions of hectares of peatlands were degraded. Many of these areas were drained for agricultural development or mined for their rich carbon fuels.

The project raised worldwide awareness about the biodiversity of peatlands and their importance in climate regulation.

It helped rehabilitate more than 30,000 hectares of peatlands and inspired national and regional initiatives aimed at protecting hundreds of thousands of hectares.

The impact of the project continues because it:

- Pioneered practical and low-cost techniques for restoring peatlands.
- Demonstrated the efficacy of these techniques at local sites leading to further investment.
- Helped raise about $150 million to support peatland conservation and rehabilitation in Southeast Asia.
- Brought peatlands to the attention of important climate change organizations.
- Results of the project influenced UNFCCC, REDD+ and Kyoto protocol discussions.'

The project run officially from July 2003 to June 2007,with as leading partners Wetlands International (Headquaters, Indonesia, China, Russia) and the Global Environment Centre (GEC) with collaboration of IMCG and many IMCG members. It, amongst other things, produced the influential 'Assessment on peatlands, biodiversity and climate change' (Parish et al. 2008) and 'Global peatland restoration manual' (Schumann & Joosten 2008).

Furthermore UNEP has decided to devote its next Yearbook 2012 to two emerging issues: 'decommissioning nuclear power plants' and 'soil organic carbon'. In the latter chapter, much attention will be paid to peatlands and to paludicultures. The yearbook will be presented to the assemblage of all Ministers of Environment of the World (February 2012) and is generally rather influential in guiding environmental policy and Worldbank/GEF financing.

FAO starts international peatland initiative

The Natural Resources Management and Environment Department of the Food and Agriculture Organization of the United Nations (FAO) has decided to pay more attention to peatlands in the framework of its Mitigation of Climate Change in Agriculture (MICCA) Programme and to start an international initiative for analysis, advocacy and policy advice on the important role of peatlands (and wetlands) for greenhouse gas emissions.

A first informal meeting with interested people has taken place in Durban, where the need for an informal initiative/organized action towards supporting mitigation of climate change by protecting, restoration and climate smart use of peatlands/organic soils was discussed.

There appeared to be strong recognition of the need to highlight the importance of wetlands, peat soils and organic soils as carbon sinks, advocate for action to keep the carbon in the soil, while adapting to changing climate and securing livelihoods.

Important issues identified were:

- Advocacy in the UNFCCC context
- Link to the Ramsar convention
- Better data on peatlands, different uses of peatlands/organic soils (agriculture, energy production, forestry)

- Better data on agriculture and agricultural practices on organic soils
- Cost effective emission reduction and adaptation methods in livelihoods context.

Next steps envisaged are:

1. A Dgroup (http://dgroups.org) or other network created by FAO.
2. An expert meeting organized by FAO in Rome at the end of March-Early April aiming at stocktaking and a common statement for the UNFCCC
3. A Side-event in the next SBSTA meeting

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New IPCC Guidelines for peatland rewetting in preparation

by Hans Joosten

One of the assumed bottlenecks for implementing peatland rewetting under the Kyoto Protocol is the absence of adequate guidelines for reporting and accounting the carbon benefits. These guidelines are made by the Intergovernmental Panel for Climate Change (IPCC), an independent scientific body, which produces the so called IPCC Methodology Reports. The Guidelines currently in use in the UNFCCC and the Kyoto Protocol are the 'Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories', the 'Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (2000)' and the 'Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003)'.

In 2006 the IPCCC has furthermore produced the '2006 IPCC Guidelines for National Greenhouse Gas Inventories', but these are not yet obligatory. The 2006 IPCC Guidelines themselves note that the guidance on wetlands is incomplete. When the

Wetlands chapter in the 2006 IPCC Guidelines was compiled, there was insufficient scientific information available to complete methodologies for all sub-categories, and so methods are only available for some emissions from flooded lands, for peatlands used for peat extraction and for some organic soils.

As part of its consideration of the use of the 2006 IPCC Guidelines, the UNFCCC's Subsidiary Body for Scientific and Technological Advice (SBSTA) in 2010 invited the IPCC "to organize an expert meeting to explore the need and ways to clarify methodological issues related to reporting on harvested wood products, wetlands and nitrous oxide emissions from soils (FCCC/SBSTA/2010/L.12, paragraph 7)".

In response to this invitation, an Expert Meeting on Harvested Wood Products, Wetlands and N_2O Emissions from Soils was held on 19-21 October, 2010 in Geneva, which concluded that: " ... that the methodological advice contained in the 2006 IPCC Guidelines still reflects the latest science... Since the 2006 IPCC Guidelines were completed much new scientific information is now available about various wetlands that enable emissions and removals to be estimated from wetland restoration and rewetting especially for peatlands." The meeting recommended that the IPCC provide additional methodological guidelines for the rewetting and restoration of peatland; emissions from fires, ditches and waterborne carbon; and constructed wetlands for waste water disposal, to fill gaps in the existing guidelines.

In December 2010 in Cancun the UNFCCC SBSTA then invited the IPCC to prepare additional guidance on wetlands, focusing on the rewetting and restoration of peatland: "The SBSTA took note of the summary of the co-chairs of the IPCC expert meeting on harvested wood products, wetlands and N_2O emissions from soils. Noting that science has developed in some areas with regard to wetlands, the SBSTA invited the IPCC to undertake further methodological work on wetlands, focusing on the rewetting and restoration of peatland, with a view to filling in the gaps in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories … in these areas and to complete this work for the thirty-ninth session of the SBSTA."

In response to this SBSTA invitation, the "IPCC Expert Meeting on Scoping Additional Guidance on Wetlands" was held in Geneva, Switzerland from 30th March to 1st April, 2011. This meeting produced a draft Terms of Reference (ToR), including an annotated chapter outline. The IPCC at its 33rd Session in Abu Dhabi (10th-13th May 2011) decided to produce the "2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands".

Draft content of the '2013 Supplement to 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands.'

Overview chapter: request from UNFCCC, focus on anthropogenic emissions or removals, policy relevance and summary

Chapter 1: Introduction: coherence and compatibility with 2006 Guidelines, gaps identified by 2006 Guidelines, definitions and coverage, significance of human activities on wetlands emissions and removals, estimation of anthropogenic emissions and removals, assessment of data available (current and historical) for wetland types of the world.

Chapter 2: Cross cutting guidance on organic soils: generic guidance for all systems with organic soils, methodologies (drainage, land use and land use intensity changes on organic soils, fires), use of these additional generic methods on Forestlands, Croplands, Grasslands, Settlements and Wetlands.

Chapter 3: Rewetting and restoration of peatlands: methodologies (rewetting, restoration/rehabilitation).

Chapter 4: Coastal wetlands: characteristics (e.g. organic vs mineral soil; hydrology and water quality; vegetation types), management practices, restoration, creation, and recovery of coastal wetlands and consequent changes in greenhouse gas fluxes.

Chapter 5: Other freshwater wetlands (i.a. seasonally flooded wetlands, riparian, swamps, marshes etc.): characteristics, management practices, land uses, restoration, creation, and recovery and how these affect greenhouse gas fluxes.

Chapter 6: Constructed wetlands (wastewater treatment): types of constructed wetlands for waste water disposal (surface-flow, subsurface-flow), main parameters affecting GHG emissions (e.g. nutrient loading), hydrological regime and plant species, emissions and removals from constructed wetlands.

Chapter 7: Good practice and implications for reporting: quality and quantity of data, completeness, time series consistency, quality assurance and control, mapping wetlands emissions into 2006 Guidelines reporting, areas for further work, worksheet.

A first Lead Authors Meeting was held at Hayama, Japan on 1st-3rd November 2011, a second will follow February 14-16, 2012, in Victoria Falls, Zimbabwe. A final draft is envisaged for February 2013, after which the draft will be sumited to the Governments for consideration and to the IPCC Panel for adoption/acceptance. Oct 2013, the Guidelines will be distributed to governments and Parties to UNFCCC, i.e. before SBSTA39 in December 2013.

A new peatland standard for the voluntary carbon market: Peatland Rewetting and Conservation (VCS-PRC)

by Hans Joosten

In March 2011, the Verified Carbon Standard (VCS) published its new guidelines for land use carbon projects for the voluntary carbon market. For the first time, it includes options for peatlands.

Since the start of the Kyoto Protocol (2005) a very active carbon market exists on which worldwide more than 345 billion (=345,000 million) Euro of carbon sales have been realised, of which almost 100 billion Euro in 2010 (Linacre et al. 2011). The vast majority of these sales occurs on the compliance market to meet Kyoto Protocol reduction obligations. Next to that also a voluntary carbon market exists. Corporate social responsibility and public relations, i.e. the wish to compensate inevitable emissions on a voluntary basis, are leading motivations to buy carbon credits on the voluntary market. Private firms are the predominant buyers, next to governments, NGOs and individuals. (Peters-Stanley et al. 2011).

Also the voluntary market is a rapidly growing market, but still very small in comparison to the compliance market. In 2010 an estimated 128 million carbon credits were transacted, up from 55 million in 2009 (Peters-Stanley et al. 2011) and 54 million in 2008. Credits from terrestrial carbon (forestry and agriculture) have grown in significance in recent years. In 2010 credits from forest protection projects (Reducing Emissions from Deforestation and forest Degradation REDD) represented 29%, from other forestry projects 13%, and from agricultural soils 5% (Peters-Stanley et al. 2011). This is a big increase compared to 2008 when terrestrial carbon credits made up only 5.6 million credits or 11% (Hamilton et al. 2009). Wetland/peatland projects were until now completely absent from the market – primarily due to voluntary market standards only recently recognizing such projects as being eligible to create carbon credits.

The Verified Carbon Standard (VCS), the globally dominant standard with 34% of recorded transactions in 2010), has recently (March 2011) adopted a new 'peatland rewetting and conservation' (PRC) category.

The VCS-PRC standard

In the new VCS-PRC standard guidance is given on, amongst others, eligible project categories, greenhouse gas (GHG) sources and carbon pools, baseline determination, leakage calculation, and GHG emission reductions and removals calculation. Eligible agriculture, forestry and other land use (AFOLU) project categories include Afforestation, Reforestation and Revegetation (ARR), Agricultural Land Management (ALM), Improved Forest Management (IFM), Reduced Emissions from Deforestation and Degradation (REDD), and Peatland Rewetting and Conservation (PRC) (see Table).

Types of PRC activities that may be combined with other AFOLU project categories.

Baseline Scenario		Project activity	Applicable guidance
Condition	Land use		
Drained peatland	Non-forest	Rewetting	RDP
		Rewetting and conversion to forest/revegetation	RDP+ARR
		Rewetting and paludiculture/erosion avoidance	RDP+ALM
	Forest	Rewetting	RDP
	Forest with deforestation/ degradation	Rewetting and avoided deforestation	RDP+REDD
	Forest managed for wood products	Rewetting and improved forest management	RDP+IFM
Undrained peatland	Non-forest	Avoided drainage	CUPP
	Forest	Avoided drainage	CUPP
	Forest with deforestation/ degradation	Avoided drainage and deforestation	CUPP+REDD
	Forest managed for wood products	Avoided drainage and improved forest management	CUPP+IFM

Project development and implementation are addressed at three different levels:

1) The general AFOLU requirements define how projects and methodologies can comply with the VCS standard.

2) Methodologies explain step-by-step how emission reductions or removals are to be estimated in line with the requirements following accepted scientific good practice.

3) Project description or design documents provide information on how a specific project complies with the AFOLU requirements and how it applies the methodologies.
The PRC requirements must be applied across all AFOLU categories when they occur on peatland, e.g. ARR on peat, REDD on peat. In addition, PRC project activities can exist stand alone, e.g. rewetting of drained peatland or avoided drainage of non-forested peatland.

Specific PRC requirements
In peatlands, GHG emissions largely depend on hydrological conditions. Therefore, most PRC requirements relate to hydrology or to soil moisture-dependent processes (VCS 2011).
Projects aiming at the conservation of undrained or partially drained peatland must demonstrate that there is either no hydrological connectivity to adjacent areas, or - where there is - that a buffer zone is established to ensure that adjacent areas will not significantly affect the project area, such as causing the water table in the project area to drop, resulting in higher GHG emissions.
PRC projects must furthermore demonstrate that their peat carbon stock is 'permanent'. The maximum quantity of GHG emission reductions that may be claimed by the project is limited to the difference in peat carbon stock between the project and the baseline scenario after 100 years. This limit is established because in peatlands that are not fully rewetted, the peat will continue to oxidize leading to GHG emissions and possibly to an eventual complete depletion of the peat.
Biofuel crop production activities on drained peatland or on peatland cleared of, or converted from, native ecosystems are not eligible. Biofuel crop production on rewetted peatland must follow the PRC requirements. Some forms of biomass production on peatland (i.e. paludicultures with mosses, alder, papyrus, reeds, sedges, and willow) are compatible with rewetting and may even lead to peat accumulation in the long run.
Rewetting of Drained Peatland (RDP) concerns establishing a higher water level on drained peatland. A clear relationship between GHG emissions and water level has been established in scientific literature with most changes occurring at water levels close to the surface (e.g. Couwenberg et al. 2011).
Afforestation, Reforestation and Revegetation (ARR) project activities that involve nitrogen fertilization or active lowering of the water level, such as draining in order to harvest, are not eligible, as they are likely to enhance net GHG emissions.
Conservation of Undrained or Partially Drained Peatland (CUPP) concerns activities that avoid drainage in undrained (or further/deeper drainage in partially drained) peatlands that are threatened by drainage. These activities aim at reducing CO_2 emissions by avoided peat oxidation and/or by avoiding increased fire incidence. Projects that continue or maintain active drainage are not eligible.
Due to the extensive local, regional, and global demand for peat, projects that avoid peat mining are likely to suffer significant (potentially 100%) leakage and are therefore not eligible. Project activities that serve the demand side and avoid peat mining by providing alternatives for peat as fuel or substrate, are outside the scope of AFOLU but may qualify under another VCS sectoral scope, e.g. energy.

GHG emissions for both the baseline and project scenarios can in the VCS-PRC be assessed using water level or another justifiable parameter as a proxy. Emissions of CH_4 from drained peatland are negligible and may conservatively be neglected in the baseline. Transient peaks of CH_4 after rewetting, however, necessitate the inclusion of CH_4 in the project emissions calculation. N_2O emissions also must be included. A methodology establishes the criteria and procedures by which the CH_4 and N_2O sources may be deemed insignificant (for which VCS has set specific rules) or may be conservatively excluded (based on a quantitative assessment or by using peer-reviewed literature). GHG accounting has to take the peat depletion time into account. The peat depletion time is the moment in the baseline scenario that all peat would have been disappeared due to oxidation or other losses and after which thus no GHG emissions from the peat would take place in the baseline scenario anymore. The peat depletion time has to be assessed on the basis of peat depths, water levels, and associated subsidence rates. No emission reductions can be claimed beyond the peat depletion time.
Methodologies for Rewetting of Drained Peatland (RDP) projects explicitly addressing anthropogenic peatland fires must establish procedures for assessing the baseline frequency and intensity of fires in the project area.
PRC project activities must account for leakage due to activity shifting (e.g. continued deforestation and associated drainage outside the project area, a shifting of agricultural practises). In addition, 'ecological' leakage may occur in PRC projects by changes in GHG emissions in ecosystems that are hydrologically connected to the project area (e.g. forests that die off outside the project area as a result of rewetting of the project area).

Outlook
The fact that peatland projects are now acceptable under the VCS and taking into account the broad recognition of that standard, makes VCS the best option to create carbon credits from peatlands. As will be evident from the explanations above, the standard is not simple and the rules strict. This will, however, guarantee the high quality of the generated credits and trustworthiness on the voluntary market.

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European Habitats Forum

The IMCG is member of the European Habitats Forum (EHF). EHF brings together leading European nature conservation organisations to provide advice on the implementation of EU biodiversity policy with a special focus on the EU Birds and Habitats Directives and the reform of sectoral policies critical to a successful implementation.

The EHF is committed to the conservation, restoration and sustainable use of habitats and species in Europe:
- It represents the interests of civil society in conserving Europe's natural heritage and in the implementation of the EU Birds and Habitats Directives;
- It advises on and promotes biodiversity policy, sectoral integration and legislation through discussion and partnership with relevant stakeholders.

Introduction

Biodiversity is the foundation of life on Earth. Oxygen, food, fresh water, fertile soil, medicines, shelter, protection from storms and floods, stable climate and recreation – all have their source in nature and healthy ecosystems.

Biodiversity is currently being lost and ecosystem services are being degraded at an alarming rate. More concerted action on biodiversity is essential for the creation of a more sustainable and resource efficient Europe.

In 2010, the European Council committed to a new long-term (2050) vision and mid-term (2020) headline target for biodiversity recovery across the EU: 'To halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020 and restore them in so far as possible, while stepping up the EU contribution to averting global biodiversity loss'. This target underpins the EU 2020 Biodiversity Strategy and demonstrates high political commitment in response to the urgent need to protect and improve the state of Europe's biodiversity over the next decade.

To ensure that the EU translates its commitment into action leading to measurable results, improving integration of biodiversity into the agriculture and fisheries sectors and increasing funding, the EHF engages with EU decision makers through discussion, advocacy and joint initiatives.

Founded in 1991, the EHF represents the expertise and voice of leading European nature conservation organisations towards the European institutions. Its Secretariat is based in Brussels to provide a coordinated means of communication with the Directorate General for the Environment of the European Commission. Twice a year the EHF meets with DG Environment to provide advice and knowledge on pressing biodiversity issues. It is represented in numerous fora within the EU institutions, including the European Commission's Expert Groups, the Coordination Group on Biodiversity and Nature, the informal EU Nature Directors meetings and the meetings of the Bern Convention.

Aims

- Identify opportunities for a better implementation and further development of EU biodiversity policy;
- Undertake common actions to promote, within EU institutions and national governments:
- A shared view on the implementation and development of EU biodiversity policy.
- Policy integration and increase of funding to achieve recovery of biodiversity, the Birds and Habitats Directives and the Natura 2000 network as priorities.
- Stimulate its members' networks to undertake priority actions at local and national level;
- Facilitate information exchange between members' networks to enhance cooperation in the field of EU biodiversity policy.

How the Forum works
The EHF is led by a Coordination Group consisting of the Chair, Vice-Chairs and the Secretariat and it is organised around thematic Working Groups to allow tackling issues of importance in a more efficient way. Currently there are seven Working Groups, dealing with the following issues: EU Biodiversity Strategy, Management of Natura 2000, Financing Natura 2000, Reporting and Monitoring, Invasive Alien Species, Green Infrastructure and Emerald Network. Each Working Group is led by a Coordinator.
The EHF meets every six months and is presented at relevant European fora. Members regularly exchange information, publications, newsletters and funding opportunities.

Members
A Rocha International, BirdLife Europe, Buglife – The Invertebrate Conservation Trust, Butterfly Conservation Europe, CEEweb for Biodiversity, ClientEarth, EUROPARC Federation, European Forum on Nature Conservation and Pastoralism (EFNCP), European Environmental Bureau (EEB), European Federation of Metropolitan and Periurban Natural and Rural Spaces (FEDENATUR), European Natural Heritage Foundation (Euronatur), ECNC Group, Eurosite, Friends of the Earth Europe (FoEE), International Mire Conservation Group (IMCG), IUCN Regional Office for Europe (IUCN ROfE), Oceana, PAN Parks, Planta Europa, Societas Europea Herpetologica (SEH), Wetlands International and World Wide Fund for Nature (WWF).

If you want to contribute to the work of EHF, e.g. by participating in one of the working groups, contact IMCG representative in the EHF Rudy van Diggelen: Ruurd.vanDiggelen@ua.ac.be

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Field guide IMCG 2010 field symposium in Slovakia and Poland online soon.

The field guide of the IMCG field symposium and Congress in Slovakia and Poland (5-17 July 2010) will be available as a special issue of the IMCG newsletter at the end of 2011. The guide consists of a short description of 21 nature reserves or Natura2000 sites, 7 in Slovakia and 14 in Poland. The guide has been compiled by 15 authors that know the local situation and could report on problems that have arisen with the conservation of these areas. Some areas include an evaluation of the present situation by IMCG participants and in some cases suggestions for restoration were formulated. A limited number of hard copies will be available for authors and interested IMCG members. Members interested in a hard copy should contact Ab Grootjans: A.P.Grootjans@rug.nl.

Pedicularis sceptrum-carolinum *in Belanské Lúky mire (Slovakia)*

Finland's Strategy for Mires and Peatlands a Step Backwards

by Tapio Lindholm

When the Ministry of Agriculture and Forestry set up a working group to draw up a national strategy for mires and peatlands on 10 February 2009, the objective was to provide a coherent, up-to-date understanding of the diversified and sustainable use of mires and peatlands, as well as to reconcile the various demands for the use of mires and peatlands. The purpose of the strategy was to define the objectives relating to Finland's mires and peatlands and, where necessary, the measures for reconciling these objectives over the coming decades.

This alone goes to show that the strategy is a traditional strategy of use, aimed at striking a deal on continuing the culture of peatland use of the past decades in the coming decades as well. Moreover, most of the experts included in the working group are representatives of the baby-boom generation, who have long experience and will soon retire from the work world. This ensured that argumentation within the group was from past decades. In addition – since all forms of economic use of mires and peatlands were represented in the group – the initial position basically dictated the outcome.

Nature conservation, i.e. mire biodiversity and ecosystems, was only regarded as one of the various forms of use – not as an ecological necessity for the existence of mires. The strategy has clearly been influenced by the Finnish Peatland Society's book *Finland – Fenland:* its spirit, structure and philosophy. This book, too, is reminiscent of past decades; and its final chapter seems like a covering note written for this working group.

What is noteworthy is that the working group was not meant to assess the status of mires in Finland, either in terms of their biodiversity or their environmental role. Mire nature was only defended by the environmental administration and the Finnish Association for Nature Conservation, with the support of BirdLife Finland. The working group had insufficient knowledge of basic mire ecology. Whilst discussing climate policy and the environmental impacts of various issues, the working group has been thinking about how everything could continue as before. Consequently, not even representatives of environmental protection from the environmental administration were included in the group. The environmental and climate issues related to mires and peatlands have therefore been foreign to the group.

As a result, the working group addressed fairly concrete issues, which cannot really be considered relevant to the strategy. The group was charged with the reconciliation of short- and long-term needs for the use of mires and peatlands. This has mainly meant the recording of the peat industry's needs in the strategy. No consideration whatsoever has been given to whether the peat industry will even exist in the future – and if it will, on what terms. Further, the working group has tasked itself with assessing the functioning of the permit procedures for peatland use, which in practice means promoting the acquisition of peat extraction permits.

Ecosystem services approach

The working group adopted an ecosystem services approach, but – compared to the model used in the Millennium Ecosystem Assessment – it applied a misleading model in which "preserving services" was added. This small technical addition had significant consequences: the basic idea behind ecosystem services of biodiversity being above and connected to everything else was lost. Since the ecosystem approach was first applied in the Biodiversity Convention, biodiversity should form the foundation and all activities should be viewed against their impact on biodiversity. The responsibility for biodiversity would then fall on operations. We are not used to this in Finland, so everyone was actually fine with clinging to the old ways. However, this means that one can no longer refer to an ecosystem approach.

The method chosen was the traditional categorisation of various activities under their own headings, and biodiversity issues were put into a category of their own. In this way, everyone in the working group could concentrate on writing down their own needs, views and even propaganda. Each sector in the group worked separately, reporting to the whole group in meetings. This has led to a situation where the peat industry has been examined on the terms of the peat industry, peatland forestry on the terms of peatland forestry, peatland agriculture on those of peatland agriculture, and even nature conservation on the terms of traditional nature conservation.

There was no need to worry about environmental responsibility, as there was no category for it. Nature conservation formed a category of its own and – as is traditional – it was assigned responsibility for what should be pervasive in all areas. It was thus forgotten that the environment – nature's ecosystems – represents the background for ecosystem services. It is utterly inconceivable that peat extraction has been treated as an ecosystem service by the working group. The excavation of an ecosystem is not an "ecosystem service". It means the destruction of an ecosystem.

In the Millennium Ecosystem Assessment, ecosystem services are specifically defined as renewable benefits. Peat is not renewable, though it has persistently been declared to be such. Now it has conveniently been listed as a provisioning service. The definition of peat as a slowly renewable resource ordered for political purposes is also mere gimmickry, considering the functional role of peat. It is carbon that is permanently removed from the carbon cycle, and is hence fossil-derived.

What is central to the ecosystem services approach is how ecosystems can be used sustainably. In Finland, mires have been seen as something bad that we need

to rid ourselves from. This is why most forms of mire use are mainly destructive. Not much thought has been given to the subjective and recreational values of mires, which the ecosystem services approach recognises as cultural services. Had the Natural Heritage Services of Metsähallitus been included in the working group as they should have been, this aspect would have perhaps received more attention. After all, they are the most significant owner of pristine mires in Finland and the most important provider of cultural services, in the sense of ecosystem services. Moreover, as cultural services were only included as a minor point, science and education received less attention than peat baths.

Peatland forestry

State subsidies for peatland forestry should end, and drainage maintenance should be strictly restricted. New studies show that forest drainage results in major greenhouse gas emissions into the atmosphere and the leaching of humus into bodies of water.

According to the Finnish forest industry, approximately two million hectares of drained mires have not produced the expected economic results. The working group uses the figure provided by the Finnish Forest Research Institute (Metla), which is 830,000 hectares. The difference is probably explained by varying ways to approach the subject, a sample-based estimate and an estimate of harvest readiness. As early as 1989, Professor Seppo Eurola stated that 1.8 million hectares of mires south of the Province of Lapland had been drained in vain. These areas should be restored in order to stop them from emitting greenhouse gases. In many cases, restoration would improve the renewable ecosystem services of peatlands.

The impact of peatland forestry on greenhouse gas emissions has attracted interest. Various studies have yielded varying results. The working group leans on literature where the problem is regarded as a minor one. However, the results arrived at in ongoing studies in the University of Eastern Finland are rather different. It is possible that emissions from peatlands drained for forestry constitute one of the greatest sources of carbon entering the atmosphere in Finland. The subject is extremely important and should be looked into thoroughly.

Peatlands in agriculture

Clearing mires for agricultural purposes should only be allowed with an environmental permit and strict restrictions, so as not to have a negative impact on the greenhouse gas balance, water quality and biodiversity. There is no real need for clearing additional fields on peatland; it is mainly done for the purposes of placing liquid manure. It is obvious that such spreading of liquid manure should be considered as nothing more than a waste management issue in sparsely populated areas. In actual fact, manure should be treated as bioenergy. The cultivation of reed canary grass on cut-away peatlands – for which even agricultural subsidies are paid – is seen as a great opportunity, but the issue may not be that simple. Critical studies into the subject are needed.

Peat mining

The role of peat has been eagerly covered up in Finland. In the late 1990s, the erstwhile Ministry of Trade and Industry commissioned a report where peat was defined as a slowly renewable resource. This definition has been severely criticised by Finnish researchers as well as the IPCC, EU and IMCG. Peat is fossil carbon that is permanently removed from the carbon cycle. Of the carbon contained in living plants, there is only about 20 per cent left in peat, the same amount as in oil or coal. Against this backdrop, it is curious that the quantity of the nearly undecomposed surface layer, formed over a hundred years, is compared to extracted peat in the memorandum. These are two unrelated issues, and combining them only serves to confuse those unfamiliar with the subject.

The working group has worked in a situation where environmental permit applications for pristine mires are constantly being filed. At the same time, it has been contemplating the criteria for a natural state, which would be complied with sometime in the future. However, it should be noted that in most parts of Finland, the proposed categories 5 and 4 are extremely rare and are mainly encountered in the largest conservation areas. South of Lapland, a major proportion of even protected mires fall into categories 2 and 3. The difference between categories 2 and 3 is significant in many ways, but in the proposed recommendations it is suggested that these categories be treated in much the same manner. The general recommendation says that peat extraction can be permitted in category 3 mires if mire nature is abundant in the region and there are no special natural values. Further, it is stated that mire nature is considered to be abundant if less than 75 per cent of the region’s mires are drained. This undermines the entire classification, since in many central peat mining areas, categories 2 and 3 would be treated in exactly the same way. This sentence clearly contradicts the objectives of the mire strategy. It also contradicts the national land use guidelines. The criteria for a natural state – and, in particular, their application – will therefore need to be further worked on.

Peat companies have acquired a number of pristine mires, and they are now in a hurry to obtain permits for these. The criteria for a natural state should of course be applied immediately to all mires, including those in the possession of the companies, be they their own or rented, and not only to mires whose permits will be considered in the distant future.

Undrained mires and parts of mires should no longer be used for peat extraction, irrespective of who owns the land. Peat extraction for energy should be stopped once the current extraction areas have been exhausted. State subsidies for peat extraction in the form of the feed-in tariff and tax reliefs should end. Peat energy should also be appropriately taxed in the

manner of coal, as peat mined from typical peat extraction areas is on a par with coal in terms of climate impact when used for energy production. This has been recently confirmed in a critical review of life-cycle assessments for energy peat conducted by Finnish research institutes.

Securing and improving mire biodiversity

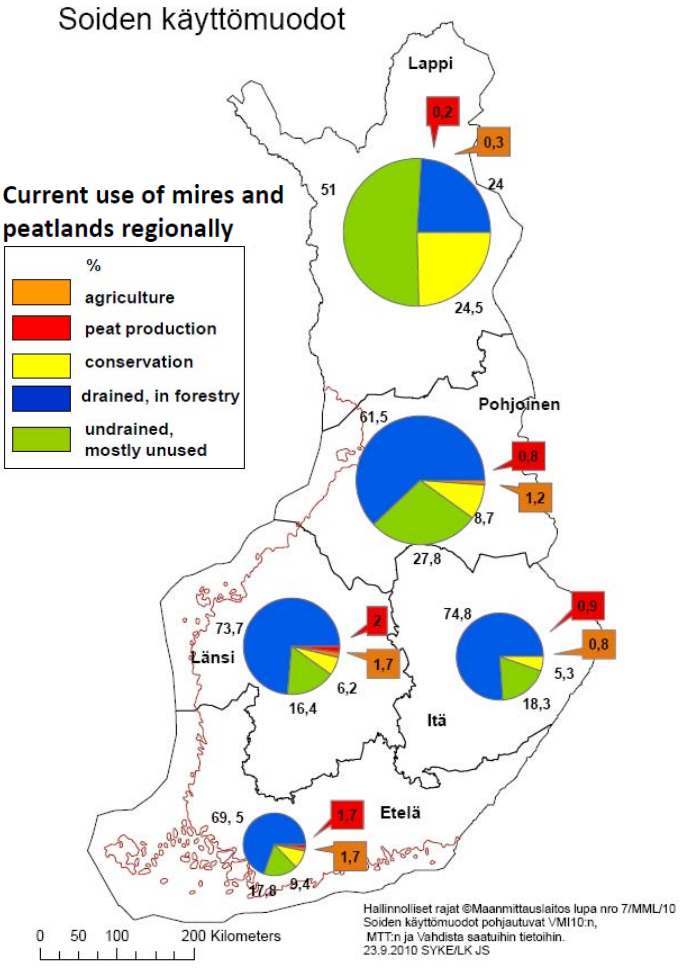
The hydrological status of mire reserves should be assessed, and in cases where external actions have damaged the hydrology of reserves, the borders should be redefined or hydrological protective zones established. Usually problems are caused by forest drainage in surrounding areas, sometimes by peat drying and agriculture as well. In guiding the future use of these areas, everything that can be done to improve the hydrological status of the mires should be done. Damaged areas should also be restored in this connection. The EU Habitats Directive should be complied with when protecting biodiversity in Natura 2000 sites. This has received very little attention in Finland.

Threatened mire biotopes must be taken into account in the implementation of Finland's mire strategy and the development of legislation. In a recent assessment of threatened natural habitats, most mire complex and mire site types were classified as threatened. It is essential that the conservation of pristine mire systems, mire complexes and their parts is promoted using all possible means. Of the mire site types, spruce mires, rich fens and spring fens were regarded as critically endangered or endangered. The destruction of these biotopes must be forbidden. Even then it is uncertain whether favourable conservation status can ever again be achieved.

Mire conservation continues to be faced with numerous challenges. The results achieved in Finland are largely due to the efforts of Professor Emeritus Rauno Ruuhijärvi, the late Senior Officer Urpo Häyrinen, as well as Eero Kaakinen, Head of Nature Conservation, and Pekka Salminen, Nature Conservation Counsellor, who will soon retire. In order for this work to continue, we need people with extensive expertise in mire ecology and mire conservation on the administrative side of the environmental administration, the Ministry of the Environment and regional administration.

Conclusions

The proposal of the working group is not a feasible strategy for Finland's mires and peatlands in terms of environmental and climate sustainability. It must be admitted that there were many mire experts in the working group who have long experience in their own field. The group put together a large number of various operator-focused perspectives, but the outcome is not convincing as a scientific report or as an expert report. Rather, it is a collection of purposeful texts explaining the activities of the writers. Finland's mires are, however, a matter of great importance. The way forward should therefore be given some thought.



Based on the above viewpoints, I consider the working group's proposal to be such that it cannot be accepted as a strategy for mires and peatlands or as groundwork for one. Consequently, I cannot approve the proposal and present this document as a differing opinion.

Helsinki, 2 February 2011, World Wetlands Day and the 40th Anniversary of the Ramsar Convention,
Tapio Lindholm

UK Commission of Inquiry on Peatlands: Summary of findings

The UK Commission of Inquiry on Peatlands brought together experts in science, policy and practice to carry out a thorough review of key peatland issues and to deliver clear scientific consensus about peatland restoration, particularly in relation to climate change, biodiversity and ecosystem services. The Commission published its final assessment report in November 2011, of which we publish here the Summary of Findings. For more information and resources: http://www.iucn-uk-peatlandprogramme.org/commission.

Peatlands are areas of land with a naturally accumulated layer of peat. These are formed under waterlogged conditions from carbon rich, dead and decaying plant material. In the UK, mosses, mainly Sphagnum species, are the main formers of peat.

Peatlands are found in at least 175 countries - from the tropics to the poles – and cover around 4 million km^2 or 3% of the world's land area. In Europe, peatlands extend to ca. 515,000 km^2. The UK is amongst the top ten nations of the world in terms of its total peatland area. The UK has between 9-15% of Europe's peatland area (46,000 – 77,000 km^2) and about 13% of the world's blanket bog – one of the world's rarest habitats.

There are three main types of peatland in the UK: blanket bogs, raised bogs and fens. The international importance of the peatlands found in the UK give it an especial responsibility for their management and conservation.

The IUCN UK Commission of Inquiry on Peatlands has gathered up-to-date knowledge from science, policy and practice. The assessment focuses on blanket bog and raised bog peatlands, because they represent over 95% of all UK peatland habitat and offer an opportunity to make early and substantial progress in delivering a combination of economic, social and biodiversity gains. However, we recognise that lowland, river and groundwater-fed fen peatlands are also vital carbon stores, as well as existing and potential areas of rich biodiversity, which have also been subject to intensive and damaging management.

Fen peatlands share many of the issues affecting rain-fed peatlands but with distinct differences in terms of their functions, threats and pressures, which merit further investigation.

A multidisciplinary team of experts produced this report. It provides an authoritative assessment of the available evidence, based on peer-reviewed, scientific consensus about the state of peatlands, the impacts of different activities on peatland ecosystems and the services they provide and the benefits of restoring and conserving them. The assessment explores mechanisms and processes for peatland conservation action, recognising the different social, economic and environmental drivers. The evidence-gathering approach was inclusive, engaging individual land managers as well as a wide range of organisations, which in itself has helped to foster joint action for peatland conservation and restoration.

The Assessment Report sets out the main conclusions, highlighting gaps and opportunities for further action. It identifies ways to secure additional funding and develop expertise to help land managers restore the UK's peatlands and to allow decision makers to take better account of their multiple benefits.

Key facts

Peatlands provide vital services to society, globally, nationally and locally.

Peatlands are vitally important in the global carbon cycle and UK greenhouse gas budgets. They represent the single most important terrestrial carbon store in the UK. Blanket and raised bog peatlands cover around 23,000 km^2 or 9.5% of the UK land area, with current estimates indicating they store at least 3.2 billion tonnes of carbon. A loss of only 5% of UK peatland carbon would equate to the total annual UK anthropogenic greenhouse gas emissions. Healthy peat bogs have a net long-term 'cooling' effect on the climate.

Peatlands include the largest remaining semi-natural habitats in the UK. Our peatland habitats host nationally and internationally important biodiversity. Many of the typical peatland species, however, are showing marked population declines.

The best available evidence suggests that *less than 20% of the UK's peatlands are undamaged*. The remaining peatlands are eroded, modified or destroyed through extraction or conversion to other land uses. Even the best protected sites (under EU wildlife legislation) have suffered, with less than 50% in a favourable condition. However, much of the damage could still be reversed. British Overseas Territories also support large areas of peatlands, particularly in the Falkland Islands, with estimates of over 5,470 km^2 of deep blanket peat.

Peatlands are important for drinking water. In the UK, 70% of all drinking water is derived from surface water that comes predominantly from upland catchments, which are generally peat dominated. Healthy peatlands provide high-quality water that is much cheaper to treat for drinking - damaged peatlands produce higher concentrations of organic 'brown water' carbon, which has to be removed at high cost.

Peatlands are national treasures. They provide a sense of place for many communities. As waterlogged soils, peat deposits provide a rich archive of cultural and environmental change stretching back over 10,000 years. Peatlands have

preserved some of the oldest and most intriguing archaeological remains including roads, tracks, houses and settlements, monuments, artefacts and bog bodies. The archive, that is peat itself, has contributed greatly to our understanding of global climate change.

Peatlands have been identified as a priority for action under international agreements. Global agreements such as the UN Convention on Biological Diversity (CBD), the UN Framework Convention on Climate Change (UNFCCC) and the Ramsar Convention on Wetlands include obligations and opportunities for countries to maintain and restore peatlands. These agreements highlight the need for policies and funding to better reflect the value of peatland habitats for the services they provide. At an EU level, legislation on wildlife and water also recognises the importance of peatlands. By drawing on the work of a wide range of public-body and private partnerships, the UK Government and devolved administrations have an opportunity to demonstrate good practice in peatland protection and restoration to other European countries and globally.

Peatlands rely on water. When drained, peatlands waste away through oxidation, adding carbon dioxide to the atmosphere – then, they are a liability. A variety of activities have resulted in peatlands being damaged including drainage for agriculture or forestry, track building and peat extraction. Fire, overgrazing, climate change and atmospheric deposition can exacerbate the effects of drainage. Lowered water tables on peat bogs encourage the growth of plant species that do not easily form peat or that actively degrade the existing peat stock, resulting in losses of soil carbon and emissions of carbon dioxide to the atmosphere.

Damaged peatlands are expensive. Damaged and degraded peatlands place a substantial financial burden on society because of increased greenhouse gas emissions, poorer water quality and loss of other ecosystem services. Damaged peatlands may also exacerbate costly flood events, when water is rapidly conveyed from peatlands through drainage ditches and erosion gullies into downstream areas.

Peatland restoration is cost-effective. Peatland restoration is cost-effective in reducing emissions of carbon to the atmosphere, improving water quality (reducing the costs for drinking water treatment) and conserving biodiversity. Peatland restoration can also help with climate change mitigation and adaptation. Funding for peatlands under current government schemes, particularly through the Common Agricultural Policy (CAP), can be an effective means of supporting management and restoration, but there is no doubt that more could be done through current funding instruments. *Peatland restoration also presents new funding opportunities* through links with business and industry, carbon markets and payments for delivery of ecosystem services within agri-environment schemes. This in turn could lead to better support for rural communities and the creation of green jobs.

The UK has world leading expertise in peatland restoration. The UK has world-leading examples of peatland restoration and considerable land management expertise in tackling different forms of peatland damage, with many demonstrable successes. This creates an opportunity for peatland restoration to make a positive contribution towards meeting the UK's biodiversity objectives and ambitious targets to reduce greenhouse gas emissions. There are several successful landscape scale restoration projects in the UK, for example blanket bog restoration in the Flow Country in Scotland, Lake Vyrnwy and Migneint in Wales, Exmoor, Dartmoor, Peak District and Pennines in England and restoration of lowland raised bogs in Cumbria, Lancashire, and Northern Ireland.

Damaged peatlands are substantially less resilient to climate change than healthy ones. Given rapid climate change, which is likely to impact widely and adversely on biodiversity, soils, water supply and quality, there is an even more urgent need for action to protect and restore peatlands. Available evidence suggests that a healthy peatland is a more resilient peatland in the face of environmental change. Good management and restoration also help to secure peatland wildlife and ecosystem services, such as carbon storage, carbon sequestration and provision of good water quality under a changing climate. Restoration therefore helps to safeguard important goods and services into the future and, at the same time, can help to meet the UK's emission-reduction targets. Not restoring peatlands will lead to increased greenhouse gas emissions from damaged peat carbon stores under a changing climate.

Peatland natural capital is not fully represented in national accounting. The fact that the true value of peatlands and the costs of damaging them are not reflected in the resources available to conserve them represents a clear example of market failure. The value of peatlands as a carbon store and in mitigating climate change is not yet fully taken into account in the national greenhouse gas inventory. In addition, there are monitoring gaps in relation to the state of peatlands, progress towards biodiversity objectives, delivery of ecosystem services and application of policy measures such as agri-environment schemes. Improvement in these areas would allow better accounting and reporting of progress against government objectives and international obligations.

Peatlands: an urgent agenda

Securing the benefits we derive from peatlands requires an urgent step-change in action to redress past damage. A speedy response to protect and restore our peatlands under a changing climate is challenging – but will cost us dear if we delay.

This Inquiry therefore calls for the multiple benefits of peatlands to be understood and appreciated. Our vision is for the UK's peatlands to be functioning to their full natural potential. There should be no further loss of near-natural peatlands in the UK, and all recoverable peatlands should be restored to a peat forming state, resilient to climate change and with long-term safeguards. Our four-pronged peatland strategy comprises:

1. Conserving peatlands in good condition, through management that maintains a favourable state, and preventing further damage to healthy peatlands (even the best protected peatland sites have suffered, with less than 50% in a favourable condition, so the first priority must be to prevent any further deterioration).
2. Restoring partially damaged peatlands through land-use changes and active habitat management to return them to a peat forming state with typical peatland vegetation and animal species (including blocking drainage ditches, altering livestock numbers or adjusting burning management).
3. Intervening to repair severely damaged peatlands through major operations, such as woodland removal, gully blocking and re-vegetating bare peat.
4. Communicating the contribution peatlands make to meeting environmental, economic and social goals – critically, to help combat climate change and to halt the loss of biodiversity.

We need strong public and business policy responses to achieve this, focused on three actions:

1. Introducing a UK and devolved government policy framework to protect and maintain existing peatlands and ensure restoration of damaged areas. Peatland policy objectives and delivery should be 'joined-up' across climate change, biodiversity, water, heritage, development and access legislation.
2. Ensuring the necessary funding is in place to protect and restore the UK's peatlands. This requires continued use of the key funding streams, such as the EU Common Agriculture Policy (CAP), and maximising any additional opportunities through forthcoming reform. Other funds should be sought through the EU Environment – LIFE+ Programme, with additional core government funding alongside the development of business investment in ecosystem services.
3. Coordinating action to encourage partnerships to secure an effective evidence base, with monitoring and reporting on progress, along with knowledge exchange, education and advice.

Targets and timescales

The management and restoration of the UK's peatlands is an ambitious goal, with best estimates of 2.3 million ha of blanket and raised bog, of which around 1.8 million ha is damaged in some way. By creating a better framework to integrate public and business policies and by putting the right funding mechanisms in place, we should be able to secure a much better future for our peatlands by 2050. A positive interim target would be to work towards having 1 million ha of peatlands in good condition or under restoration management by 2020 – a timescale consistent with UK and international biodiversity objectives as well as commitments to tackle global climate change.

Black Hill eroding blanket bog in the Pennines (UK)

Moving towards healthier peatlands

Policy framework

We need to muster the considerable peatland expertise and potential resources across the public and private sectors to achieve the scale and urgency of action required recognizing the challenges of the current economic climate.

1. Clear government signals need to empower public bodies, the private sector, NGO's and communities to maintain and restore peatlands.
   - Establish a UK wide, coordinated, funded peatland restoration delivery programme with agreed areas, targets and timescales, reflecting international commitments on peatlands.
2. Coordination and cooperation across government sectors and agencies would help deliver peatland biodiversity objectives and secure ecosystem benefits.
   - Recognise the important role of peatlands under all relevant public body duties e.g. climate change mitigation and adaptation, biodiversity conservation and water regulation.
   - Take forward opportunities for delivery of landscape and cross-catchment scale projects with cooperation across different administrative boundaries.
   - Establish a high-level peatland group to facilitate cross agency coordination and to report on progress against peatland objectives.
3. Develop an ecosystem-based approach to peatland policy.
   - Adopt an ecosystem-based approach with healthy functioning peatland habitat as the

shared goal, rather than simply maximising individual services from peatlands.

4. Have better collaboration across public bodies, business, NGOs, and communities with stronger connections between end-beneficiaries and those delivering services on peatlands.
   - Support collaborative working at the site level to deliver peatland management and restoration, showcasing good examples nationally and internationally.
   - Explore mechanisms to encourage better connection between peatland managers and beneficiaries of the ecosystem services.

Funding

There are opportunities to greatly improve the sharing of costs experienced by society in terms of damaging impacts to water, loss of biodiversity and carbon emissions and the support given to the management of peatlands. Put simply, we want to vastly reduce these costs. Support towards this includes direct government and business funding along with government action to facilitate international funds, business and private investment for peatland management and restoration.

5. Improved funding through the CAP, both Pillar I direct payments and Pillar II Rural Development Programmes (especially agri-environment and forestry measures) for peatland management and restoration.
   - Improve the alignment of funds within the four UK country programmes to the provision of benefits for biodiversity, climate change and water.
   - Ensure appropriate payment levels and integration with private/public funding initiatives to incentivise land managers and cover the costs of providing public benefits from peatlands.
6. Use public and private resources in a coordinated way to support peatland restoration and management.
   - Establish core government funding specifically to support peatland projects, and encourage public bodies and the business sector to work jointly in funding peatland work.
7. Development of new sources of funding for peatland conservation and restoration.
   - Explore opportunities to support business-led carbon investment in peatlands including developing a Peatland Carbon Code.
   - Support water company investment in upstream land management.
   - Explore other funding opportunities such as payment schemes for ecosystem services, biodiversity offsets and habitat banking.

Coordinated action

8. Establish nationally coordinated and funded peatland accounting.
   - Monitor the state of peatlands.
   - Report on progress towards biodiversity targets and delivery of international and national objectives, greenhouse gas emissions savings and other ecosystem service benefits.
   - Assess the effectiveness and progress of policy measures, including agri-environment measures.
9. Provide support for a UK peatland hub for information and consensus building, training and partnership working between scientists, policy advisers, businesses and land managers.
   - Provide a one-stop shop for information.
   - Showcase cost effective and flexible solutions for peatland restoration and management through demonstration sites.
   - Facilitate effective collaborations between policy, practice and academic research.
10. Encourage trans-disciplinary research on peatlands.
    - Provide solutions for effective peatland conservation/restoration.
    - Improve the evidence base for the services that peatlands provide and the effects of restoration.
11. Communicate the importance of peatlands, highlighting their benefits to society including market and non market values.
    - Build on the wealth of peatland projects and stories to provide the tools for wider communication, engaging expertise to incorporate peatlands more extensively in media and education.

Throughout the course of this Inquiry, it has been evident that there is a large community of interested people and organisations willing to help deliver the vision for peatlands – but needing the right signals and support. We now want to see a significant shift in public attitudes and support towards realising the immense value of peatlands in making the planet healthier for us – and for nature.

Realising the Benefits of Peatlands: Overcoming policy barriers to peatland restoration

RSPB Scotland

for birds
for people
for ever

Scotland's peatland landscapes have enormous potential as a natural solution to limiting dangerous climate change. Peatland habitats are also well known for their unique and special wildlife. However, the needs of Scotland's peatlands have been ignored for too long. As a consequence, a large proportion of our peatland areas are degraded and contributing to climate change rather than helping to fight it.

Peatlands can only fulfil their potential if they are in a functioning and healthy state. But our use and management of peatlands, both past and present, and the policies that drive this, have led to significant damage. Current policies are often failing to deliver sustainable peatland restoration and management, and can actually conflict with and block its achievement. Landscape-scale peatland restoration -and the many benefits it can provide is a long way from being realised.

To address this, RSPB Scotland is calling for the following:

- • The Scottish Government must commit new funding to restore e at least 600,000ha of peat bog habitat in Scotland by 2016, in order to protect the stocks of carbon locked up in peat soil, prevent further erosion and loss to the atmosphere, and realise the multiple benefits a and services that arise from functioning peatland habitats.
- • Policies must be updated, adapted and aligned to remove the remaining policy barriers to landscape-scale peatland restoration and protection.
- • Government needs a new vision for peatland restoration and an overarching strategy and action plan to coordinate the efforts of all organisations involved in achieving it.
- • In addition to central Government taking a lead, the policies and practices of Government Agencies, public bodies and industry must be aligned with this new restoration agenda.

1. Introduction

Peatlands have the potential to be a natural solution to reducing greenhouse gas emissions. They hold a vast stock of carbon in their soils and can add more by sequestering carbon from the atmosphere. But this natural carbon capture and storage ability can only happen if peatland habitats are healthy and functioning. To get to that state many areas of degraded and damaged peatland, which are currently losing carbon, need to be restored.

RSPB Scotland has called for peatland restoration for many years[1], recognising them as a fantastic habitat for some of our rarest wildlife. More recently, the value of peatlands as a store and sink for carbon has been acknowledged.

It is widely accepted that peatlands are a huge store of carbon. This store needs to be protected to help limit climate change and thus benefit people in Scotland and the world.

Research into the carbon benefits of restoration techniques is no longer in its infancy and the consensus is that restoration is beneficial for the climate. RSPB Scotland and others have been seeking political and financial commitment to turn this knowledge into action. In addition to knowledge, money and political commitment the right policies need to be in place to make restoration happen. There is no single policy in existence which can make restoration happen at the scale needed. Achieving the restoration goal will require existing land use and other policies to work together for the common good.

In 2010, the Scottish Government clearly identified policies which support peatland restoration in its Carbon-Rich Soils discussion paper[2]. But as the Royal Society of Edinburgh's report 'Facing up to Climate Change'[3] highlighted, there are barriers in policy which hinder the progress toward coherent approaches to reduce GHG emissions. The Land Use Sector is no exception to this lack of joined up policy to support sustainable land use outcomes. This report reviews the policies and land use practices which influence peatland use and management, and which promote peatland restoration. It identifies where the barriers to restoration are and how these can be overcome to realise their natural carbon capture and storage potential.

2. Peatlands background

Peatlands are naturally dominated by sphagnum moss vegetation which thrives in cool wet conditions. Peat is formed below the living surface layer as the dead remains of bog mosses and other plants are preserved in wet, acidic conditions, creating a set of unique landscapes and habitats. This peat soil builds up over millennia and can reach depths of over five metres in places.

Peatland habitats cover 1,727,000 hectares of Scotland, 22% of the land area[4] and overlay deep peat reserves. The habitat types covered are blanket bog, upland flushes and mires, lowland raised bogs and fens. Shallower (less than 30cm deep) peaty and organo-mineral soils contain less carbon, are frequently agriculturally managed and are also often associated with wetland habitats such as rivers, lochs and pools. These cover approx. 60% of Scotland's land area.

This report focuses mainly on policies affecting the deep peat habitats as opposed to the peaty soils. However, some land use policies will have an influence on both peatland habitats and peaty or carbon-rich soils.

2.1. Importance of peatlands

Peatlands are important for a number of reasons. They are:

- An internationally important wildlife habitat
- A huge store of carbon
- A significant carbon sink
- A regulator of water flow and water quality
- A place for sport and recreation
- A place of employment
- Culturally significant and a valuable archive of our past.

Almost 20% of peatland habitat in Scotland is designated under national and international wildlife conservation legislation. Birds of European importance found on peatlands include black-throated diver, greenshank, short-eared owl and dunlin. Other wildlife include red deer, sundew and mountain hare. Unfortunately, approx. 40% of sites are in unfavourable condition (38% of upland (blanket) bogs, 42% of lowland raised bogs, and 39% of upland fens/marshes/swamps).

Currently, there is a heavy focus on the benefit of peatlands for assisting Scotland in achieving climate change targets. Peatlands have the potential to sequester a million tonnes of carbon[5] per year from the atmosphere[6]. This carbon is then locked up and stored in the peat soil. Of greater importance is the carbon stock within Scotland's soils which has been calculated at 3 billion tonnes of carbon – 1,620 (MT) million tonnes (Chapman et al 2009) in peatlands. The carbon stored in Scotland's soils is 20 times the amount stored the whole of the UK's forest biomass[7]. However, approximately half of all peatland has been degraded through inappropriate burning, tree planting, drainage (moor gripping) and inappropriate grazing regimes. Annual loss of carbon from degraded peatlands is on average 4.6t CO_2 eq per hectare per year[8]. It has been estimated that by restoring 600,000ha of blanket bog 2.7Mt CO_2 eq could be stopped from entering the atmosphere each year and every year into the future[9].

2.2. Restoration

Peatlands are only able to provide the valuable services which are of importance to human well-being where the habitat is in a functioning and healthy state. However, the use of peatlands by land owners and land managers, for a variety of purposes, has led to damage to the fragile habitat and soil. When peat becomes open, dried and exposed, the vegetation changes and the carbon in the soil oxidises and is lost to the atmosphere – adding to climate change. It also becomes more susceptible to erosion by water and wind.

The scale of damage varies, from bare peat soils and deeply eroded gulleys, to heather and cotton grass dominated vegetation, and determines the ease and speed of restoration. Peatland restoration involves creating the right conditions for sphagnum moss to recolonise and thus secure the integrity of the carbon in the soil. Most crucial is rewetting the soil by manipulating the water table. Other activities depend upon the nature of the damage, for example, removing grazing animals or non-natural vegetation, such as trees. On large areas of bare peat the greatest need may be to stabilise and re-vegetate the soil.

RSPB Forsinard nature reserve in the Flow Country – A case study

In 1988, following a major campaign led by the RSPB and the Nature Conservancy Council, a network of Sites of Special Scientific Interest (SSSIs) was established to protect the Flow Country of Caithness and Sutherland. This 400,000 ha area of blanket bog was under threat from landscape-scale draining of the bog and non-native conifer planting. Tax breaks, which had promoted the planting, were removed later that year, effectively ending the widespread practice. Most of the key areas are now protected as the Caithness and Sutherland Peatlands Special Area of Conservation (144,000 ha) and Special Protection Area (146,000 ha).

In 1995, the RSPB acquired Forsinard Estate in the heart of the Flow Country, thanks to contributions from RSPB members and supporters. EU LIFE funding also supported the wider work in the early years which included piloting a variety of habitat restoration techniques. This work took a leap forward in 2001 through a £2.8 million partnership project run of the RSPB, SNH, the Forestry Commission and Plantlife, funded again by LIFE Nature. It brought conservationists, foresters and the Highland Council together to restore damaged blanket bog and led to the publication, in 2005, of SNH's strategy for 'The Peatlands of Caithness and Sutherland' (http://www.snh.org.uk/pdfs/scottish/nhighland/PeatlandsStrategy.pdf).

Since the initial acquisition, RSPB Scotland has added to the Forsinard reserve by purchasing or leasing more blocks of land in the Flows. A purchase in 2011 brought RSPB Scotland's holding to approximately 20,000ha. Drains have been blocked across 16,500ha of bog and 2,200ha of trees have been felled. The Scottish Government provided £200,000 in 2010 for the RSPB and SNH to carry out research on peatland restoration. RSPB Scotland's continuing aim is to improve the overall condition of the remaining areas of intact bog and to restore areas lost to forestry. In time, the important populations of breeding birds and other wildlife will return.

3. Policies and barriers to peatland restoration

For peatland restoration activity to happen dedicated funding and people are needed. We also need the right policy environment if it is to happen at a sufficient scale. This section identifies a range of policies and practices which influence the restoration, use and management of peatlands and carbon-rich soils. It identifies the policy barriers to restoration which hinder peatland restoration, and causes them to fail to deliver climate change benefits.

3.1. Overarching Policies

In May 2011, the Scottish National Party was returned to power in Holyrood with a manifesto which pledged to "take action to protect and restore peatlands". This followed the preceding SNP administration's investigation of the value of peatlands as a carbon sink and store, and warming to the call for restoration. As a result action which works towards restoration is already included within a number of overarching Government policies.

The Scottish Soil Framework, published in 2009, contains a long list of policies in place for protecting Scotland's soils and includes actions to promote peatland restoration through the SRDP and to coordinate wider work. March 2011 saw the publication of Scotland's first Land Use Strategy. The ecosystems approach and need for multiple benefits from land use are enshrined in the vision for land use and management in the Strategy. The Strategy recognises peatlands as valuable in the fight against climate change.

Recommended policy change
- The SNP Government must make firm its promise to take action to restore peatlands with commitment to funding, coordination and policy change where needed.
- The Land Use Strategy must be applied across Government to direct other relevant strategies and policy. Its Action Plan must be strong and aim to solve land use conflicts which block peatland restoration.

3.2. Biodiversity Policy

Peatlands are important for biodiversity, supporting a unique assemblage of wildlife. Scotland has some of the best and most extensive remaining peatland habitats anywhere in the world. This is recognised by domestic and European land designations. As discussed above, unfortunately, approx 40% of designated peatland sites are in unfavourable condition.

The Scottish Biodiversity Strategy (SBS) provides the statutory underpinning to biodiversity policy in Scotland including how Scotland fulfills its commitments under the Convention on Biological Diversity and the EU Biodiversity Action Plan. However, the implementation plans for the Strategy are weak because the actions they specify, which could drive effective protection and restoration, are vague and unambitious – failing to reflect or deliver the Strategy's vision.

Despite the failings of the biodiversity process until now, there is hope that the process can be reinvigorated. The new UN 2020 targets set in Nagoya provide goals to aim for, especially target 15 which relates to peatlands[10]. A new EU Biodiversity Strategy is in place to drive improvements and sets a 2020 target for biodiversity conservation[11]. Scottish Natural Heritage has a new structure which includes a specific, cross-cutting biodiversity work programme. Part of this programme will be to 'refresh' the Scottish Biodiversity Strategy to reflect the new EU and UN targets.

The Public Bodies Biodiversity Duty under the Nature Conservation (Scotland) Act 2004 requires all public bodies to work to benefit biodiversity in carrying out their business. RSPB Scotland has concerns that this duty is widely ignored and weakly enforced.

Recommended policy change
- Actions arising from the Scottish Biodiversity Strategy should be given statutory footing, and clear expectations regarding who will do what, and by when. The revised Scottish Biodiversity Strategy should specify a target and ensure the means to deliver peatland restoration at a significant scale.
- Government must put pressure on Public Bodies to act according to the requirements of their Biodiversity Duty in order to realise peatland restoration and sustainable management.

3.3. Climate Change

The Climate Change (Scotland) Act was unanimously passed by the Scottish Parliament in 2009 and sets the legal basis for tackling climate change in Scotland including an ambitious interim target of a 42% reduction in greenhouse gases (GHGs) by 2020. The Scottish Government's plan of action on reducing GHGs is set out in its Report on Proposals and Policies (RPP). Peatland restoration is included in this document but only as a Supporting Policy. This means that it is recognised by Government but is not a priority policy for tackling climate change, and at the current time there is no funding for action on peatland restoration at a scale appropriate to the need.

The Farming for a Better Climate (FFBC) initiative is included as a policy in the RPP. This encourages farmers to adopt practices which reduce emissions or lock carbon in soil and vegetation. It may have an influence on peat soil management, including in peatlands, but at present there is no publically available data to show the influence of FFBC or the level of uptake of climate beneficial farming measures.

Government policy on adaptation to the impact of climate change is currently covered by the Scottish Adaptation Framework. This is the precursor to a statutory Adaptation Programme to be published in 2013. Peatland restoration practices are likely to be beneficial in preparing Scotland and it's wildlife for a future climate. At present, this document contains action plans with actions which will facilitate peatland restoration but few deliverables to actually kick start this process at the current time and at an appropriate scale.

Recommended policy change
- • Government must boost peatland restoration to policy status in the RPP by committing new funding to restore at least 600,000ha of peat bog habitat by 2016.
- Farming for a Better Climate must be given a higher profile in the farming sector with increased effort to assist farmers in recognising the benefits of the measures, especially those which increase the carbon content of soils.
- The statutory Adaptation Programme in 2013 must include action to restore ecosystems and thereby optimise the valuable services which come from ecosystems, including peatland habitats. These are needed to prepare Scotland for an uncertain future.

3.4. Forestry

Government policy no longer encourages the siting of new forestry plantations on important peatland habitats in Scotland. It now recognises that new forestry has to be properly located and designed to protect this key wildlife and carbon resource. Unfortunately, Scotland's peatlands are still scarred by the plantations encouraged by earlier forestry policies. These peatlands have yet to be properly restored to their former ecological health and extent, to benefit wildlife and to help tackle climate change.

The current Scottish Forestry Strategy[12] recognises the biodiversity importance of the appropriate location of new woodland, as well as the need to restore priority open ground habitats, such as peatlands. The current Scotland Rural Development Programme (SRDP) includes positive peatland restoration measures to benefit wildlife including removal of forestry plantations and restoration of natural water levels, which can also help protect carbon stores. However, the SRDP's Woodland Improvement Grant limits the clearance of trees from peatlands to only 20% of a woodland area, even where the whole area is in need of restoration.

Forestry Commission Scotland consents the removal of trees for peatland habitat restoration under the forestry Environmental Impact Assessment process and associated felling licensing. The Nature Conservation (Scotland) Act 2004 introduced an important change to felling licensing permitting the restoration of important open ground habitats, including peatland, without the mandatory replanting of trees. The Scottish Government's Policy on Control of Woodland Removal[13] acknowledges the need for restoration of important open ground habitats, including peatlands, without the need for so-called 'compensatory' forestry planting.

Recommended policy change
- The Scottish Government must take a strategic and more ambitious approach to the restoration of peatland, from inappropriately located forestry plantations on the National Forest Estate and private land. Incentives should be aligned to bring forward felling on afforested open ground habitats, such as peatlands.
- Forestry Commission Scotland's practice guidance and conditions on tree planting must be changed, to stop the replanting of trees on restorable peatlands following felling.
- The UK Forestry Standard must be changed, during its review due in 2011, to stop the replanting of damaging forestry plantations, following felling, on important and restorable peatland habitats.

3.5. Agriculture and Rural Development

The majority of Scotland's rural areas receive support through the Common Agricultural Policy. The vast majority of this comes as direct payments based on historical levels of production support with the Scotland Rural Development Programme (SRDP) providing other payments which aim to increase economic, social or environmental benefits.

To receive direct support through the Single Farm Payment, farmers have to comply with basic standards to prevent environmental harm (cross compliance). Certain cross compliance measures can be beneficial for peat management, e.g. measures on soil management, grazing practice, muirburn and permanent pasture.

Currently, the largest part of the SRDP is the Less Favoured Area Support Scheme (LFASS) which pays for maintaining grazing livestock but is not linked to the carrying capacity of the land, nor its ecological requirements. Indeed the land grazed with high stocking densities in the past, continues to receive the greatest levels of support.

Agri-environment schemes within the SRDP, can pay for peatland management. Uptake of measures to benefit peatlands has been generally low and may be due to a number of factors including the level of the payments available.

Recommended policy change
- A new CAP, due for 2014, must be better directed towards paying for the provision of public goods.
- While direct support continues, it should provide a baseline of protection for peatland and carbon-rich soils through strengthened cross compliance requirements and the addition of environmental top-ups, such as a permanent pasture requirement.
- The Scottish Government should be seeking an increased share of EU Rural Development funding in order to pay for the activities such as peatland restoration through the SRDP.
- Peatland restoration should be regarded as a high priority for the next SRDP and receive increased funding. Payments available for peatland restoration should be reviewed to ensure they incentivise restoration activities which are currently not financially attractive.
- LFASS should be realigned to support more sustainable High Nature Value grazing systems.
- Better advice provision is needed to target measures, assist farmers in collaborating as groups, and ensure environmental priorities are delivered.

3.6. Energy – Renewables on Peatland

Often the ideal location for onshore windfarm development in Scotland, in energy terms, is on upland peatland blanket bog or carbon-rich soils but the installation of turbines and service tracks can degrade the peat resources leading to carbon losses. RSPB Scotland believes that renewable energy should play a key role in tackling climate change and contribute to the Scottish Government target of generating 100% of electricity demand from renewable sources by 2020. But, wind energy developments must be designed, located and constructed in ways that avoid environmentally sensitive areas of peatland as well as ensuring that peat carbon losses are minimised. The wind farm industry also has a major role in restoring previously damaged peatland habitat.

Guidance such as the 'Windfarm and peatland good practice principles[14]' and 'Environmental good practice during windfarm construction'[15] are important in ensuring that standards of best practice are adhered to during windfarm construction and management. The Scottish Government has also developed a carbon calculator to assist developers in calculating the impact of wind farm developments on the soil carbon stocks held in peats[16].

Recommended policy change
- All windfarm developers must commit to following the guidelines in place and every reasonable effort should be made to avoid significant adverse environmental effects on peatlands. Agreements should also be reached through full and open stakeholder engagement to ensure habitat restoration is properly planned and managed.
- Government should work with the renewables industry to improve understanding of the impact of windfarms on peatlands and improve its tools and guidelines.

3.7. Water Industry

The majority[17] of Scotland's drinking water comes from peatland-dominated catchments. Degradation of peatland habitat increases levels of Dissolved Organic Carbon (DOC) in water, which results in water discolouration and so requires treatment using coagulants that bind the DOC. This is not only costly; it is carbon intensive and brings the risk of harmful disinfection by-products[18]. Climate change is likely to increase DOC in water, which could escalate current treatment costs. Therefore, from a drinking water perspective alone, it is in the public interest to ensure healthy peatlands.

How Scottish Water invests financially to achieve drinking water and environmental standards is regulated by the Water Industry Commission, the Drinking Water Quality Regulator and SEPA through the 'Quality & Standards' investment process. In the past, investment has been centred on installing expensive 'end of pipe' treatment to remove pollutants, such as DOC. The current Q&S III investment programme period has stipulated that Scottish Water can use £3 million pa to facilitate sustainable land management in five catchments in Scotland from 2010-2015. This gives huge potential for investment in peatland restoration to improve water quality at source while delivering other associated benefits such as habitat restoration for biodiversity and protection of the carbon stocks.

Sustainable management of peatlands and carbon-rich soils across Scotland would contribute to achieving Water Framework Directive objectives. It would also help Scottish Water to comply with the Public Bodies Climate Change Duty under the Climate Change Act and its duty to further the conservation of biodiversity under the Nature Conservation Act.

Recommended policy change
- Scottish Water and its regulators must focus on delivering safe drinking water to the public in the most carbon-efficient ways, including through sustainable land management and peatland restoration.
- Scottish Water's Sustainable Land Management Fund (in Q&S III, 2010-2015) should invest now in peatland restoration and must deliver multiple benefits, including water quality.
- Ministerial Objectives for Q&S IV must require investment in peatland restoration and ongoing sustainable management of Scotland's peatlands, with the outcome of improved water quality.

3.8. Sporting management

Moorland, including areas of blanket bog, has been intensively managed primarily through heather burning and predator control for private sporting interests for several centuries. Management of land aiming to ensure a good supply of deer and grouse for shooting or salmon and trout for fishing can have damaging effects on fragile peatlands. Muirburn on

grouse moors, especially on damaged deep peat areas, can lead to peat fires. Deer can cause trampling or browsing damage on deep blanket bogs at stocking density greater than 1 per km^2. (Higher stocking rates are appropriate where other less fragile habitats also exist across an estate). River engineering and drainage to maintain flow rates for angling can erode peat and dry out the peat soils.

Few regulations exist to control activities and ensure the provision of public goods from private estates in connection with management for sporting. A voluntary approach including codes of practice has generally been relied upon as a delivery mechanism by successive Governments. River engineering issues, however, are covered by the Controlled Activities Regulations[19] but need better enforcement.

The Scottish Joint Agency Working Group on Deer coordinates efforts to reduce deer numbers in designated areas for nature conservation, implementing control orders under the Deer (Scotland) Act 1996. However, whilst powers to intervene to reduce deer numbers in the public interest outside designated sites exist, and where serious damage to the public interest is confirmed, these powers have not been used to date. There is also joint agency guidance on the funding and location of deer fencing, which is designed to minimise the risk of impacts on woodland grouse populations arising from poorly sited deer fencing. The recent Wildlife and Natural Environment Act 2011 (WANE Act) has updated the 1996 Act, including the introduction of a new Code of Sustainable Deer Management.

Also as part of the WANE Act, the Scottish Government has reformed the outdated legislation relating to muirburn practice in Scotland. These new measures will necessitate a review of the Muirburn Code, which is included in cross compliance.

Recommended policy change
- The expected review of the Muirburn Code should be extended to control wildfires, which may damage peatlands and provide other measures for peatland protection. Any further review by the Scottish Government of muirburn dates should ensure that damage to peat soils and associated wildlife is minimised.
- The new Code for Sustainable Deer Management must present a clear and transparent pathway for Government to intervene to reduce deer numbers on all peatlands where deer cause damage, not just on designated sites.

3.9. Planning Policy

The vast majority of planning decisions are made by local planning authorities in accordance with the relevant development plan for an area. Relevant policies within the National Planning Framework (NPF)[20] and Scottish Planning Policy (SPP)[21] also need to be considered. Both of these national policies recognise the value of peatlands for carbon storage and biodiversity, and afford relatively substantial protection to sites, at least those of higher conservation value. However, there is no information on how effectively national policy is being implemented at the local level.

Peat for horticultural use is on the whole extracted from lowland raised bog areas despite alternatives to peat being widely available. Current planning policy means that commercial peat cutting could be acceptable in areas of degraded peatland. However, in some degraded peatland areas it is possible to stabilise and protect the carbon stores and even restore the habitat, so peat cutting could be preventing restoration of important carbon stores and areas of habitat.

Local planning authorities also decide most applications for other types of development on peatland, such as the opencast extraction of coal deposits lying beneath peatlands. In these cases, the peat is removed and damaged, releasing carbon, to expose the underlying coal.

Recommended policy change
- National policy in Scotland should be changed to introduce a general presumption against any new or extended commercial peat cutting and encourage restoration or management of existing degraded sites to protect the remaining store of carbon.
- The practice of coal extraction from beneath blanket bog must be ended for the double climate benefit of reducing fossil fuel use and protecting the stores of carbon.
- Additional monitoring should be put in place to ensure local planning authorities are implementing national policies on the protection of peatlands.

4. Policy recommendations

This report has highlighted the barriers to peatland restoration within a range of sectoral policies. The Scottish Government must address the recommendations set out above in order to enable widespread protection and restoration of peatlands.

In addition, the above analysis shows that Scotland also needs effort to solve some overarching barriers. To make peatland restoration happen we need the following from policymakers:
- Commitment -the Scottish Government must fully commit to a new vision of landscape-scale peatland restoration. All stakeholders need to embrace and share the new vision of how restoration can be achieved through the principles set out in the Land Use Strategy.
- Coordination – the Scottish Government needs a new overarching strategy and action plan to coordinate peatland restoration and the efforts of all organisations involved in achieving it.
- Policy change– Individual policies must be reviewed and changed, to (i) ensure existing policies are fully implemented and deliver restoration, (ii) promote restoration and sustainable management of peatlands, by making it easier to

achieve these goals or more attractive to those managing the land and (iii) ensure that they aim to deliver multiple benefits from land use, especially protection of the carbon stores and sequestration capabilities.

- Funding -A mix of funding and associated delivery mechanisms is needed to secure restoration. The cost/benefit of delivering services, such as clean water, needs to be reevaluated to show the value of ecosystem approaches. Private investment should be investigated too.
- Regulation – regulation or controls which are designed to stop damaging activity should, as a matter of urgency, be enforced or strengthened by authorities to avoid further emissions. Private companies and individuals should not be allowed to put profits before peatland protection which benefits all of society. Rather, policy and funding changes should incentivise sustainable management.

5. Conclusions

The needs of Scotland's peatlands have been ignored for too long. As a consequence, the policies we have today often fail to support sustainable peatland management and restoration, and can actually conflict and block its achievement. Policies and land use norms which influence the use or management of peatlands are not fit for purpose when aiming to deliver the large-scale peatland restoration needed, and as a consequence some peatland is contributing to climate change rather than helping to fight it.

In the past, policies have been designed for their own purposes and somewhat in isolation and, in the worst cases, their influence on peatlands has been negative, causing degradation. The remaining policy barriers to peatland restoration must be removed. Individual policies with their own aims and objectives do not always pull together and create synergies towards peatland restoration and achievement of climate change goals. Policies need to be updated, adapted and aligned in order to make peatland restoration and protection happen at a landscape scale. In doing so, policies on land use and management must move away from the single use outcomes, such as food production, and aim to maximise multiple benefits, as required by Scotland's Land Use Strategy.

In addition to central Government taking a lead, the policies and practices of Government Agencies, public bodies and industry must be aligned with this new restoration agenda.

Policies which influence the way peatland is used and managed need to be enhanced, aligned or redesigned in order to promote the restoration of damaged peatlands and realise their natural carbon capture and storage potential.

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Notes

[1] RSPB Scotland. The Peatlands of Scotland: The urgent need for restoration and conservation. www.rspb.org.uk/Images/thepeatlandsofscotland_tcm9-224528.pdf

[2] Scottish Government, Management of carbon-rich soils – Overview & discussion paper, http://www.scotland.gov.uk/Resource/Doc/921/0109512.pdf

[3] http://www.royalsoced.org.uk/enquiries/climate_change/index.htm

[4] Chapman S. J., Bell J., Donnelly D., Lilly A., 2009, Soil Use and Management, Volume 25, Issue 2, pages 105–112.

[5] RSPB. The Peatlands of Scotland: The urgent need for restoration and conservation. www.rspb.org.uk/Images/thepeatlandsofscotland_tcm9-224528.pdf

[6] Active, undamaged peatlands accumulate carbon as organic matter at a rate of at least 50 tonnes of carbon per km^2 per year (Billett et al. 2010; Worrall et al. 2010a).

[7] IUCN. http://www.iucn-uk-peatlandprogramme.org/sites/all/files/091201BriefingPeatlands_andClimateChange.pdf

[8] IUCN. http://www.iucn-ukpeatlandprogramme.org/sites/all/files/100218Briefing_Peatlands_andGreenhouseGasEmissions.pdf

[9] IUCN reference, as above.

[10] UN Convention on Biological Diversity, 2010 - http://www.cbd.int/sp/targets/

[11] http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm

[12] Scottish Executive (2006), The Scottish Forestry Strategy. http://www.forestry.gov.uk/pdf/SFS2006fcfc101.pdf/$FILE/SFS2006fcfc101.pdf

[13] Scottish Government (2009) Policy on the Control of Woodland Removal. http://www.forestry.gov.uk/pdf/fcfc125.pdf/$FILE/fcfc125.pdf & Scottish Government. http://www.forestry.gov.uk/pdf/WRpolicyguidance17March2010.pdf/$FILE/WRpolicyguidance17March2010.pdf

[14] Wind Farm and Peatland Good Practice Principles: http://www.scottishrenewables.com/news/conservation-groupsand-renewable-developers-agree/

[15] Good practice during windfarm construction: http://www.snh.org.uk/pdfs/strategy/renewables/Good%20practice%20during%20windfarm%20construction.pdf

[16] Calculating carbon savings from wind farms on Scottish peat lands: http://www.scotland.gov.uk/Publications/2008/06/25114657/0

[17] It is widely reported that 70% of drinking water comes from peatland-dominated catchments.

[18] http://www.dwqr.org.uk/public/national-water-quality/top-ten-parameters#item10

[19] The Water Environment (Controlled Activities) (Scotland) Regulations 2011, http://www.legislation.gov.uk/ssi/2011/209/contents/made

[20] http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/npf

[21] http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/newSPP

BOGLAND: Sustainable management of peatlands in Ireland.

by Florence Renou-Wilson, Tom Bolger, Craig Bullock, Frank Convery, Jim Curry, Shane Ward, David Wilson and Christoph Müller

Peatlands are Ireland's last great area of wilderness, hovering between land and water, providing unusual habitats for their unique and specialist flora and fauna. Peatlands cover a large part of the land surface in the Republic of Ireland, occurring as raised bogs, blanket bogs and fens, and forming cultural landscape icons in many parts of the country. The BOGLAND project was funded as part of the Sustainable Development Research Programme of the Environmental Protection Agency (EPA) to reveal the global significance of this national resource and the dilemmas of peatland management, utilisation and conservation. This paper provides an executive summary of the conclusions and recommendations of the project.

Section 1 of the BOGLAND report provides a comprehensive overview of what Irish peatlands are and what their contribution to the next generations should be. Associated concepts and definitions of terms used in Ireland are presented in order to facilitate communication and clear decisions.

In Section 2, the focus is on building on existing data regarding the biodiversity of peatlands and their associated abiotic environment (soil and water). New surveys of birds, aquatic and terrestrial invertebrates, as well as vegetation and micro-organisms comprised critical information against which the effectiveness of future management practices of peatlands (e.g. conservation, restoration) can be measured. This research demonstrated that peatlands support few but unusual and rare species with exceptional adaptation. As species new to Ireland and indeed one new to science were discovered, it is clear that the contribution of Irish peatlands to biodiversity is not yet fully understood. Meanwhile, biodiversity indicators, such as protected species, but also habitat heterogeneity can inform whether a peatland site is:

1. Suffering from degradation;
2. Healthy; or
3. In the process of recovery.

These indicators should be used for future assessment of all the peatlands, starting with state-owned sites, in order to draw up individual restoration and management plans that will maximise their natural functions, not least their unique biodiversity.

In Section 3, a newly constructed map shows that peat soils cover 20.6% of the national land area and contain more than 75% of the national soil organic carbon. It was revealed that near-intact peatlands may actively sequester c. 57,402 t C/year over the whole country. However, damaged peatlands are a persistent source of carbon dioxide (CO_2) and, at the national level, Irish peatlands are a large net source of carbon, estimated currently at around 2.64 Mt C/year. In view of these findings, it is clear that carbon dynamics should be a key driver of policies for peatland management. Active and remedial management options, such as avoiding drainage (conserving) and re-wetting (full restoration or paludiculture) may be effective ways to maintain the carbon storage of peatlands and to recreate conditions whereby the peatland may actively sequester carbon in the future.

This investigation into peatland utilisation showed that neither past nor current management of peatlands in Ireland has been sustainable. Disturbances in the form of industrial and domestic peat extraction, private afforestation, overgrazing, wind farms and recreational activities have had and are having major negative impacts on the hydrology and ecology of these habitats. Natural peatlands, which are hydrologically and ecologically intact, have become rare and are being further threatened. The biggest threat to peatlands in the 21st century is likely to be climate change and its associated policies, e.g. wind farms. Rigorous examination and guidance for their full impact assessment (including a new technique developed in this project to test peat strength) are urgently required.

Peat erosion in the Wicklow Mountains blanket bogs (Ireland)

Not only mismanagement, but also legislative inertia, has led to a majority of the Irish peatlands being damaged and in deteriorating conditions. Conservation management has only succeeded in fully protecting a small area of peatland while designated (thus legally protected) areas continue to be damaged by turf cutting due to lack of law enforcement.

The management of the Irish peatland resource is a complex task comprising large areas of various habitats exhibiting a range of status (from near-intact to very degraded), involving a mixture of stakeholders and which are affected by many different (sometime contradicting) policies. In order to achieve sustainable management of peatlands, their ecosystem services (biodiversity, carbon storage and sink, archive value, etc.) should underpin policy. This is demonstrated in Section 4, where an economic analysis has revealed that peatlands are public goods

that deliver benefits of great economic and social value (primarily in relation to carbon storage, biodiversity, amenity and landscape). However, these are often ignored by the general public and can sometimes work in conflicting directions. While there is a lack of public awareness regarding certain functions of peatlands (e.g. the contribution of peat extraction to increased carbon dioxide emissions in the atmosphere and related current climate change), people's attitudes to peatlands are changing. The results of this survey indicated general public support for:

1. The protection of peatlands;
2. The transformation of industrial cutaways into uses that encourage wildlife and green energy production; and
3. A willingness to pay for the establishment of a dedicated National Peatland Park.

However, people still attach a social value to the domestic cutting of peat and do not always recognise a contradiction with peatland preservation. This study has identified considerable ambiguity and lack of understanding as to the significance of the peatland resource and, in particular, its role in provision of ecosystem services. It is time to open the debate and actively involve the public, especially the local communities, in drawing future management options for peatlands and, in particular, industrial cutaway peatlands.

The BOGLAND project has demonstrated the compelling evidence of the importance of Ireland's peatland resource in terms of:

1. Being an extensive resource and carbon store;
2. The negative potential of degraded peatlands to augment the greenhouse effect;
3. The positive role of natural and restored peatlands to actively sequester carbon from the atmosphere;
4. The role of peatlands in watershed management;
5. Their contribution to biodiversity; and
6. Their essential attributes that confer them with a cultural and informative function.

In conclusion, managing peatlands sustainably, so that they can deliver all these benefits, will require a mixture of economic instruments, regulation and institutional design but, most of all, it requires immediate action.

This collation of physical, environmental, social, economic and institutional information provides a comprehensive guidance for the development of a support framework or protocol for the sustainable management of peatlands, which is presented in Section 5 of the report. The protocol delivers an action plan or set of recommendations that should be used to draft a much-needed National Peatland Policy that should ensure that this natural heritage is not lost in the future, but that it is safeguarded and enhanced during a challenging period of economic transition. In short, any vision of the future of Ireland must include maintaining and enhancing one of its last natural resource: peatlands. This protocol aims to succeed in achieving such a vision that serves the needs of the people and preserves what nature gives us pro bono.

Main findings of the BOGLAND Project

- Peatlands support rare and threatened species with exceptional adaptation and more species are yet to be discovered. In this study, two species new to Ireland were identified, a mite (*Limnozetes amnicus*) and a beetle (*Ochthebius nilssoni*), and another species of mite is possibly new to science.
- The loss (and ongoing degradation) of Irish peatlands equates to a loss of biodiversity at regional, national and international levels.
- The loss of biodiversity is observed from a mesotope level (entire ecosystems such as raised bogs and fens have been almost all damaged) to a microtope level (species and particularly habitats).
- The drivers of biodiversity change are projected to remain constant or even increase in the near future and this represents a major challenge for the protection of peatlands.
- Using new modelling methodologies, it was estimated that peat soils cover 1,466,469 ha or 20.6% of the national land area.
- Irish peatlands are a huge carbon store, likely containing more than 75% of the soil organic carbon in Ireland.
- Natural peatlands act as a long-term carbon store and play an important role in the regulation of the global climate by actively removing carbon from the atmosphere, but this important function is reversed (i.e. there is a net release of carbon) when the peatland is damaged. This study's investigations showed that near-intact peatlands may actively sequester, on average, 57,402 t C/year (equivalent to 0.21 Mt CO_2). However, losses of carbon from degraded peatlands and associated activities (e.g. combustion of peat) mean that, at a national level, Irish peatlands are a large net source of carbon estimated at 2.64 Mt C/year (equivalent to 9.66 Mt CO_2).

Status of Irish peatlands

- Peat soils currently occur under different land uses, forest, grassland, agricultural crops, as well as a range of degraded peatland ecosystems from industrial cutaway bogs to overgrazed blanket bogs. Very few peatlands remain in their natural state (i.e. near intact).
- All Irish peatlands have been impacted by natural and anthropogenic disturbances over the course of their history, but the worst damage occurred in the 20th century. The biggest disturbances in the 21st century are domestic peat extraction, private afforestation, wind farms, recreational activities, invasive species and agricultural policies (e.g. farmers moving away from agri-environmental schemes in order to cut turf).
- There are no more intact raised bog landscapes in Ireland. The current area of active raised bog stands at a mere 2,000 ha, less than 6% of the protected raised bog area. It is estimated that between 2% and 4% (40–80 ha) of this active area is being lost every year mainly as a result of turf cutting. Even if turf

cutting were to cease, peat oxidation would continue (due to drainage) unless measures were employed to stop and revert the deterioration.

Fresh peat extraction at the Clara bog protected area (Ireland).

- The area of active blanket bogs is still unknown but is likely to be a small fraction of the currently protected blanket bog area and is also likely to decrease in the future due to the aforementioned disturbances.
- Most protected peatlands are insufficiently protected from a hydrological aspect because the boundaries of the designated site do not match the eco-hydrological boundaries. The conservation and restoration of these peatlands in terms of active area and fully functioning ecosystem is thus jeopardised. Cost-effective management of protected sites requires extended cognisance of local hydro-ecology of the site and surrounding areas.
- Being degraded to various degrees, the vast majority of Irish peatlands are critically at risk of future disturbances, such as climate change. Predicted changes are likely to affect low Atlantic blanket bogs in the west of Ireland the least, while the areas showing greatest changes in precipitation and temperature are the areas containing basin peat in the Midlands.

Blanket bog under peat extraction in Connemara (Ireland)

Peatland management

- In the case of ongoing turf cutting on protected sites, acquisition would be a better option (value for money) than compensation. If the State acquires the land, it not only has full ownership of the turbary rights but holds also the management rights. This would allow restoration work to be carried out, for example.
- Several peat failures on blanket bogs were associated with wind-farm developments and this has questioned the ability of the Environmental Impact Assessment (EIA) process to fully assess the likely environmental impacts. Peat strength is a complex attribute of peatlands and varies at each site and thus requires a stability assessment to be carried out as part of the EIA. Such assessment should utilise the UCD-DSS2 technique which has been developed within the BOGLAND project. It is a simple shear device that allows the strength of peat to be assessed in a mode of deformation.
- Sheep grazing on hill and mountain peatlands can be sustainably managed using a stocking density based on habitats that are most likely to be used and by acknowledging seasonal variations in vegetation cover and composition.

Socio-economic and institutional aspects

- Policies affecting peatlands have been determined only by the market value of peat, namely the value of peat as combustible fuel. These policies are at odds with the other international and national government policies and conventions, specifically those addressing climate change, biodiversity protection and environmental sustainability.
- A number of governmental departments, in particular the Department of Communications, Energy and Natural Resources and the Department of the Environment, Heritage and Local Government, have key policy responsibilities that shape how peatlands are managed but these are often in conflict.
- While a legal and administrative structure exists in Ireland to help the decision-making process, the absence of a national policy relevant to peatlands and the inadequate public administration functions (including funding) to administer current legislation are major obstacles to conservation targets and principles.
- The economic valuation study showed a positive willingness to pay for peatland protection. However, this willingness to pay appears to be higher for a dedicated National Peatlands Park and is not restricted to peatland restoration alone.
- Willingness to pay for the protection of raised and blanket bogs appears to be less than the amounts that are currently spent by the State on protection, suggesting that current spending fails to pass a cost–benefit analysis.
- The cost of burning peat (either industrially or for domestic purpose) is very high in terms of carbon loss. However, the social aspects of peat use are

very complex and solutions will have to consider the cultural attachment to turf cutting.
- The new generation of peat-fuelled power stations has been designed to run on biomass. While biomass is marginally economic, it suffers from supply constraints.
- Wind farms on lowland industrial cutaway peatlands perform poorly financially in comparison with those on elevated and coastal sites, but cutaway sites do have major advantages and could be supported by policy (in particular regulatory instruments). Such after-use of cutaways would not necessarily interfere with other uses such as peatland restoration or wildlife options, which were perceived positively by local people in the ethnographic studies carried out within this project.

Peatland and people
- People attach a social value to the domestic cutting of peat, but do not always recognise a contradiction with peatland preservation.
- There is a clear information deficit regarding the ecosystem services of peatlands and how these benefit the public in general. However, people's perception of peatlands is changing.
- There is no public awareness of the relationship between peatland and carbon and the contribution of peat extraction to climate change.
- The value of peatlands as an ecosystem providing crucial ecological, hydrological and other services has generally been disregarded by the public, mainly because it was not communicated in any meaningful way.
- There appears to be a willingness amongst many people living in local communities to participate in the future after-use of industrial peatlands. These preferred after-uses include amenity, wildlife and wind energy options. However, there does seem to be a need for government or national institutions to take a lead in demonstrating what peatland afteruses are being seriously considered.

60 Degrees by Kevin O'Dwyer in the Lough Boora sculpture park (Ireland)

Recommendations
The BOGLAND project revealed not only the global significance of Irish peatlands and the dilemmas of peatland management and utilisation but also engaged the general and local public as well as stakeholders in peatland discussions. This collation of information provides a strong scientific and socio-economic evidence base, ready to be translated into instruments to assist decision making. In that regard, an action plan or set of recommendations is presented, with the aim of managing peatlands sustainably. The top 10 critical recommendations emerging from this protocol and requiring immediate actions by the Government have been identified as follows:

1. A much needed National Peatland Strategy
A National Peatland Strategy is clearly required if the proposed protocol for sustainable management of peatlands is to be implemented. The ensuing National Peatland Policy should be integrated into other government policies, such as the Climate Change Policy, the Renewable Energy Policy, the Strategy for Invasive Species and the Water Framework Directive. The Peatland Strategy would be subject to the requirement of the Strategic Environmental Assessment Directive.

2. More protected peatlands
All remaining areas of priority habitat peatlands (active and degraded raised bogs and blanket bogs) should be declared as Special Areas of Conservation (SACs) and more peatland sites (including fens) should be designated under adequate legal protection.
(i) Attention should be paid to maintaining the integrity of these peatland habitats to ensure the survival of the unique biodiversity that they sustain.
(ii) The establishment of a network of protected areas representing the geographical distribution of peatland types should be a priority in order to offset climate change threats.

3. Proactive management of protected sites
Designated peatland sites should be appropriately managed with a view to increasing the total area of near-intact peatlands and reversing the trend of these endangered habitats. A range of key peatland sites representing all types of peatlands should be identified for proactive management to achieve biodiversity targets at different levels – genetic, species, habitat and ecosystem. This requires that management plans are to be readily drawn for all designated peatland sites (in particular one of the largest sites: Ox Mountains Bogs SAC).

4. Enforcement of regulations
Strict protection of natural peatland sites that have been designated for conservation is critical for the´maintenance of their carbon storage and sequestration capacity and associated ecosystem functions. This means stopping and removing any disturbances on these sites if there is any hope of

maintaining or restoring the full functioning status of the peatland.
(i) Where there is a current illegal disturbance on a protected site, it should be immediately removed by enforcement of the law. This means that the Cessation of Turf Cutting Scheme should be fully implemented on the 55 raised bogs designated as SACs and be given full political back-up.
(ii) As a matter of priority, 'sausage machine' cutting should be banned and the ban should be enforced on all protected sites.
(iii) The cessation of turf cutting on other designated sites (blanket bogs) should be immediately addressed and solutions proposed from a forum of adequate representatives.

Sausage peat extracted on blanket bog in Ireland

5. Restoration of protected peatlands to stop carbon loss

Peat oxidation is induced by drainage of peatlands and releases carbon to the atmosphere. Peat oxidation should be stopped or at best reduced in all protected peatlands through the following actions:
(i) A programme to restore peatlands designated for conservation, which are not in favourable conditions, should be initiated. As a matter of priority, state-owned peatlands should first be assessed and individual restoration and management plans should be drawn up to maximise the natural functions of the site, particularly in relation to biodiversity, greenhouse gas emissions and water management; and
(ii) Restoration work needs sufficient time and resource to take cognisance of the local hydrogeology which has often very localised conditions.

6. Management of non-designated peatlands to stop carbon loss

Opportunities to restore degraded nondesignated peatlands should be immediately explored as protected peatlands are only a minor part of the total area of peatlands. Carbon is constantly emitted to the atmosphere from drained peatlands and several management options should be explored, for example:
(i) Restoration of degraded non-designated peatlands should follow an adaptive management approach as each site is different in terms of site condition (e.g. how deep it is drained), historical disturbance, geographical location (catchment), ownership and local demands; and (ii) Water management in degraded peatlands should be optimised (reduce drainage) in order to combat carbon dioxide emissions from peat oxidation and preserve the palaeoinformation within the peat.

Rewetted cut-over site at Turaun Boora (Ireland)

7. Review of the peat industry

It has been internationally recognised that subsidies that promote excessive and destructive uses of peatlands and their ecosystem services should be eliminated. Therefore, the Public Service Obligation Levy allocated to the peat industry should be reviewed since the continued carbon emissions from peat burning are contrary to the national interest.
(i) This review should be carried out as part of a cost–benefit analysis at a macroeconomic level of peat extraction and its role in modern Ireland.
(ii) A portion of the taxpayer monies given to the peat industry could be channelled to a new institution charged with the management and restoration of the country's peatlands.

8. A code of good practice

A code of good practice for development on peatlands should be produced and systematically used for assessing any development proposals involving peatlands. Such a code should emphasise the current legislation framework (EIA, Appropriate Assessment (AA), Integrated Pollution Prevention Control (IPPC) licensing) within which projects/plans can proceed and include evidence-based guidance for the relevant authorities (see Recommendations 12–16). Such a code could, for example, impose a maximum permitted drainage level for ongoing authorised activities on peatlands, as well as define best practices for the development of wind farms on blanket bogs.

9. A National Peatland Park for the people
The creation of a National Peatland Park, pushed forward by local communities, deserves serious consideration and commands a degree of support from the Government. This proposed park could provide an opportunity to develop a centre of excellence for applied integrated peatland research and a national database for peatland related data and information as well as communicating information regarding peatlands.

10. Peatland Strategy Working Group
The development of a National Peatland Strategy should be carried out through the establishment of a special working group whose main role would be to co-ordinate the development of a consensus that charts the way forward and draft a National Peatland Strategy from which a Statement of Policy could later be issued.
(i) Such a group should be set the task to develop a code of best practice for development on peatlands (see Recommendation 8), with an immediate objective of looking into wind-farm developments on blanket bogs.
(ii) It should also take the lead in demonstrating what after-uses are being seriously considered for the industrial cutaway peatlands in Bord na Móna's ownership and aid the drawing up of an after-use policy (see Recommendations 30–32).
(iii) It should establish a National Co-Ordinated Integrated Management, Monitoring and Enforcement Network to provide the framework necessary to achieve sustainable management and protection of Ireland's national peatlands biodiversity resource.

Other recommendations are presented below. Their remit may not only lie with the Government and governmental agencies but also with the industry, nongovernmental organisations (NGOs) and academia or other research institutions.

Policy and regulation
11. The Environmental Impact Assessment Directive specifies that thresholds do not preclude sensitive areas and as such peatlands are to be considered sensitive areas for any development and thus require an EIA. It is therefore recommended that all commercial peat-cutting enterprises (i.e. no threshold) should require planning permission (and therefore an EIA). Enforcement action against unauthorised peat extraction should be pursued.
12. While an amendment to the Planning and Development Regulations (SI No. 539, 2001) set a lower threshold requirement of 10 ha for planning permission for peat extraction, the current threshold imposed by the IPPC licensing to restore or rehabilitate a site remains at 50 ha and thus should also be reduced to 10 ha.
13. To ensure compliance with the requirement of Article 6 of the Habitats Directive, further guidance should be developed to carry out AA of plans or projects involving peatlands. Special attention should be given where exploitive utilisation (including turf cutting) is taking place on or near protected sites. Emphasis should be put on the need to address cumulative/in-combination effects (e.g. wind farms). In addition, the assimilative capacity of the peatland to absorb impacts should be considered.
14. Policy regarding wind-farm developments on state-owned forests should be properly appraised by a group of independent experts on an individual case basis (life-cycle analysis) as the renewable energy sector should not be developed at the expense of the protection of endangered habitats. Wind-farm development on designated mountain blanket bogs should be avoided by correctly applying the AA process.
15. Particular guidance should be given in the case of an EIA for wind-farm developments on peatlands (see Recommendation 10). It should follow the guidance from the European Union Commission regarding such development on Natura 2000 sites and the wind energy guidelines of the DOEHLG (2006), especially with regards to road construction, fragmentation of the habitats and ground investigation. These guidelines include an assessment of the peat strength over the profile depth. New guidance should refer to new tools developed within the BOGLAND project that should be used in stability assessment. The UCD-DSS technique is a direct simple shear device that allows the strength of peat to be assessed in a mode of deformation that is appropriate for stability assessment. Further collaborative research work should be pursued between academia and practitioners in order to help in drafting best practices.
16. The aforementioned code of good practice (Recommendation 8) could necessitate the establishment of an environmental system management (ESM) for all peatland-related development. An ESM monitors and controls the impact of an enterprise's activities on the environment by establishing an environmental policy with objectives and procedures (similar to the ISO 14001 standard) which could then be audited by the EPA.
17. The Government should engage in a review of the use of peat in the horticultural industry and actively promote the use of peat-free horticultural growing medium in the retail market on the basis that these are sustainable products. While there is not at present a technically, environmentally suitable alternative material that could replace peat in professional horticultural crop production, Ireland should lead research in this area and economic incentives should be applied to compete with non-sustainable horticultural peat.
18. Avoiding carbon loss from degraded peat soils through peatland conservation, restoration and paludiculture should be supported by Ireland for the next commitment periods of the Kyoto Protocol after 2012. Meanwhile, Ireland should work towards realising the asset value of peatlands through

remuneration of the emissions avoided from peat soils via linkage with the European Carbon Trading Scheme.

19. Wind-farm development and paludiculture (especially cultivation of Sphagnum moss) should be encouraged on industrial cutaway peatlands through tax relief.

Peatland management

20. No form of peat cutting should be allowed within an agri-environment scheme agreement.

21. Measures to reduce peat oxidation (and thus carbon loss) from degraded peatlands should be introduced at a management plan level and in other agri-environmental policies.

22. Burning of peatland vegetation as a management practice to facilitate the extraction of the peat or to increase the population of grouse (promoting heather growth) should be strictly controlled. Agreement (the like of which has been established for the Slieve Bloom SAC) should be readily established and the Muirburn Code (Scottish Natural Heritage, 20054) should be used as best practice in using fire as a management tool to avoid accidental fire and additional carbon emissions. Such activity should be reviewed under the scope of the Environmental Liabilities Directive (e.g. when the peat fire goes out of control).

23. Sheep grazing on hill and mountain peatlands can be sustainably managed using a stocking density based on habitats that are most likely to be used and by acknowledging seasonal variations in vegetation cover and composition. This information should be communicated accordingly.

24. Relevant authorities should ensure that forest policies and management plans continue to protect and enhance peatland habitats and associated species (see Recommendation 28).

25. Any invasive species should be actively removed from protected sites and appropriate long-term management set out to keep invasive species away from these sites.

26. It should be ensured that peatlands (including cutaway peatlands) are fully included in the development of River Basin Management Plans and that they are appropriately assessed in Strategy Environmental Assessment of County Council Development Plans.

State-owned peatlands

27. The present management of state-owned peatland areas should be evaluated and alternative management options aimed at increasing the natural functions of peatlands should be implemented. Where the current disturbance has not impacted on the major functions of the peatland, the disturbance should be maintained at an acceptable level and monitored in order to retain most of the ecosystem services provided by the site. For example, grazing at a managed intensity and controlled turf cutting on blanket bogs could represent such management options. This option requires, however, strict surveillance.

28. The management options regarding state-owned forested peatlands should be critically reviewed. Management options identified by Coillte regarding the western peatland forests should be fully implemented in view of managing this national asset in the most sustainable fashion. Western forested peatlands which are commercially unproductive should be candidates for:

(i) Restoration of the peatland ecosystem;

(ii) Long-term retention of the trees (in effect leave these areas to nature); or

(iii) Used to promote the regeneration of native scrubs on reforestation sites together with continuous cover.

The effect of these management options on greenhouse gas emissions and on peat oxidation rates should be investigated.

Industrial cutaway peatlands (their after-use)

29. The first option for after-use of cutaway peatlands should be to promote, where possible, the return to a natural functioning peatland ecosystem. While restoring past ecosystems may be difficult, the option of creating new semi-natural habitats is considered the easiest and most likely after-use for the majority of these cutaway bogs. The favoured management option in this case should involve re-wetting (i.e. paludiculture) or wetland creation.

30. New production techniques, such as paludiculture, should be developed and promoted to generate production benefits from cutaway and cutover peatlands provided that these activities represent the best environmentally sustainable option. Paludiculture is probably the after-use option that can have the most benefit from a climate mitigation point of view – avoiding carbon emissions from the degraded peatland, from the displaced fossil fuels, and also from its transport. Ireland should take the lead in this expanding area of research.

31. The enhancement of cutaway peatlands for flood storage and flood attenuation should be investigated. This aspect should be reviewed as part of the national programme of Flood Risk Management Plans being rolled out under the Floods Directive.

Peatlands and people

32. Peatland awareness programmes and education material should be developed and promoted through a wide variety of media – information sharing (TV programmes, website, DVDs, etc.), education packs (financial support to the Irish Peatland Conservation Council education programme), workshops, posters in public places. Clear ‘peatland messages’ should be provided for use across a wide range of media.

33. It is critical that a national institution take a lead in communicating information regarding peatlands. With the removal of governmental support for communication of environmental information (ENFO), it is critical that NGOs fill this gap and communicate this knowledge and that the

Government adequately supports this task. In particular, awareness and education could be easily promoted by the improvement of public access at certain peatland sites (collaboration with Coillte, LIFE project).
34. With the complex discussion surrounding turf cutting, governmental institutions should communicate early and extensively to the stakeholders so that they become familiarised with the benefits of peatlands other than for fuel.
35. Traditional, indigenous knowledge of peat and peatlands, as well as relevant scientific findings and data, should be clearly communicated and made available to the public and to decision makers. This would also help dialogue between all the stakeholders, who may not be sufficiently aware of the information and views held by others. Information from all sources is crucial if more effective ecosystem management strategies are to be introduced. This could be harnessed through the National Peatland Park (see Recommendation 9).
36. Local communities have a very important role as stewards of peatland resources and should be involved in activities to restore and sustain their use. Local committees and other vested groups should be consulted in order to balance local concerns with the wider public 'good'. The greater the responsibility, accountability, participation and use of local knowledge, the better the management and likely positive outcomes.
37. Research on peatlands should be pursued. As a priority, an inventory of the condition of all peatlands (including those not designated) should be carried out. A methodology/approach should be developed to systematically investigate and quantify the environmental supporting conditions and hydro-ecological linkages which can be peculiar to any given peatland. This is in order to develop restoration or other management plans tailored to the site and aimed at achieving a fully functioning peatland site (see Recommendation 38).
38. There is a need to identify and review practical peatland restoration projects and techniques to assess their effectiveness in terms of hydrology, carbon storage and sequestration potential and biodiversity.
39. Finally, adequate funding and mechanisms to support sustainable management of peatlands should be provided.

The BOGLAND report provideds large-scale analysis and findings that demonstrate that the Irish State needs to change the way in which the peatland resource is currently viewed and managed if it wishes to secure the multiple benefits offered by these natural ecosystems and avoid the costly consequences of further unsustainable management of peatland.

The full report "*Bogland: Sustainable management of Peatlands in Ireland (STRIVE Report no. 75)*" is available at: http://www.epa.ie/downloads/pubs/research/land/strive75-bogland-for-web.pdf

Estonian mire inventory

by Jaanus Paal & Erik Leibak

For planning sustainable management of mires and optimizing the network of protected mires we need besides information on peat resources and their quality also knowledge about other values, e.g. their flora and fauna, plant communities, hydrological, aestethical and didactical importance, etc.. These values will be totally or at least largely lost by drainage and/or peat extraction.
In 1997 1,376 different wetlands in Estonia (mires, floodplain meadows, coastal pastures, peatland forests) were inspected and their nature protection value assessed in the framework of the Estonian Wetlands Conservation and Management Strategy project (Paal et al. 1998). This inventory only included part of the protected mires and focussed only on larger mires. The inventory concluded with the proposal to add various wetlands with high conservation value to the network of protected areas. Since 1997, a lot of these proposals have been realized by the Government of Estonia, largely in the course of implementation of the EU Habitats Directive. On the basis of the project results, a preliminary list of mires with lower conservation value was compiled. The mires on this list, which was discussed and developed together with the Environment Management Department of the Estonian Ministry of the Environment, were thought to serve potential new peat extraction fields, to avoid extraction of bogs with high conservation value. However, the Ministry did not find enough juridical foundation to establish the list as a ministerial regulation (a new version of Earth's Crust Act was not yet adopted) and the list worked only as a recommendation.
In 2009–2010 a new project "Estonian Mire Inventory Completion for Maintaining Biodiversity" was implemented to cover all mires in Estonia.

Very wet Riisa bog in Sooma National Park (Estonia) in spring 2011.

Objectives

The operational objectives of the project were:

- to improve the classification and identification system for establishing the nature conservation value of mires in Estonia (considering all relevant conventions and other international legal instruments, such as the Convention on Biological Diversity and the EU Habitat Directive) based on the criteria reflecting the principles of the Estonian Environmental Strategy;
- to characterize and evaluate Estonian mires according to the aims of their future management and/or conservation;
- to complete the database and the geographical information system on Estonian mires, and to exchange relevant data with the Natura 2000 database and the Estonian Nature Information System;
- to assess the typological and areal representativeness of the network of protected mires in Estonia, including the Natura 2000 network;
- to develop best practice management guidelines and recommendations for the mires taking into consideration the principles of management and conservation and the proportions and scope of various activities; and to provide these guidelines and recommendations to the relevant national, regional and local authorities;
- to promote public awareness on the nature protection value of mires.

The 2009-2010 project provided reliable data for decision makers and interest groups regarding possible mining in new sites. Furthermore, local municipalities and governmental departments can apply the project results in the process of issuing permissions, approvals or other documents concerning the use of natural resources of mires and their surroundings. In that way the project results contribute to the wise use of peatlands by providing objective baseline data for planning peat use. Local people living in the surroundings of the mires benefit as the results provide an overview of the future of the wetlands and thus enable people to have some perspective of and confidence in the future of their homeland and community.

The organization responsible for the project was the Estonian Fund for Nature in co-operation with the Environmental Board. The project was financially supported through grants from EEA and Norway, but also by the Estonian Environmental Investment Centre and Mr. Ahti Heinla. 110 experts and 42 assistants participated in the field work.

Methods

For the inventory, field worksheets were used in which *inter alia* the following features were examined and respective assessments given:

- Estonian habitat site type (according to Paal, 1997)
- Natura 2000 habitat type
- state and composition of shrub and tree layers
- human impact (incl. drainage, mowing, grazing, burning)
- nature conservation values: plant community status, floristical and aesthetical value, other values (hydrological, faunistical, recreative, didactic, etc.)
- representativity of the habitat
- global assessment (importance for nature conservation).

On the backside of the worksheets the standard registration list of the Estonian flora was printed for recording plant species and their abundance values.

To determine the sites for field work, and for the later use in the geographical information system (GIS), the Estonian Basic Map (1:20,000) was used. The map has been made on the basis of orthophotos, has good accuracy and well defined borders of landscape units. The map also has a digital version and is constantly being renewed.

Associated with the 'Mires and Wilderness' conference (Tartu 18-April 2011) where the Estonian Mires Inventory was presented, a canoo excursion was made through the largely flooded Sooma ('Mire Land') National Park.

Field work periods were June–November 2009 and June–November 2010. In the beginning of both field work periods, an instruction day for field experts was

organized. In May 2010, a special training day concerning mire vegetation was carried out. However, to unify the results of inventories and to diminish the quality control, a longer training period would have been beneficial.
During the two field work periods 13,901 peatlands were inspected, on the basis of which 13,850 data sheets were added to the database. Most of the sites concern mires (8,676 sheets), others represent paludified grasslands and forests, peatland forests, floodplain habitats, drained (degraded) peatlands, etc.

The GIS for this project was developed using the MapInfo Professional mapping software (versions 8.5 and 10) together with the MapBasic development environment. The areas were digitized from the screen using the boundaries of land-use units of Estonian Basic Map raster images. Orthophotos were used for specifying borders, e.g. between open bogs and peatland forests. The MapInfo can directly open the database format of Visual FoxPro, which supports the use of tabular data in both systems.

Results
It has often been stated that mires cover more than 20% of the Estonian territory. Actually, all peatlands together cover 1,009,101 ha or 22.3% of Estonia (Orru 1995) but this figure does not apply to only mires. The confusion is caused by the fact that the Estonian word '*soo*' has in the past been used both for 'mire' and for 'peatland'. According to the present inventory, mires cover at least 233,000 ha or 5.2% of our territory. Adding numerous tiny (less than 0.5 ha large) mires, which were not inspected, and mire habitats that occur as marginal patches within other habitats (and of which the area is included in the area of the latter), the total cover of mires in Estonia may reach ca 5.5% of the territory (240,000–245,000 ha). The remaining 17% consist of paludified grasslands and forests, peatland forests, degraded peatlands and other (former) peatlands.
The area covered by mires in Estonia has during the last 60 years decreased with over 60%: from 642,200 hectares in 1950 to 232,900 (-245,000) hectares in 2010 (Table 1).

Table 1. Comparison of mire habitat area estimates in 1950 (Laasimer 1965) and 2010 (present survey).

Habitat site type (Paal 1997)	1950	2010
Poor fens	152,300	19,000
Rich fens	74,900	20,000
Minerotrophic quagmires	1,300	1,800
Spring fens	1,500	900
Floodplain fens	83,000	>3,000
Mixotrophic grassmires	76,200	35,000
Mixotrophic quagmires		>3,500
Heath moors	3,000	1,200
Raised bogs	250,000	>152,000
Total	642,200	>232,900

With respect to the different site types, the conservation status of 67–95% of the inspected mires was assessed to be excellent or high. This outcome results from the fact that mires covered by a dense tree layer and habitats with low conservation status due to the (direct or indirect) impact of human activities are often not qualified as mires any more but as peatland forests. In that way, the total number and area of mires are decreasing but the conservation status of the extant mire habitats remains high.
The results concerning global conservation importance are similar to those of the conservation status. For only two site types the habitats of high conservation importance cover less than half of the total area of the respective site type: poor fens (46%) and minerotrophic quagmires (48%). The percentage for heath moors is 51%, whereas for all other types the habitats of high conservation importance constitute 72–90% of the total area of these site types.

The proportion of the various site types that is protected amounts to 42 - 81% of the total area covered by these types (Table 2). We can also confirm that the majority of the areas of high conservation importance are found in the already protected mires, which implies that the network of Estonian protected areas has been established effectively. Nevertheless, for every mire site type we discovered areas with high conservation value outside the existing network of protected areas that should be added in the nearest future. Moreover, some mires are only partially protected at present.
The mire areas within the Sites of Community Importance (SCIs) have previously been estimated by the Estonian Ministry of the Environment. For most habitat types, these estimates differ noticeably from the results of the present survey, but percentages of inclusion of areas into the SCIs coincide pretty well for the majority of the habitat types (Table 3). The only exceptions are types 7160 (Fennoscandian mineral-rich springs and springfens) and 7230 (alkaline fens) for which the Ministry has remarkably overestimated the conservation status.
Mostly more than 60% of the habitat type area occurs within the SCIs, which the European Commission considers to be sufficient. We largely support that conclusion and do not foresee large-scale establishment of additional sites for most mire habitat types in future. However, there are two mire habitat types for which a number of additional sites have to be designated: the already mentioned types 7160 and 7230. The present occurrence of these habitat types within the SCIs of 48% and 65%, respectively, may formally seem sufficient, but these two habitat types are the most threatened types in Estonia. From the hydrological point of view, less than 25% of the spring fens and less than 10% of the species-rich alkaline fens were found to be in more or less natural conditions (Ilomets 1994) and their favourable conservation status cannot be guaranteed outside the Natura 2000 network.

Table 2. Area and proportion of various habitat types within and outside protected mire areas.

Habitat site type (Paal 1997)	Total area within protected areas		Area of high conservation value		
			within protected areas		outside protected areas
	ha	%	ha	%	ha
Poor fens	9,888	50	7,168	72	1,963
Rich fens	12,360	64	11,266	91	2,752
Minerotrophic quagmires	960	59	838	87	331
Spring fens	432	55	403	93	300
Floodplain fens	1,656	52	1,200	72	338
Mixotrophic grassmires	27,359	81	24,970	91	2,052
Mixotrophic quagmires	2,792	76	2,769	99	453
Heath moors	487	42	452	93	146
Raised bogs	115,453	76	103,856	90	10,911
Total	171,387	–	152,922	–	19,246

Table 3. Area and percentage of mire habitats within Sites of Community Importance in Estonia according to Ministry of Environment (K. Möller, pers. comm.) and the present inventory.

Habitat type	Total area within Sites of Community Interest				Area with high value outside SCI-s
	Ministry of Environment		present inventory		
	ha	%	ha	%	ha
Active raised bogs	130,000	82	108,139	80	13,139
Degraded raised bogs still capable of natural regeneration	2,000	4	1,011	13	197
Transition mires and quaking bogs	24,000	75	30,118	80	3,082
Depressions of peat substrates of the *Rhynchosporion*	6,000	75	468	99	1
Fennoscandian mineral-rich springs and springfens	500	68	409	48	395
Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	1,900	53	1,075	64	461
Alkaline fens	23,000	96	19,626	65	4,074
Total	~190,000	–	160,846	–	21,349

The 'fifth season': spring flood in Sooma National Park, Estonia

Though the Natura 2000 network has been established to protect rare and/or threatened habitats on a larger (European) scale (and not only within one state, as it is too often done), and though most Estonian mire habitat types are listed in Annex I of the Habitats Directive, it is clear that not all valuable sites are of equal importance. Often a lot of attention and finances are focused on conserving a single representative of a habitat type in a country (region) without asking whether that habitat type is common in other countries (regions). And, *vice versa*, a country (region) may be heedless with respect to habitat types that are widespread and common in the country itself, without considering its status in other countries. Therefore the concept of responsibility species should be widened to include also responsibility habitats.

Estonia has a large number of mires of international importance, including some of the largest and most intact boreo-nemoral raised bogs and rich (calcareous) fens, which are valuable in an all-European context. With respect to the total area of active raised bogs, Estonia holds the third place in Europe after Sweden and Latvia, even in absolute numbers. However, the number and area of large

bogs is much lower in Latvia (comparable to the situation in southeastern Estonia) and in southern Finland the pressure of amelioration and other human impacts have been much more intensive than in Estonia. Therefore Estonia (together with Sweden) turns out to be the main responsible country for preserving large bogs within the European Union.

Habitat types 7160 (Fennoscandian mineral-rich springs and springfens) and 7230 (alkaline fens) might also emerge as responsibility habitats for Estonia, especially due to the rarity of intact calcareous habitats in most other countries of the Boreal bioregion. Even when Estonian *Cladium mariscus* fens (type 7210) are absent from 2/3 of the country, they occupy with respect to their total area the third place in Europe, after France and Sweden.

In order to both sustain the use of peat and to preserve valuable sites, the Estonian State Audit Office suggested in 2005 to the Ministry of the Environment to stop issuing new mining permits for mires or their parts that have so far not been mined (Exploitation..., 2005). To resolve this static situation we need an agreement, concluded on as large a social and scientific basis as possible, which mires need to be preserved and which may be left free for admissible human activities. More than 115,000 ha of bogs are at present situated in various protected areas. The remaining bogs (ca 35,000 ha) cover an area that is larger than has been used by peat extractors during all the industrial history of Estonia. The results of the present inventory may help to select areas with low conservation value and enable to find compromises between nature conservationists and peat extractors.

Full description and results of the project (Paal & Leibak, 2011) can be ordered from the Estonian Fund for Nature (elf@elfond.ee) or be downloaded from: http://issuu.com/elfond/docs/estonian_mires_inventory

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Three species of *Sphagnum* endemic to Île Amsterdam, Terres australes et Antarctiques françaises

In the austral summer of 2007/8, Jennie Whinam and her colleague from the University of Rennes Marc Lebouvier were part of the IPEV research group that went to Ile Amsterdam, the most northerly of the French sub-Antarctic islands. Subsequent to that visit, the peatlands of Île Amsterdam, with their relictual endemic peat moss species, were identified as being of international importance, through their listing as RAMSAR wetlands. From the many samples collected from three levels of extinct caldera and from the slopes on this island, Kjell-Ivar Flatberg has identified three endemic species of *Sphagnum* peat (Flatberg, Whinam & Lebouvier 2011 Journal of Bryology 33 (105-121). Two species belong to the *Sphagnum* subgenus *Subsecunda*, while a third species has uncertain taxonomic affinity. One of the *Subsecunda* species has previously been described under the name *S. islei* Warnst. based on material from Île Amsterdam and an amended description is provided. The other species differs at the species level and is described as *S. complanatum* sp. nov. Both species share morphological characteristics with *S. capense* Hornsch. known from Southern Africa, Malawi, Madagascar and Reunion. The third species is distinguished by several morphological characteristics and is described as *S. cavernulosum* sp. nov. It has morphological characteristics that share similarities with both subgenera *Sphagnum* and *Acutifolia* but especially *Subsecunda*. Among known *Sphagnum* species, the closest morphological relative seems to be *S. novo-caledoniae* Paris & Warnst. described from southern Melanesia in Oceania. Their phylogenetic affinities and likely evolutionary histories appear interesting, but molecular genetic data are necessary for further evaluation of the phylogeny, taxonomic relationships and phylogeography of these three species. To date repeated attempts to sequence plants of the specific taxa have failed.

Sphagnum farming workshop in the Canadian Maritimes: international research efforts and challenges

by Josée Landry, Rémy Pouliot, Greta Gaudig, Sabine Wichmann & Line Rochefort

There is a growing worldwide interest to grow *Sphagnum* fibre on a renewable basis. Requests over the past five years from various parts of the world on how best to grow *Sphagnum* prompted the Peatland Ecology Research Group (PERG) to organize a workshop to assess progress made since the first *Sphagnum* farming workshop in Bremen (Germany) in 2005. The second workshop was held in the Canadian Maritimes, more specifically in the Acadian Peninsula of New Brunswick on June 20th and 21st 2001. A total of 21 participants coming from Europe and Canada with different backgrounds (science, peat industry, nature conservation) took part in this interactive workshop dedicated to exchange on the advancements, ideas and challenges of *Sphagnum* farming.

All participants had been invited to bring slides of their preferred subjects to stimulate the discussions within a structured framework of questions. Since most investigations on *Sphagnum* farming have been conducted by research groups in Canada and Germany, they gave most inputs to the workshop, but works done by Chilean, Finish, Japanese and South Korean groups were also considered (Figure 1). Here we present the main conclusions of questions addressed during the workshop sessions.

Figure 1: Examples of Sphagnum *farming: Japan (left-top, Photo: Yoshikazu Hoshi), South Korea (right-top), Chile (left-bottom) and Canada (right-bottom side, photos: Line Rochefort).*

How to favour rapid establishment of a Sphagnum carpet?

This session started by addressing one of the first questions when starting a *Sphagnum* culture: Which species to favour? The choice obviously strongly depends on what species are native or available in the area, as well as on the final use of the *Sphagnum* fibre. If *Sphagnum* is used for restoration, species of the *Acutifolia* section (such as *Sphagnum fuscum* or *S. rubellum*) can be favoured since they regenerate well and are relatively tolerant to drier conditions. If *Sphagnum* fibres are to be used in growing media, species with good absorbency, stability and structure should be prioritized. In the latter case, *Sphagnum* from the section *Sphagnum* (e.g. *S. magellanicum*) seems to be more appropriate since these broad leaf species have very good absorbent and physical properties. *Sphagnum* from the section *Cuspidata* (such as *S. cuspidatum*) are not interesting, as they grow fast but tend to decompose quickly. Few studies have yet compared the performance of different *Sphagnum* species in professional horticulture. *S. affine* (from the section *Sphagnum*) appeared to be a good candidate, but *S. fimbriatum* performed similarly well as a raw material for growing media.

Another question is whether to establish mono-specific stands or mixtures of species to promote rapid establishment of the *Sphagnum* carpet. If hydrology can be accurately controlled, it is easier to establish mono-specific cultures, even with less tolerant species. Under optimal conditions, i.e. when the water is near or equal to the surface, *Sphagnum magellanicum* and *S. papillosum* don't establish better when accompanied by other *Sphagnum* species. However, when water supply is limited, *S. magellanicum* and *S. papillosum* establish better when accompanied by species of the *Acutifolia* section. As the first two years after initial establishment are crucial for *Sphagnum* growth, weather plays a major role in successful establishment of a *Sphagnum* carpet. A wet year with evenly distributed rain events of more than 2 mm is optimal for *Sphagnum* establishment.

Much effort has been put in optimizing the conditions for *Sphagnum* cultivation. *Sphagnum* can efficiently grow on numerous substrates. Good results have been obtained on black peat, blond peat, floating mats and even on clay. Not the substrate is crucial but the humidity on the interface. It appears that even when water level is very high (as on floating mats), the addition of straw mulch still has a positive effect on *Sphagnum* establishment and growth. Under acidic conditions, *Sphagnum* can tolerate surprisingly high conductivities, as proven by studies in abandoned mining lakes. As long as the pH is between 3 and 6, the conductivity below 500µS/cm and the water level high, *Sphagnum* can grow. It has to be noted that, regardless of the species, the quality of the fibres will strongly be influenced by the type and timing of harvest (prioritize drier periods).

How to optimize large scale farming?

In regions where *Sphagnum* mosses are rare, greenhouse production of *Sphagnum* propagules,

either by spores or fragments, is an interesting option. Spores germinate well and form more vigorous individuals, but recovery of spore material can be challenging. Fragments are easy to produce and form new stems on peat or when submerged in aerated solution.

When large scale *Sphagnum* farming is considered, preliminary inventories and measurements should be conducted to ensure that everything is in place for a successful culture. The main aspects to be taken into account are:

i) Evaluate if a proper water supply is available. A good automatic water control pumping system increases the chance of efficiently controlling water levels.

ii) Ensure that evapotranspiration and infiltration on site are as low as possible in order to limit water losses. Measuring hydraulic conductivity can give a good idea of water movements and ultimately of how much water will remain on site.

iii) Identify the initial conditions of the site: peat stratigraphy, soil chemistry, peat depth, water flow direction, existing vegetation.

iv) For better management, knowing the exact area available for culture and the distance to the processing plant is also important.

The main steps to establish large scale *Sphagnum* farming follow the *Sphagnum* moss transfer method used for restoration (refresh surface, collect *Sphagnum* fragments, spread *Sphagnum* fragments, cover with straw mulch and control water level). A challenge is to find the optimal combination of machinery, as it has to be adapted to the field it is used on (Figure 2).

Figure 2: Spreading Sphagnum *fragments with a lateral manure spreader in former block cut peatlands in Canadian Sphagnum farming experimental station. Photo: Josée Landry.*

How to increase Sphagnum *accumulation rates?*

In the context of *Sphagnum* farming, controlling the hydrology is really the key to obtaining optimal biomass accumulation rates. Under optimal conditions of humidity, the addition of vertical structures (ex: wooden sticks) does not increase biomass accumulation. However, under low humidity conditions the presence of structures enhances growth and biomass accumulation by creating favourable microclimates and providing growth support (Figure 3). On floating mats, structures have been proven useful to keep the *Sphagnum* fragments in place. Vascular plants can provide interesting structures in situations where *Sphagnum* is produced for restoration. When *Sphagnum* is cultivated to be used in growing substrate or as floral moss, the presence of vascular plants becomes problematic, because the material needs to be sorted out. In that situation, easily removable inert structures should be considered.

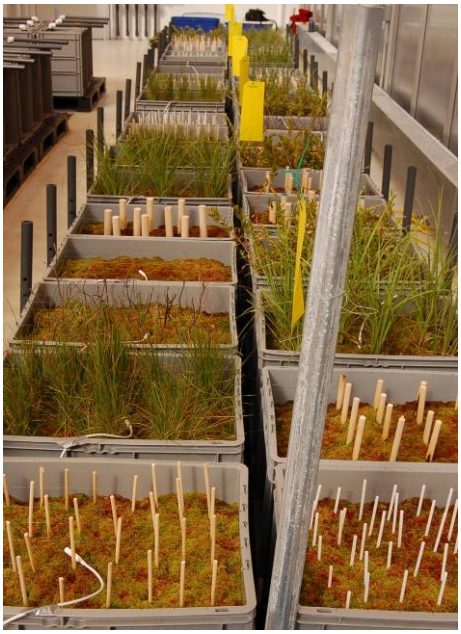


Figure 3: Greenhouse experiments testing the effect of structure addition on Sphagnum *biomass production. Photo: Rémy Pouliot.*

As for *Sphagnum* establishment, mono-specific cultures are more interesting when water supply is sufficient. In other cases, mixing *Sphagnum* species can promote biomass accumulation. However, if *Sphagnum magellanicum* or *S. papillosum* are targeted, mixing them with competitive species (as *S. rubellum*) might not be the best idea.

Water level has much more influence on *Sphagnum* biomass accumulation than fertilisation. Fertilizing with nitrogen or phosphorus promotes length increment, but not biomass accumulation. Fertilizing is useful when *Sphagnum* is used for restoration because it facilitates the growth of vascular plants and *Polytrichum* which are desirable species for restoration.

Weed control is a concern for *Sphagnum* farming, because removal of these undesirables is not easy. Trials with repeated mulching did not give any relevant results. Repeated cutting with a trimmer, first time before seed formation and a second time in autumn, seems to suppress tussock forming species. More research is needed to find the most efficient techniques. But starting with material that is as exempt of weeds as possible will facilitate weed control from the beginning.

Other uninvited guests that may occur in *Sphagnum* cultures include birds, mammals, algae, fungi and signs of chlorosis. The workshop participants discussed the possible causes of the appearance of chlorosis on *Sphagnum* in controlled environments (Figure 4) and several hypotheses emerged. When *Sphagnum* is watered from the top under a very strong sun, leaves can burn. In the greenhouse, where the water level is always kept high, *Sphagnum* may pump up large volumes of water by capillarity, causing the accretion of minerals on *Sphagnum* tips. Research is still needed to solve this problem. In order to promote biomass accumulation, finding ways to slow down decomposition is crucial. Phenolics have the potential to do so. To conclude, there are still many interesting avenues to explore. Studies of ecohydrology at the micro scale have to be promoted to push further knowledge on evapotranspiration versus precipitation.

Figure 4: Dead Sphagnum *tips by what appears to be a stress of growing in a controlled environment under too large evaporative demand. Photo: Line Rochefort.*

What are the advancements in end products research?

The participants made a concerted effort to list possible end products and here is an overview of what came up: floral moss; component of growing media; pure *Sphagnum* as a growing substrate; packaging material for transporting/mailing special flowers, small animals, vegetables, etc.; orchid propagation; specialised products such as peat pots made of H1 to H3 peat; vegetation walls; sculpture ornaments or specialized gardening; and diaspores for restoration of abandoned peatlands.

One of the questions in the discussion was whether *Sphagnum* material used for cultivating horticultural plants causes N-immobilization. This has been tested and in the trials no immobilization of nitrogen was observed, even a small delivery was noted.

Storage of fresh *Sphagnum* material has also been a subject of discussion. It seems that storage at 4°C or below zero works well. It may also be interesting to compress the material to diminish its volume, but this still has to be tested. When storing substantial volumes of *Sphagnum*, one should avoid overheating by making relatively small piles of material.

Interesting future research questions have emerged on how to process the material. Thresholds about the quantity of shrubs, sedges, herbs and *Polytrichum* that are acceptable in growing media have to be known. Also, techniques to sort and separate the material have to be developed.

To what extent is Sphagnum *farming economically feasible?*

The implementation of *Sphagnum* farming requires investments, especially for damming (on peatlands used for milled peat extraction), water control, maintenance, adapted machinery, harvesting and conditioning the final *Sphagnum* biomass. The income will mainly depend on the productivity of the culture, on special markets and on the remuneration of ecosystem services (for example: Carbon certificates or agricultural subventions). In the end, economical feasibility of *Sphagnum* farming is directly related to the market and to decisions of society.

What is the environmental impact of Sphagnum *farming?*

Impacts on the environment will depend on the starting point and on the country where *Sphagnum* farming is implemented. Positive impacts from *Sphagnum* farming may include sustainable provision of raw materials, improved carbon storage, improved conservation of biodiversity, open landscapes and peat archives, improved water regulation, diminished pressure on natural ecosystems and an end to peatland degradation in some regions. As with any activity in peatland, negative environmental impacts have to be avoided, such as changes in water chemistry (DOC, suspended solids, phosphorus, etc.) that can have repercussions on receiving watercourses.

Defining Sphagnum *farming…*

Through the discussions and with the help of all the participants, a first attempt was made to define *Sphagnum* farming as "Production and harvest of Sphagnum fibre on a cycling basis over a given area".

What's next?

International exchange on all aspects of *Sphagnum* farming will be continued. The next workshop is planned in association with the *Sphagnum* farming session at the 14th International Peat Congress 2012 in Stockholm.

Acknowledgements

The authors sincerely thank all participants for making this *Sphagnum* farming workshop a productive and successful event. The PERG would also like to thank the sponsors for this event: Fafard Peat Moss, Acadian Peat Moss and ASB Greenworld.

Mire conservation and the Ramsar Convention

by Tatiana Minaeva

More than 15 years have passed since IMCG started to be engaged in international policy through the Ramsar Convention. Thanks to Richard Lindsay, Michael Steiner and Andreas Grünig mire conservation became a special issue of consideration of the Ramsar Convention. Unfortunately we lost the term "mire" under way and had to agree on using "peatland" in the wise use concept and in our dialogue with land users. The term "peatland" is used further in all international communications. Since that initial phase we moved much farther in international advocacy.

Peatland wise use and mire conservation was upscaled into European policy and in other conventions by Geert Raeymaeckers, Jan Sliva, Philippe Julve and Hans Joosten. Most significant and effective was the work in the Convention on Biological Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC) through the cooperation between IMCG (Hans, John, Andrey and Tatiana), Global Environment Centre (Faizal Parish) and Wetlands International (Marcel Silvius). The experience of working together and cooperating with industry through the International Peat Society and business through GHG emissions reduction options also were helpful in this work.

Anyway: the Ramsar Convention was the beginning and it would be a big shame to give up this activity. The Ramsar Convention gives us the great opportunity to directly involve Contracting Parties in the process of discussing and considering peatland issues. By Ramsar resolution VIII.17 the Coordinating Committee on Global Action Plan on Peatlands was created. This CC GAP consists of representatives of countries and NGOs – with expertise in peatlands – and acts as added value to the STRP regarding peatland questions. CC GAPP can communicate directly with parties, it can assess the implementation of Resolution VIII.17 via the National Reports and can advise on Draft resolutions that may affect peatland. CC GAP can also produce awareness materials and technical background documents. During the two trienniums of its existence CC GAPP consisted of a permanent group of people. In the last years the Secretariat of CC GAP (what is currently Wetlands International) contacts experts for reviewing documents on behalf of CC GAPP, reviews the National Reports with respect to peatland relevant information and provides feedback to the Contracting Parties.

The next Ramsar COP11 is scheduled for 19-26 June 2012 in Bucharest (Romania) and the preparatory work for Draft Resolutions is already in its finals stage. Resolutions that are being produced and especially technical background documents really need consideration by peatland specialists. The most interesting topics for IMCG are:

- Wetlands and energy issues
- Climate change and wetlands: implications for the Ramsar Convention on Wetlands
- An integrated framework for linking wetland conservation and wise use with poverty eradication
- An Integrated Framework for avoiding, mitigating, and compensating for wetland losses
- Principles for urban planning and wetlands
- Wetlands and health: taking an ecosystem approach
- Rice paddy, wetlands and pesticides
- Tourism and wetlands
- Promoting responsible investment by government and the private sector to ensure the maintenance of the benefits people and nature gain from wetlands
- The status of sites on the List of Wetlands of International Importance

IMCG members are invited to study the Ramsar documents and send comments to Tatiana Minaeva: Tatiana.minaeva@wetlands.org

You can find the draft resolutions under: http://tinyurl.com/csauevb

Studying peatland profiles: Mires and Peat publishes global protocol

To look beneath the surface of a peatland, you usually need a core. But how can you get a good core, especially if it's to include the springy, fibrous acrotelm as well as catotelm peat? For a long, 'continuous' core, won't the sampling process mess up the ends of the core sections, and what can you do to avoid that? How to get the material back to base in reasonable condition, and are you sure that this sample came from that location and depth? What is the best way to measure density, degree of decomposition and mineral content, how to determine age, should you count macrofossils or pollen or testate amoebae or charcoal (or all of them?) and how can these be extracted and identified?

Palaeoenvironmental scientists deal with these questions on a daily basis and yet, when some of the top international specialists met in Estonia the year before last they realised that there were significant differences between their methodologies which created problems when they tried to compare results. And so *A Review of Protocols in Peat Palaeoenvironmental Studies* was born, as an integrated guide written and reviewed by world leaders in a wide range of fields within the discipline, co-ordinated by François De Vleeschouwer (Sweden/France), Paul Hughes (UK), Jonathan Nichols (USA) and Frank Chambers (UK). It is now published as a Special Volume of the IMCG/IPS journal *Mires and Peat*, so everybody can use it for free.

This is the first integrated methodological guide to obtaining, preparing and analysing material from peatland profiles. The primary purpose is to achieve conformity in multi-proxy palaeoenvironmental data. For experienced researchers it provides a basis for critical assessment of methods with a view to ensuring and enhancing the cross-comparability of their own data. For newcomers it offers a comprehensive overview of uses and limits, as well as step-by-step procedures for sampling, sub-sampling and analysis. It can also be used as a 'cook-book' for student investigations. But it is, in fact, relevant to anybody working on peatland profiles for whatever reason; for example, some of the articles are already in use by a student here who wants to measure the carbon content of a bog.

This volume demonstrates again the versatility of the *Mires and Peat* web format. The Foreword and each 'Chapter' of the review are published as separate articles, which offers the options of downloading just the parts that are of interest, or assembling the whole volume as a reference book with the different procedures collated in your own preferred order. The eleven articles published so far (approximate titles, grouped loosely according to topic) deal with:

- Coring and sub-sampling of peatlands
- Peat humification, bulk density, organic matter and carbon content
- Dating recent peat profiles using spheroidal carbonaceous particles (SCPs)
- Constructing recent peat accumulation chronologies using atmospheric fall-out radionuclides
- Dating peat profiles using tephra
- Constructing deposition chronologies for peat deposits using radiocarbon dating
- Inorganic geochemistry
- Charcoal analysis
- Plant macrofossil analysis
- Pollen and non-pollen palynomorphs
- Testate amoebae

There are two more articles which are still in the review and revision process. These cover analyses based on biomarkers and diatoms respectively and, so long as they reach a sufficiently high standard, will also be published before the volume closes at the end of 2011.

The Protocol Volume was conceived at the workshop *Peatland Archives of Holocene Climate Variability*, held in Vihula, Estonia in May 2009. The meeting was sponsored by the National Science Foundation (USA), the Past Global Changes (PAGES) International Project Office, the International Union for Quaternary Research, the Quaternary Research Association (UK) and the University of Tartu (Estonia). It is published as Volume 7 (2010/11) of *Mires and Peat*. To find it, go to http://www.mires-and-peat.net/mpj.html and click on 'Volumes'.

Olivia Bragg

Regional News

News from Germany
Mire action plan for Schleswig-Holstein

In August 2011, the parliament of the federal State Schleswig-Holstein, Germany, adopted a Mire Conservation Plan. The plan was prepared in close cooperation between the Ministry and the State Agency for Agriculture, Environment and Rural Areas.

Peatland status
Mire conservation and peatland restoration belong since decades to the main activities in nature protection. However, the new plan bundles for the first time all activities in this field. After a short introduction into mire and peat types, the state of peatlands is described. The plan recognizes that at present the knowledge about peatland distribution is based on partly old data from different sources (Tab. 1).

Tab. 1: Knowledge on peatland distribution in Schleswig-Holstein.

Data source	Area (ha) Fen	Bog	Present Mire Area
Geological peatland database (1995)	145.000		
	115.000	30.000	
Soil mapping (1938 – 1948); only peat soils on agricultural area with a depth of > 60 cm	94.000		192.000 ha; after joining the 3 sources
Habitat mapping (1971 – 1991; 2001 – 2010)	35.600		
	25.600	10.000	

Ecological valuable habitats occur on 35.600 ha, of which less than 50 % are regarded as peat forming. One third of these habitats belong to the habitat type degenerated bog (7120). The majority of the peat soils are used for agricultural purposes mainly as grassland with different drainage depths.

Functional approach
Mire conservation and restoration are justified in this plan with a functional approach. Mires and peatlands are important for the local and regional biodiversity. They host a specific flora and fauna with many threatened species and several strongly protected habitat types. Mires fulfil important water regulation functions including water quality improvement and some mire types have a high potential as natural flooding area. Peatlands in Schleswig-Holstein have a high impact on global warming. They are with a contribution of 9.1 % to the greenhouse gas emissions of Schleswig-Holstein an important source. Additionally mires are valuable as archives for archaeological and palaeoecological purposes.

Implementation
Mire restoration and conservation can be funded in Schleswig-Holstein from two sources. Projects aiming on improving the biodiversity of mires and peatlands are funded by the nature conservation department. Target areas are sites from the Natura-2000 habitat network and additionally a list of 20 raised bogs, where restoration activities can improve the situation quickly. Projects with the rehabilitation goal water quality improvement are funded by the water management department in the frame of the implementation of the water framework directive. Target areas are mainly fens.
While the basic measure in mire restoration is rewetting, this activities can only be implemented if all land owners and neighbours agree. Thus rewetting and restoration measures are basically voluntarily; however funds are available for land purchase.

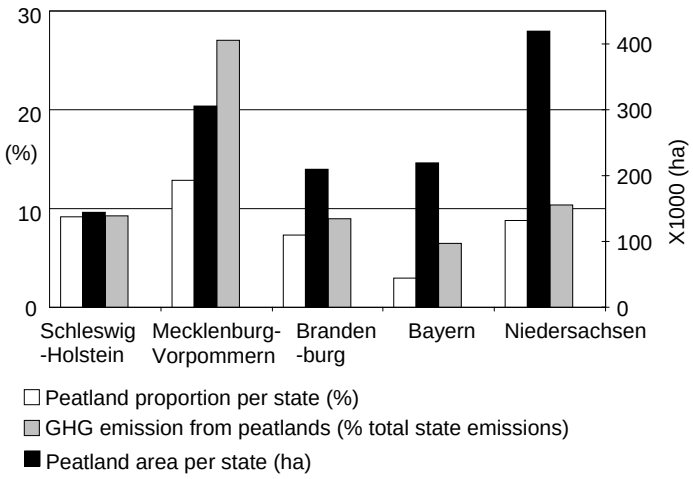
Evaluation
The newly adopted mire action plan for Schleswig-Holstein focuses mainly on implementing rewetting and restoration projects for improving biodiversity and water quality. While peatlands are recognized as an important source of greenhouse gas emissions in Schleswig-Holstein no activities are discussed in the plan to minimize the environmental impact from these areas. To control, if peat soils are used as grassland and not as arable land only, an update of the peat soil distribution data is urgently needed.

More information
The Mire Action Plan Schleswig-Holstein can be downloaded here:
http://www.landtag.ltsh.de/infothek/wahl17/drucks/1400/drucksache-17-1490.pdf

German Länder agree on a common position on mire conservation and climate protection

Germany belongs to the countries in Europe which have drastically altered most of their mires for agriculture and peat extraction. It is estimated that Germany's drained peatlands contribute significantly to global warming with their emissions. Thus it is important that 15 of 16 Federal States agreed on a common position on mire conservation and emphasized the high potential of land use change for reducing the global warming impact from drained peatlands.
The position paper was written by representatives of the state agencies for environment from Bavaria, Brandenburg, Lower-Saxony, Mecklenburg-Vorpommern and Schleswig-Holstein and adopted by the heads of all other Federal State Agencies for Environment (except Hessen).
The position paper adopts the ecosystem service approach and emphasizes the importance of peatlands for biodiversity, improving water quality and reducing greenhouse gas emissions. Often these services are more cost-efficient when compared with

technical solutions for example for reduction of greenhouse gas.
Peatlands cover in Northern Germany between 7 and 12 % of the states land. The majority of peat soils is drained. Thus drained peatlands contribute with emissions from drained peatland of 10 – 30 % (Fig. 1) to the state's specific global warming potential. Land use change in combination with rewetting has in these areas high potential for reducing emissions.



Behind this background the Federal State Agencies agree on the following targets for an improvement of mire conservation in Germany:
- Strict conservation of all natural and semi-natural peatlands
- Rewetting of drained peatlands
  A short term target is that each State rewets at least 5 – 10% of the present peatland area until 2015.
- Use peatlands with high water levels is economically
- Significant reduction of greenhouse gas emissions from peatlands as a national contribution to climate change measures

These targets can be reached when the following measures are implemented:
- Improved water management in peatlands (rewetting)
- Improved nature conservation (improved conservation status and site-specific management)
- Development of an environmental friendly agriculture on peat soils with high water levels for minimizing peat loss due to oxidation.
- Improved forest management on peat soils through rewetting and rehabilitation of mires in forests
- Continuous reduction of peat extraction
- Update of data and knowledge on peatland distribution and quality

As most peatlands are used for agriculture and these areas are responsible for the high environmental impact it is necessary to set standards for future agriculture on peat soils. In the position paper some standard for agriculture on peat soils are defined (Tab. 1)

Tab. 1: Standards for agricultural land use on peat soils

Parameter	Minimum standard (best practice)	Greening	agri environmental schemes
Lowest water level during summer period	> 60 cm	> 40 cm	> 10 cm
Lowest water level during winter period	> l 30 cm	Near or slightly above surface	Near or slightly above surface
Water management	- Ditch not > 80 cm - Higher water levels in winter		No drainage (except shortly or partly as exemptions for e.g. paludiculture)
Land use and land use restrictrions	- Grassland without ploughing - Forest with site-adapted tree species e.g. alder, birch, partly pine) - No crop productio n - No fast-growing plantation s	Change from arable land into permanent grassland	paludiculture - Phragmites - Typha - Sphagnum farming - Alnus - Wet grassland improved forestry - Alder carr - Birch carr
Soil Management	Only milling allowed		No soil management allowed
Fertilization	Fertilization in accordance with the Nitrate directive	No fertilization	No fertilization

Additionally to changes in agricultural land use it is necessary to rewet and rehabilitate more peatlands. The existing funding structures should be improved namely funds for planning and land purchase are needed. The development of environmental friendly land use types for peatlands requires the use of innovative land technique.
Peatland rewetting should be actively integrated as an avoidance measure in the states climate policy. The product MoorFuture© is seen as a promising tool to

compensate carbon emissions on a voluntary basis. Additionally, it offers good possibilities to raise awareness of ecological services offered by mires for the wider public.
The full paper is available here: www.schleswig-holstein.de/cae/servlet/contentblob/1032034/publicationFile/Positionspapier.pdf

Michael Trepel

News from Georgia: Honorary Doctorate for Hans Joosten

IMCG Secretary General Hans Joosten was bestowed with an Honorary Doctorate of the Batumi Shota Rustaveli State University to honour his contributions to research, conservation and sustainable use of the peatlands of the Kolkheti. The festive event coincided with the 70th anniversary of the University. Scientific research of Hans and his students was conducted jointly with students of the Department of Biology and Ecology at Batumi Rustaveli State University.
A Memorandum between the University of Greifswald and Rustaveli State University supports joint student programs in the field of biodiversity conservation and sustainable application (biology and morphology of the Kolkheti lowlands, *Sphagnum* farming, peatlands of the Kolkheti lowlands and highlands). Within the framework of the Memorandum Hans Joosten will deliver lectures and seminars and students will hold internships.

News from South Africa: Peat found in the Baviaanskloof

The Baviaanskloof World Heritage Site, a mountainous conservation area of over 200 000ha, is situated in the south western part of the Eastern Cape Province in South Africa (Figure 1). The Baviaanskloof River that originates in this catchment area is characterized by steep mountains (Figure 2) on both sides of the relatively narrow linear valley that drains in an easterly direction before it joins the larger Kouga River system. The rainfall in this area is relatively low with an average rainfall of about 350mm per annum.
The Baviaanskloof River is regarded as an important river from a water resource point of view because it supplies water to the Nelson Mandela Metropolitan Municipality and the Gamtoos River Irrigation area. The western portion of the Baviaanskloof area has been subject to intensive livestock farming (mostly Angora goats and sheep) over the past 150 years. This farming practice resulted in denuding major parts of the succulent thicket vegetation that occur on the north facing Kouga mountain hill slopes. This resulted in increased water runoff and sediment loads ending in the Baviaanskloof River. Over the past 70 years farmers gradually also started to farm with irrigation lands (pastures and vegetables) on the alluvial sediments in the floodplains of the valley floor. The area experiences frequent floods and to protect their lands, many landowners modified the river by channelling the river and by creating large earth berms to divert the river away from intensively farmed lands. Some of the alluvial fans from side tributaries that feed into the main Baviaanskloof River were also altered to protect lands from flooding. With all these human impacts the condition of the Baviaanskloof River gradually deteriorated over the past 40 years. In some areas the river is incised by over 1.5 meters.

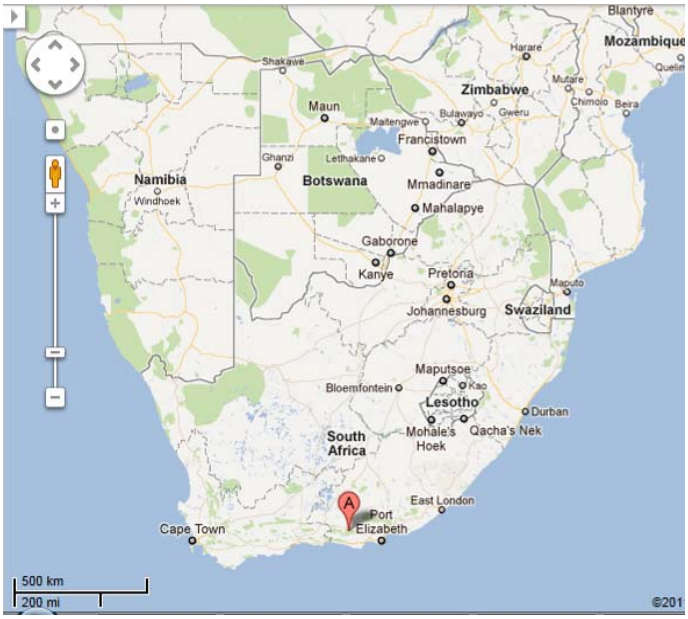


Figure 1: The Baviaanskloof World Heritage Site (indicated by the A-icon) is situated in the south western part of the Eastern Cape Province in South Africa

Discovering a peat layer in the river bed
Because of the conservation status of the area, many research initiatives have been undertaken in recent years in the area. The Working for Wetlands Programme was requested to investigate the possibility and potential for wetland rehabilitation projects in the Baviaanskloof River system. During one of the wetland assessment field visits the team discovered a well defined black dried out peat layer of about 30 – 40cm thick, together with an ash layer of about 20cm on top of the black layer, in the exposed incised river bed profile. This correlated with some of the old farmers' stories that that portion of the river used to burn for years in the early 1960's. The wetlands team never expected to find peat in this relatively dry climate area and the only explanation of this occurrence and formation of peat in this part is through the constant supply of groundwater from the nearby massive alluvial fan being fed with water from a large tributary. These alluvial fans act as major water storage areas and supply water to the main Baviaanskloof stream. There are two main reasons for the drying out of the peat layer: Firstly, over the last 40 years the main Baviaanskloof River has incised with every flood event to its current level

(lowering the base level) causing the gradual draw down of the water table. This can be contributed to the general degradation of the catchment area, resulting in more frequent high energy flow events, and the interference of the floodplains. The second reason is the altering (channelling) and diversion of the drainage from the alluvial fans. Sediment generated by the erosion of the catchment eventually covered the peat layer.

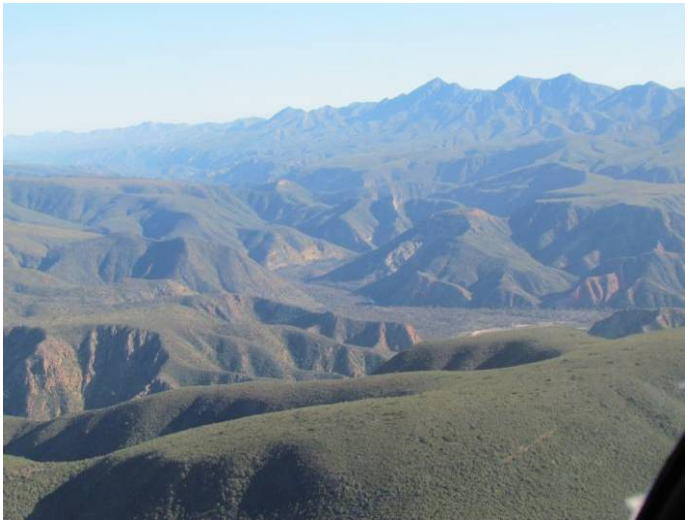


Figure 2: The Baviaanskloof River is characterized by a catchment with steep mountains.

Figure 3: Farmers, academics, students and wetland field workers studying the peat layer in the exposed incised Baviaanskloof River bank.

Rehabilitation initiatives

Working for Wetlands and the Living Lands NGO (a Dutch initiative) have drawn up rehabilitation plans to restore some of the functioning of both the alluvial fans and the main Baviaanskloof River. Funding was received through Living Lands from the Dutch Government and work started in September 2011with the rehabilitation of four of the alluvial fans. Work will continue for the next three years to try and restore the natural drainage of the area. Working for Wetlands will invest funding by building low gabion rock weirs across the incised channels in the floodplain of the main river to act as sediment traps in an effort to build up the base level of the river channel. All artificial diversion walls will be removed from the floodplains and used for infill material. Only time will tell how successful these efforts might be to ensure a more natural functioning river system. Other catchment rehabilitation initiatives are also been undertaken e.g. the planting of "spekboom" (*Porticularia afra*), an indigenous succulent plant, on the denuded hill slopes. All this work is done with the good cooperation of the landowners (Figure 3).

Japie Buckle

South Africa's wetland community recognises contributions of IMCG members

The South African wetland community held its annual National Wetland Indaba *("Indaba' is the Zulu word for gathering*) from 22 – 24 Oct 2011 in the Ukhahlamba Drakensberg Transfrontier Park (with Lesotho). This park is both a World Heritage and a Ramsar site and was very appropriate setting for this prestigious event on the South African wetland calendar. This year's meeting was special in that it was the 1st time since 2003 that the South African wetland community was to recognize its members for outstanding service.

The new National Wetland Awards sponsored by paper giant Mondi will be awarded annually to recognise outstanding contributions of those doing wetland work. The awards are unique bronze Wattled crane sculptures designed by sculptor Sarah Richards. These will be presented as floating trophies to recognise outstanding contributions or achievements in the broad wetland community and to showcase successful or innovative work by the wetland sector to the public through media coverage.

The awards highlight achievements in: the better management of wetlands through stewardship, the development of skills for improved wetland management and conservation, as well as achievements in wetland scientific research. We are proud to announce that IMCG members are amongst the recipients:

- David Klein received the Wetland Stewardship Award for furthering wetland and mire conservation in the National Department of Agriculture and applying the Conservation of Agricultural Resources Act to protect wetlands and peatlands (this same act was used in the past to permit peat extraction and drain wetlands).
- Donovan Kotze received the wetland Scientific Research Award for his solid contribution to wetland research in South Africa which with his

high standards and by good practice had lead to a significant improvement in how we understand and manage wetlands in this country. His commitment has been exemplary to the wetland scientific community who followed in his footsteps.
- The Mpumalanga Wetland Forum (MPF) was awarded for "Promoting the wise use, effective management and rehabilitation of wetlands in the Mpumalanga Province through co-operative governance by engaging all public and private sectors to achieve its objectives". Some hardworking IMCG members in the MPW include Anton Linström. The IMCG salutes Gavin Cowen, the MPF chair and his team.

Recipients of the South African National Wetland Awards (from left to right): Gavin Cowden (Chair: Mpumalanga Wetland Forum), Chris Burchmore (Mondi: Award Sponsor), Donovan Kotze and David Kleyn. Photo: Pontso Pakkies.

News from Indonesia: Symposium on Wetland Ecosystems

From 11-14 April 2011 a symposium on Tropical Wetland Ecosystems of Indonesia, sponsored by the US Department of State took place on Bali with the aim to link up ecosystem science with governance and economy. Indonesia holds 23% of the global mangroves and probably over half of the world's tropical peatlands. Background is the development of a national strategy for REDD+ with innovative solutions to bring benefits for local people and the environment. Some highlights of the symposium:

Pep Canadell presented the latest figures on the global Carbon budget and the role of forests and peatlands (see also www.globalcarbonproject.org/news/forestsink.html). The emissions from fossil fuels are currently 7.7 ± 0.5 PgC, those of land use and land use changes (LULUCF) 1.1 ± 0.7 PgC without peat and 1.4±0.8 with peat. 4.1 ± 0.1 PgC (47%) of these emissions remain in the atmosphere as increased CO_2 concenrations, 2.4 PgC (27%) is sequestered in the increasing biomass pool, and 2.3 ± 0.4 PgC (26%) ends up in the oceans. The emissions in 2009 were 37% higher than those in 1990, and over 2000-2008 an annual growth rate of 3.2% has been observed.

Since 2005, coal is more important than oil and the emissions of developing countries are more important than those of developed countries. Since 2000 land use in the temperate zone is a net carbon sink, whereas land use in the tropics is a declining source. Since 2000 a strong decline of emissions is observable also in SE Asia, with values currently similar to those in the 1960s and 1970s. In 2000-2005 Brazil and Indonesia were responsible for 60% of the global LULUCF emissions.
Peat decomposition and peat fires increase the emissions from land use globally with 27%. Emissions from peat are responsible for 3 % of the total global anthropogenic CO_2 emissions.

Jyrki Jauhiainen presented new data on greenhouse gas fluxes on the basis of an extensive nearly 3 year's case study in an Acacia pulp tree plantation in Riau, Sumatra. The locations were representative of the various Acacia crop growth cycle stages, including post-harvest. The water table was controlled at an average of about 0.8m below the surface. Over 2300 CO_2 emissions measurements were obtained from 144 monitoring positions established along eight transects, located across one large peat dome. This provides the largest and longest CO_2 emissions database from co-located, multiple locations in a single tropical peatland. Most important results:
- No dependence was found between CO_2 emission arising from peat decomposition and momentary water table depth.
- A stronger correlation (R^2 = 0.47) was found between long-term average peat CO_2 emission and long-term average water table depth.
- CO_2 emissions still increase under drainage deeper than 0.5 m.
- The mean heterotrophic (i.e. root respiration excluded) peat CO_2 emission rate is estimated to be 92 t CO_2 $ha^{-1}y^{-1}$ at 0.78 m mean annual water table depth, which is substantially higher than previously assumed.
- CO_2 fluxes from peat in drained areas with plantations were 14-80 % higher than those from bare peat areas.
- Carbon losses with DOC/POC can be substantial, but are often forgotten.

Boone Kaufmann saw tropical peat forests as excellent candidates for inclusion in REDD+. He mentioned an ecosystem C pool of 500 – 2000 Mg/ha for tropical freshwater wetland forests. Much carbon is also stored in the mineral substrate beneath the peat.
Coastal ecosystems have only 0.05% of the global biomass but fix a comparable amount of C per year to tropical rain forests (Nelleman et al. 2009). Tidal forests occupy globally 140,000 – 400,000 km^2 in 124 countries. Mangrove soils contain 12 – 15% C (of dry mass) of C, with estuarine ecosystems having 1000 Mg/ha below ground and oceanic ecosystems 600-800 Mg/ha. 75% of all tropical commercial fishes spend part of their life in mangroves.

The annual rate of deforestation in mangroves in SE Asia is 8%, leading to a loss of 2-7% of the 'blue carbon' sinks. Most conversion is to shrimp farms including pond construction by removing and heaping soil. This carbon is supposed to gone lost.

Aljosja Hooijer presented an overview of findings on subsidence and carbon loss in tropical peatlands. His recent field research included monitoring of peat surface subsidence rates and water depth at 174 locations in Sumatra, for 1 to 9 years, in acacia and oil palm plantations. Bulk density measurements of over 1000 samples from 29 vertical soil pits up to 2.3 m depth allowed separating the oxidation, consolidation and compaction components of subsidence. Most important findings:

- • Consolidation (below water level) and compaction (above water level) are dominant contributors to subsidence in the initial period after drainage, amounting to 0.75 m in the first year only. Oxidation becomes dominant in subsequent years and after 18 years oxidation accounts for 92% of the subsidence over the entire period since drainage. Bulk density does not appear to increase beyond 5 years after drainage, as indicated by nearly identical bulk density profiles after 5 and 18 years, which suggests an oxidation contribution to subsidence approaching 100%.
- • Subsidence rates after 5 and 18 years are very similar, around 5 cm/y on average. This confirms the dominance of oxidation.
- • A relation between water depth and subsidence is apparent. However, other factors including soil temperature, soil disturbance and fertilization also appear to influence carbon loss and subsidence.
- • No consistent difference was found in subsidence and carbon loss at the oil palm and acacia plantation sites.
- • Based on subsidence and bulk density, annual carbon loss from peat amounts to 70 tonnes ha^{-1} y^{-1} CO_2 eq. at all plantation locations after the first 5 years. Annualized over 50 years, including the initial years when carbon loss is well over 100 t ha^{-1} y^{-1} CO_2 eq., an average carbon loss of 86 t ha^{-1} y^{-1} CO_2 eq. is found. These results are exclusive of the carbon loss due to fire, biomass removal and oxidation in adjoining peatlands affected by plantation drainage (including access roads).
- • Subsidence and bulk density measurements can yield accurate peat soil carbon loss figures, if methods are applied rigorously.
- • As there is no evidence of a further decrease in subsidence and carbon loss in time after the first 5 years, and as controls other than water table depth are also important, improved water management in plantations may reduce carbon loss and subsidence by some 10%. The remainder should be accepted as inevitable.

Grahame Applegate gave an overview of the Indonesia – Australia Forest Carbon Partnership (IAFCP), in which Australia provides to Indonesia $A13 million for developing a national policy framework for REDD (policy development, fire management, program management), $A10 million for developing the Indonesia National Carbon Accounting System (INCAS), $A47 million for the Kalimantan Forests and Climate Partnership as a practical REDD+ demonstration, and $A30 million for the Sumatra Forest Carbon Partnership, a second REDD demonstration activity in Indonesia.

The goals of the Kalimantan Forest and Climate Partnership are to develop science based methodologies to estimate emissions, to estimate historical and future emissions, to forecast effects of REDD interventions e.g. by canal blocking, fire management, and reforestation, and to enable Indonesia to participate in international carbon markets.

A demonstration site is selected in C-Kalimantan, 120,000 ha of one peat dome, of which roughly 70,000 ha is intact and 50,000 ha severly degraded. About 10,000 people live in the area in 14 villages and hamlets along the western edge of the site.

The accounting methodology is based on a review of science and should be consistent with the IPCC 2006 guidelines, tier 3 level. It should be a simple approach that can be applied to REDD+ projects on peat soils. Key elements of the methodology include remote sensing of forest disturbance, peat CO_2 emissions as a function of subsidence, default values for other biological peat emissions, fire emissions as a product of area burnt and mass of peat combusted, and biomass monitoring with 'C accumulation curves' following and prior to disturbance. Research needs include:

- Improved spatial data on C and N stocks in peat, and how they vary with depth
- Better understanding of the relationship between subsidence and other characteristics and CO_2 emissions
- More reliable fire emission factors (GHG release/mass of peat combusted)
- Knowledge of the modified N cycle in drained/deforested/burnt peatland
- Temporal pattern of forest C accumulation by new plantings, or after disturbances by logging and fire.

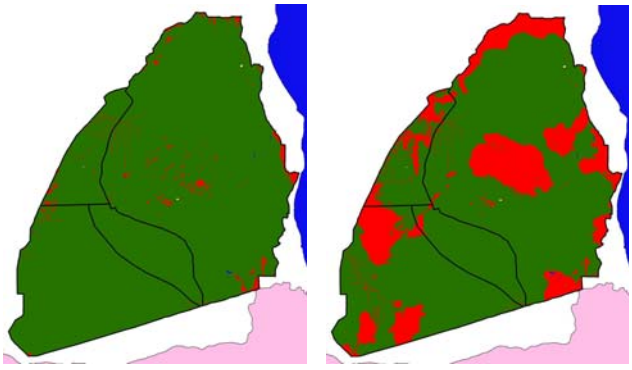
Agus Suratno gave a presentation on peatland distribution and vegetation change in the Berbak ecosystem (Jambi, Sumatra).

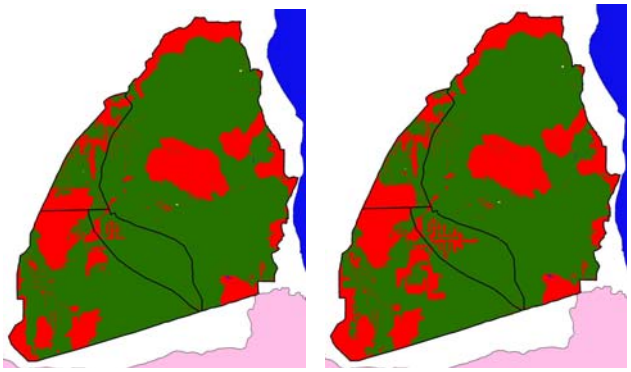
Between 1990 and 2000 17% of the study area was deforested, and 22% of Berbak National Park (the eastern part of the study area was degraded. Around 3,000 ha were cleared and burned in May 1998 following the 1997 El Nino. Fire burned more than 16,000 ha.

Between 2000 and 2005 more than 22% of the TAHURA conservation forest area (the central western part of the study area) and 10% of production forest (in the southwest) was lost.

Between 2005 and 2009 8% areas of protected forest in the centre and of the TAHURA forest were lost, and 13.5% of the production forest. In total, the

average annual deforestation rate between 1990 and 2009 was 2%.





Deforestation in Berbak National Park (Sumatra, Indonesia); green forested, red deforested.

Jukka Miettinen presented the latest detailed insights in peatland deforestation in Sumatra and Kalimantan over the 1990s and 2000s.

Peat swamp forest in Sumatra and Kalimantan (km^2)

	1990	2000	2010
Sumatra	49 216	30 785	18 069
Kalimantan	38 570	28 692	24 035

In 1990-2000 deforestation especially took place in Central-Kalimantan and South Sumatra, in 2000-2010 especially Riau (Sumatra). Fires appeared to be closely associated with areas under deforestation.

Presentations/abstracts of the workshop can be downloaded from:
http://www.forestsclimatechange.org/workshop-on-tropical-wetland.html

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News from Malaysia
Rehabilitating Raja Musa Peat Swamp Forest

A barren land occupied by *lalang* – that used to be Raja Musa Peat Swamp Forest Reserve. Now, Raja Musa Forest Reserve (RMFR) is reviving and restoring its ecology and biodiversity since the inception of community based rehabilitation programme by GEC and Selangor State Forestry Department in 2009. The programme was the first of its kind in Malaysia in which public/volunteers are invited to participate in the rehabilitation activities in a forest reserve. The response was great as hundreds of volunteer participated in the rehabilitation activity. Opening up canals to drain out the water for agricultural activities has caused RMFR to lose its hydrological function. This caused carbon emission and several forest fire incidents in the area especially during hot weather and dry season. To restore its hydrological function, the existing or abandoned canals in Raja Musa need to be block to increase the water table and sustain the amount of water in peat soil.

News from Canada
Line Rochefort winner of the IPS Award of Excellence 2011

The IPS Award of Excellence 2011 went to our IMCG Main Board member Dr. Line Rochefort of Université Laval, Québec, Canada. Line is a full Professor at the University's Department of Plant Sciences and has been holding the Industrial Research Chair for Peatland Management since 2003, mainly specializing in peatland restoration. Her scientific activities include restoration ecology, peatlands ecology (fen and bogs), Sphagnum biology, bryophyte ecology, ecosystem experiments, plant-soil interactions in mosses, ecosystem rehabilitation and Sphagnum farming (see elsewhere in this Newsletter). She is actively collaborating with the Canadian peat industry with respect to peatland restoration after peat extraction, berry and tree production on peatlands, Sphagnum farming and recently with oil sands companies researching ways to recreate fens after the decommission of sites, and with polymetallic mining companies to restore peatlands-wetlands for their filtration capacities. Last but not least, Line Rochefort works as expert advisor for different levels of government in Canada and within the Canadian provinces where peatlands are involved, including departments of agriculture, forestry, environment, natural resources and transport. She was for many years Chair of Commission V of the International Peat Society (IPS) on "Restoration, rehabilitation and after-use of peatlands", has organised numerous conferences, symposia and workshops on different peatland matters and had a large share in editing the IPS guide to organising scientific events. The IPS Award of Excellence was launched in 2005 and comprises of a framed scroll and a cash prize of € 1000.

Fuel peat activities in Ontario, Canada

Peat Resources Limited has renewed its permits on 19,000 hectares of peatlands in the Upsala area of north-western Ontario and has received a Letter of Authority from the Ontario Ministry of Natural Resources to carry out surveys and resource

evaluations of peatlands in the McFaulds Lake (Ring of Fire) region. The Upsala properties contain approximately 200 million tonnes of fuel-grade peat (defined at NI 43-101 standard). The peat resources are within economic transportation distance of OPG's Atikokan Generating Station and the Port of Thunder Bay. Peat Resources Limited is in discussion with mining companies, and provincial government authorities, urging consideration of the use of peat fuel to supplement the energy needs of these mining and ore processing developments as well as the introduction of peat-fuelled combined-heat-and-power systems in remote (off-grid) First Nations communities. The company's small-scale peat fuel production operation in Stephenville, Newfoundland serves as a demonstration facility for these remote applications. For more information, please see www.peatresources.com.

News from Russia
Restoring peatlands in Russia

More than 8% of Russia's land area is covered by peatlands. In the past, these were drained on a large scale to gain land for agriculture, forestry, and peat extraction. Following the collapse of the Soviet Union, many of these former peatlands fell out of use. Today, many of these now fallow areas – a total of ca. 2.75 million hectares – pose a serious fire hazard. In addition, they represent a source of greenhouse gases that result from peat mineralization caused by the drainage. In view of the devastating peatland fires of 2010, the Russian government has decided to initiate the rewetting of degraded peatlands as a preventative measure, and has applied for international support for this undertaking.

An agreement signed by German chancellor Angela Merkel and Russia's president Dmitri Medvedev in July of 2011 lead the way for a joint Russian-German project that includes German investments for further development of technical expertise and Russian investments for the rewetting measures'actual implementation.

The project aims to reduce the greenhouse gas emissions resulting from peatland drainage and peatland fires by c. 10 tons of CO_2-equivalents/ha/year through climate-optimized rewetting and sustainable management of degraded peatlands in the European part of Russia. At the same time, this will lead to an increased biological diversity and reduced fire danger in these areas and will open new sources of income to the local population. In addition, the project aims at creating an improved legal and political framework for these restoration measures through a clear definition of the responsible authorities, the development of guidelines for a national greenhouse gas inventory, and the inclusion of peatland protection and rewetting into a follow-up agreement to the Kyoto Protocol.

Project activities include an inventory of peatlands and prioritization of areas intended for rewetting, the rewetting of peatlands, e.g., in the Moscow Oblast, but also in other areas and establishing monitoring systems for greenhouse gases and biodiversity. Moreover, the project aims to offer advanced training measures, draw up recommendations for policy and statute revisions regarding sustainable peatland management, and develop new approaches and mechanisms for a financially and ecologically viable and sustainable peatland use.

The project is financed by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety through KfW development bank in the framework of the International Climate Initiative (ICI). It is a joint venture of Wetlands International (Netherlands), represented locally by Wetlands International Russia, the Michael Succow Foundation, the University of Greifswald, and the Institute of Forestry at the Russian Academy of Sciences. It is carried out in cooperation with the Oblasts' responsible administrative bodies and the Russian Ministry of Natural Resources and Environment.

News from Latvia
Klasmann-Deilmann expands in the Baltics

Klasmann-Deilmann is stepping up its activities in the Baltic region and is now also active in Latvia. With effect from 13 September 2011, the Group has acquired the Latvian company Blue Mountain Peat SIA, which produces milled and sod-cut white peat over an area of around 1,325 ha within the Valmiera district. The extraction enterprises in the towns of Zilaiskalns, Raki, Tevgarsas, Koceni and Ozolmuiza operate with a workforce of around 60 under the name Klasmann-Deilmann Latvia SIA. Klasmann-Deilmann has been active in the Baltic states since the early 1990s. Its business activities in the region are focused on its four subsidiaries in Lithuania. In Silute, a state-of-the-art growing-media factory went into production in 2010. With annual production exceeding 1 million cubic metres, it is one of the largest in Europe. The Klasmann-Deilmann Group is the world's leading producer of growing media for commercial horticulture. The company is set to generate turnover of more than € 150 million in the 2011 financial year, employing some 810 people in Europe, Asia and the USA. More information and the full press release can be found at the website of the company at www.klasmann-deilmann.com/en/news_2/news.

Source: IPS News

News from the UK
Reduction of Peat in UK Horticulture

Defra, the UK government department responsible for policy and regulations on the environment, food and rural affairs, has set out a new policy framework to reduce the use of peat in horticulture to zero by 2030 as part of the Natural Environment White Paper. This includes the following milestones:

- a progressive phase-out target of 2015 for government and the public sector on direct procurement of peat in new contracts for plants;
- a voluntary phase-out target of 2020 for amateur gardeners; and
- a final voluntary phase-out target of 2030 for professional growers of fruit, vegetables and plants;
- Defra will establish a Task Force bringing together representatives from across the supply chain with a clear remit to advise on how best to overcome the barriers to reducing peat use, exploring all the available measures to achieve this goal;
- building on the advice of the Task Force, Defra will review progress towards these targets before the end of this spending period and consider the potential for alternative policy measures if necessary.

The summary of responses to Defra's recent consultation on this issue can be found under: www.tiny.cc/lu4mg

Two research reports provide part of the evidence base for the paper above:

- Research on the costs of phasing out peat in the hardy nursery stock sector: www.tiny.cc/rxr1a
- Research on use of peat in growing media in other countries: www.tiny.cc/d60bq

IUCN Commission of Inquiry

The proceedings from the conference 'Investing in Peatlands: Delivering Multiple Benefits', held in Stirling summer 2011 are now available online:
www.iucn-uk-peatlandprogramme.org/2011presentations
www.iucn-uk-peatlandprogramme.org/2011posters
www.iucn-uk-peatlandprogramme.org/2011proceedings

The final technical reviews that contributed to the IUCN UK Commission of Inquiry on Peatlands and resulting briefing notes are now available as downloads on the website www.iucn-uk-peatlandprogramme.org/scientificreviews. See also elsewhere in this Newsletter.

The 2012 IUCN/BES conference 'Investing in Peatlands: Demonstrating Success' is held in collaboration with the British Ecological Society at the University of Bangor on 26-28 June 2012. More information at www.iucn-uk-peatlandprogramme.org/2012conference

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News from many countries:
Peat Extraction Summer 2011

(quoted from IPS Peat News September 2011).

"The following information was collected by the IPS Secretariat in August and September from our National Committees and Industry Associations, for more details please contact these organisations:

Belarus: The extraction of peat in Belarus in 2011 amounted to 3.2 million tons *(Alexey Osipov, Beltopgaz)*

Canada: Poor weather conditions have caused Canadian peat harvesting to fall short of targets in the 2011 season. Harvesting has been especially difficult in the East of the country where only 15-30% of historically targeted requirements have been met. Continuous and heavy rainfall conditions throughout Eastern Canadian peatlands have impacted on the ability of the industry to harvest expected volumes. The areas hardest hit are in New Brunswick and Québec, accounting for 60-70% of all of Canada's peat production. The conditions at the end of September were so unfavourable that the harvest season has practically concluded. Weather conditions have been better in Western Canada, where harvesting is continuing in some locations. That area, however, represents only 30-40% of the total Canadian production. The outcome is that overall the industry is facing one of its poorest peat harvest seasons. The peat industry is committed to working cooperatively with its commercial business partners to minimize the short-term impacts for the horticultural and agricultural industries. *(press release Canadian Sphagnum Peat Moss Association)*

Sod peat extraction in Germany (August 2011).

Finland: According to preliminary figures gathered by the Association of Finnish Peat Industries, peat production accumulated up to 22.3 million cubic meters in 2011. This is only 75% compared to the long-term average production figures. Energy peat was produced little less than 21 million cubic meters (18.7 TWh) and horticultural & environmental peat about 1.5 million cubic meters. Due to low production and storage levels, peat demand will exceed supply within the coming winter months,

endangering the national security of supply. The active peat production area amounted to 62,400 ha (0.7% of the total peatland area in Finland). Some 3,000 ha of peat production sites move on to new land use forms annually, mostly to forest, agriculture and various wetland ecosystems. Old production sites usually suffer badly from rainy season conditions, and there is an urgent need for new production areas – efforts are taken to speed up the environmental permission process in our country. *(Hannu Salo, Association of Finnish Peat Industries)*

Germany: Until June, the production season went very well, and about 80-90% of our targets could be harvested. After that, the weather conditions were very bad and production nearly impossible. We do not believe that there will be shortages, but there might be a lack of supply from the Baltics as, due to unsuitable weather, production in those countries was even lower. *(Johannes Welsch, Industrieverband Garten)*

Ireland (August): After an excellent early start in April to the peat production season in Ireland about 40% of normal annual volumes were achieved by the end of May. However, weather since then has been broken with a lot of rainfall (well above average) and very patchy drying. Just now, almost at the end of August, volumes harvested are about 75 - 80% of normal and the weather outlook continues to be mixed. (Pat Fitzgerald, Bord na Móna)

Latvia (August): Until June weather conditions in Latvia were very good. Many extractors started their season already just after Easter. It was raining a lot in July and August, therefore peat extraction amounts were small. The average production amount in Latvia in the last five years (2006 - 2011) is approx. 790,000 t. Up to August, about 700,000 t were produced and because weather forecast for September promise a lot of rain the total production amount can reach just 720 - 750 which is more than last year (694,000 t) but less than average. Market situation - demand is greater than supply. (Ilze Ozola, Latvian Peat Producers' Association)

Norway: This season has been the poorest season ever for peat production in Norway. The peat producers have harvested much less than the demand for peat in the market. Many meteorological measuring stations have received more than annual normal precipitation in the period January to September. For the period January to August this year has been the wettest since 1900 for eastern Norway (150 % of normal), and for Norway as a whole this year was the fourth wettest since 1900 (135% of normal, see http://tiny.cc/gssae). In September, the rainy period has continued, causing flooding of rivers and agricultural land. The weather forecasts are not positive and no long periods without precipitation are expected. Therefore 2011 will end up as a very poor year for peat production in Norway. (Trond Knapp Haraldsen, Norwegian Peat Producers Association)

Russia: In 2011, peat was harvested industrially by 36 enterprises, which produced approximately 1,650 thousand tons. The weather in the North-Western region (Karelia, Pskov, Novgorod, St. Petersburg) allowed proper work only in June. The rest of the time was heavily influenced by rainfall. In other regions of Russia the weather was fine, allowing better production. *(Alexander Ivanov, Russian National Committee)*

Sweden: The weather has been very different in different parts of Sweden. A lot of rain in the southern parts, almost no rain in the middle and a normal amount of rain in the northern and northeastern parts. The weather was good to the end of June; July and August gave large amounts of rain, resulting in very low peat production in the southern parts. The biggest peat producer, Neova, is rather content with their peat harvest this year. Stefan Östlund, project manager: "Neova has harvested aprox 75% according to our plan. We hope that we can harvest 10% more before autumn is over. We have a large demand of peat and we are dependent on import." In general, bad weather conditions gave less peat production as expected, with southern parts of Sweden having the most difficulties. In addition, the local demand is much larger than the production, resulting in a dependence on imported peat. *(Marie Kofod-Hansen, Swedish National Committee)*

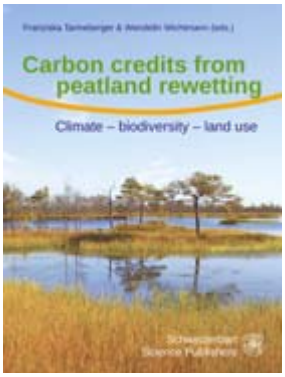
Ukraine: The Ukrainian peat producers produced in 2011 in total 394 thousand tons of milled peat (for the manufacture of bricks) and 60 thousand tons of milled peat for use in agriculture, horticulture and floriculture. Sod peat is almost not extracted. The weather season is satisfactory, but in July rain prevented harvesting. *(Volodymyr Hnyeushev, Ukrainian National Committee)*

New and recent Journals/Newsletters/Books/Reports/Websites

Nature Iraq has made a documentary on the restoration of the Mesopotamian marshes. Watch part of the documentary on YouTube: Nature Iraq Staff Embrace Magical Marshlands.

The **ASEAN Peat project** has recently uploaded various interesting films on peatlands in Southeast Asia. Take a look:
http://www.youtube.com/user/ASEANPeatProject

Tanneberger, F. & Wichtmann, W. (eds.) 2011. Carbon credits from peatland rewetting: Climate – biodiversity – land use. Science, policy, implementation and recommendations of a pilot project in Belarus. Xii + 223 p. € 39.80 (English) or € 29.90 (Russian)



Carbon credits from peatland rewetting – The idea is good, but how to put it into practice?
Drained peatlands account for only 0.3% of the global land area. At the same time, they are the source of a disproportional 6% of total anthropogenic CO2 emissions; a problem that needs to be addressed. The 'hotspots' are well known: South east Asia, Central and Eastern Europe, parts of the United States and Northeast China. The solution is obvious: Restore high water levels in peatlands.

But many questions remain. How does rewetting affect greenhouse gas fluxes? What about methane? Are the emissions measurable, reportable and verifiable? Are emission reductions from peatland rewetting creditable towards Kyoto Protocol commitments? Can they be sold on the voluntary carbon market? How does rewetting influence biodiversity? And, may rewetted peatlands still be used productively?
Belarus ranks 8th among the world's countries in terms of peatland CO2 emissions and occupies 3rd place in emissions per unit land area. In recent years, tens of thousands of hectares of drained peatlands in Belarus have been rewetted.
This volume provides a synthesis of the challenges encountered and solutions adopted in a pilot project conducted in Belarus between 2008 and 2011. It presents data and conclusions from the project and relates basic principles to advanced applications, integrating science and politics, ecology and economy. The experiences and recommendations set forth in this volume will inspire practitioners, scientists and politicians alike.
Available in both english and russian. More information:
http://www.schweizerbart.de/publications/detail/isbn/9783510652716/Carbon_credits_from_peatland_rewettingbrClimate_biodiversity_land_use

Michaelis, D. 2011. Die *Sphagnum*-Arten der Welt. Bibliotheca Botanica, Heft 160, Schweizerbart, Stuttgart, 408 p, 10 fig., 194 plates (in German)

Sphagnum peat mosses are of immense economic and ecological importance. They occur on almost all continents, mainly in northern South-America, North-America and east and north-east Asia as well as in Europe.
The genus *Sphagnum* is very isolated within the Bryophyte plant division. Similarities in sporophyte design suggest a distant relationship with lantern mosses (Andreaeopsida). Only recently the genus *Ambuchanania* was identified as more closely related, but this genus similarly shows strongly derived characters. The genus *Sphagnum* is monophyletic; various approaches exist for its division in up to 4 subgenera and up to 18 sections. This revision discriminates 13 sections, including the newly established section *Lapazensis*.
Among mosses the genus *Sphagnum* displays a singular combination of leaf-dimorphism (stem and branch leaves), branch-dimorphism (standing and hanging branches) and cell-dimorphism within leaves (living chlorocytes and empty halocytes). Hence, assigning mosses to the genus *Spagnum* generally is not a problem. However, identification to the species level may be difficult because of the wide morphological plasticity in relation to hydrological conditions found in some species. In combination with differences in species concepts, this morphological plasticity has led to the recognition of narrowly or broadly defined species – up to the almost total negation of the existence of species. The total number of *Sphagnum* species has been estimated between 150 and 450.
This book offers an identification guide to all *Sphagnum* species worldwide. Since Carl Warnstorf's 'Sphagnologia Universalis', published in 1911 as part of A. Engler's 'Die natürlichen Pflanzenfamilien', it is the first complete overview of the genus *Sphagnum*. Warnstorf used a rather narrow species concept, describing many morphotypes as separate species. Since 1911, numerous synonyms have been recognised, particularly through the works of Andrews, Eddy and Isoviita. Their revisions as well as c. 150 newly described species and own research

provide the basis for the current volume. Delimitation of difficult taxa furthermore makes use of the results of recent genetic research.
Chapter 1 gives an overview of *Sphagnum* anatomy and morphology, providing the necessary terminology for description and identification. In addition, the reproductive biology and phylogeny are described together with a short account of research history. Chapter 2 provides descriptions of and a key to the sections. A key to the species, arranged by continent, is given in Chapter 3, complemented by species lists for 19 biogeographic regions. The keys to the *Sphagnum* species of Africa, Europe and North-America were developed on the basis of existing work. The keys for Asia and South-America are entirely new. Detailed descriptions of 286 *Sphagnum* species can be found in Chapter 4. In addition to morphological-anatomical characteristics, habitat, geographic distribution and synonyms are given. This chapter includes 194 plates showing morphological and anatomical details. A comprehensive list of references allows for access to older literature on *Sphagnum*.

Abel, S., Haberl, A. & Joosten, H. 2011. A Decision Support System for degraded abandoned peatlands illustrated by reference to peatlands of the Russian Federation. Michael Succow Foundation for Protection of Nature, Greifswald, 52 p. (in Russian and English).

The huge peatland fires of 2010 have brought the drained and abandoned peatlands in Russia under the attention of the world. Drained peatland soils are subject to inherent degradation, which continuously lowers their economic value. Since the 1990s millions of hectares of peatland drained for agriculture, forestry and peat extraction have been abandoned in Russia. The drainage systems that were installed during the soviet period, however, continued to work.
If not rewetted, drained peatlands continue to go up in air by incessant microbial peat oxidation and – in case of abandonment – also by periodic uncontrolled peat fires, such as those in 2003, 2007, and 2010. Every year the drained peatlands in European Russia emit tremendous amounts of carbon dioxide, making Russia one of the largest CO_2 emitters from drained peatlands worldwide. Comparable amounts of CO_2 were released to the atmosphere during peat fires in Russia in 2010.
Peatland fires can only be prevented when peatlands have a clear economic value or when they are effectively rewetted. Rewetting not only precludes peat fires but also strongly reduces microbial peat oxidation and consequent CO_2 emissions.
The Decision Support System (DSS) provides decision makers with background information for wise decision making with respect to the management of degraded and abandoned peatlands, with special attention to reducing CO_2 emissions.
The brochure is bilingual in English and discusses:

- various management (incl. utilisation) options,
- advantages and disadvantages of these options, and
- conflicts and synergies between these options.

The DSS is organised in modules that deal with:
- rewetting to reduce greenhouse gas emissions,
- rewetting to reduce fire hazard,
- nature conservation, and
- utilisation / production (peat extraction, agriculture, forestry, and paludiculture).

Additionally compatibilities of different aims (production, biodiversity, conservation, climate change mitigation, and fire hazard reduction) are discussed in a conflicts and synergies module.
Parallel to the guidance, each module is elaborated in a dichotomous decision tree where simple “yes” / “no” decisions lead to recommendations and advices to find best solutions. The DSS brochure can be downloaded from the homepage of the Michael Succow Foundation: http://www.succow-stiftung.de/tl_files/pdfs_downloads/Buecher%20und%20Broschueren/DSS_Broschuere.pdf
The tool is an outcome of a BMU ICI project run by the Michael Succow Foundation (Greifswald, Germany) that aimed at developing an implementation strategy for protecting climate and biodiversity in the European part of the Russian Federation.
The project consortium of Michael Succow Foundation, Greifswald University, Russian Academy of Sciences, and Wetlands International Russia also developed a proposal for a large BMU ICI implementation project: “Restoring Peatlands in Russia - for fire prevention and climate change mitigation” (PEATRUS). The proposal has been accepted and the project will be implemented in the coming years.

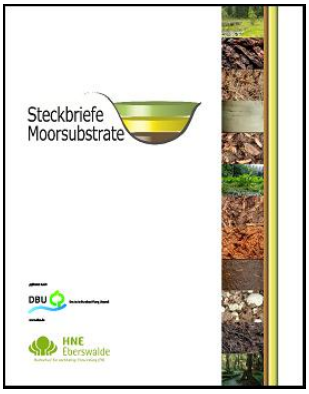
Bringing Life Back to the Bogs

RSPB Scotland has produced a leaflet ‘Bringing Life Back to the Bogs’, which summarises the extensive peatland restoration work at the Forsinard Flows nature reserve in the Flow Country (Scotland), together with a policy report ‘Realising the Benefits of Peatlands: Overcoming policy barriers to peatland restoration’.
The Royal Society for the Protection of Birds RSPB has long been a champion of peatlands and at the heart of its work in the UK has been the massive conservation undertaking in the Flow Country. Through its work at Forsinard RSPB aims to showcase the amazing wildlife spectacle these peatlands offer and to demonstrate the wider benefits of biodiversity conservation for key services such as carbon storage.
This trialling of large scale peatland restoration techniques will inform others and encourage a step up in effort on the ground across Scotland and beyond. It is recognised that to achieve this scale of restoration and realise the many benefits, policy and fiscal

support is needed to influence the management of peatlands toward the goal of restoration.
To download the leaflet and the full report, or for more information, visit:
http://www.rspb.org.uk/ourwork/farming/policy/farmingsustainability/landuse/peatlands/index.aspx

Steckbriefe Moorsubstrate.

Prequisite for an effective planning of peatland conservation and restoration is knowledge about their origin and functioning. Much relevant information can be derived from their peat deposits, but regretfully the expertise to identify peat types in detail was hitherto restricted to specialists. The "Steckbriefe Moorsubstrate" fill an important gap by



presenting a comprehensive, detailed and scientifically reliable overview of 24 common European peat types, including detailed descriptions, informative pictures and ecological background information. The core of the 'Steckbriefe Moorsubstrate' are the 24 profiles, developed for use in the field, with a determination key and a key for determining degrees of humification or (in case of lake deposits) of consistency. The introductory part presents copious information about peatlands, peatland types, peat types and peat soils. Furthermore it contains protocols for describing peat profiles and for identifying peatland types on the basis of the sequence of peat types. Regretfully only in German, but an English version is being prepared. Download from: http://www.mire-substrates.com/download_ deu.html

Prentice, R.C. 2011. The peatland biodiversity management toolbox: A handbook for the conservation and management of peatland biodiversity in Southeast Asia. A compilation. ASEAN Peatland Forests Project -Rehabilitation and Sustainable Use of Peatland Forests in Southeast Asia. ASEAN Secretariat and the Global Environment Centre.

In February 2003, ten Member States of the Association of Southeast Asian Nations (ASEAN) endorsed the ASEAN Peatland Management Initiative (APMI) to act as a framework for collaborative activities to address peatland degradation and fires. Subsequently in November 2006, the ASEAN Ministerial Meeting on the Environment endorsed the ASEAN Peatland Management Strategy 2006-2020 (APMS) to guide the sustainable management of peatlands in the region.

The goal of the strategy is promote sustainable management of peatlands in the ASEAN region through collective action and enhanced cooperation to support and sustain local livelihoods, reduce the risk of fire and associated haze, and contribute to global environmental management. The strategy includes 25 operational objectives and 97 action points in 13 focal areas ranging from integrated management to climate change and peatland inventory. Countries in the region are currently in the process of developing and implementing their respective National Action Plans.
The preparation of this handbook was initiated under the project on Conservation of Peatland Biodiversity in Southeast Asia (Phase 2) supported by the ASEAN Centre for Biodiversity (ACB). Under the ASEAN Peatland Forests Project (APFP), the Handbook was revised and finalised as part of the Project's aim to promote the establishment of a network of protected peatlands through awareness and outreach to various stakeholders.
The handbook aims to advance biodiversity conservation issues by providing guidance to technical professionals and administrators on approaches and techniques for improved conservation and restoration of peatlands, as well as sustainable development practices and options including reducing the risks and impacts of land-uses in peatland areas.
The handbook summarizes information from existing scientific and technical literature and provides a reference to available guidance.
The handbook is divided into two parts. Part 1 provides introductory material on the nature and characteristics of peatlands, their distribution and extent in Southeast Asia, peatland biodiversity, threats, and the international policy framework for their management and conservation. Part 2 provides guidance on conservation approaches, minimising the impacts of land uses, and restoration and rehabilitation of peatlands.
In Part 1, Section 2 provides a brief overview of peatlands and the significance of peatland biodiversity in Southeast Asia, as a reminder that a globally significant resource is at stake. This is followed in Section 3 by an overview of the status of peatland biodiversity and the underlying causes for its progressive, serious loss and degradation. This underlines that the full commitment of national governments is required to tackle threats and put in place sustainable use practices for peatlands.
Section 4 describes the framework of global and regional policies, which are relatively comprehensive, but to be effective they need to be put into action on the ground through national policies, plans and programmes, such as the National Action Plans for Peatlands under the APMS, and integrated with other relevant policies (e.g. national wetland or biodiversity policies), plans and programmes. Downloadable (20 Mb) under: http://www.aseanpeat.net/ebook/toolbox/

Davies, J. 2011. Training module on peatland assessment and management. ASEAN Peatland Forests Project and Sustainable Management of Peatland Forests Project. ASEAN Secretariat and Global Environment Centre, 236 p.
A training module that contains comprehensive information on how to assess and manage peatland. Downloadable (> 40 Mb!) under: http://www.gec.org.my/view_file.cfm?fileid=2863

Rotherham, I.D. 2010. Yorkshire's Forgotten fenlands. Wharnecliffe Books, Barnsley, 181 p.
History of the cultural landscape of the Humber basin wetlands and the entire county of Yorkshire (England). A story of a changing landscape, the lost cultures and ways of life, and the wildlife that has gone too. With a vision for new wet fenland landscapes in the future.

Kolka, R.K., Sebestyen, S. D., Verry, E.S. & Brooks, K.N (eds.) 2011. Peatland biogeochemistry and watershed hydrology at the Marcell Experimental Forest. Crc Press, Boca Raton.
The Marcell Experimental Forest (MEF) in Minnesota serves as a living laboratory and provides scientists with a fundamental understanding of peatland hydrology, acid rain impacts, nutrient and carbon cycling, trace gas emissions, and controls on mercury transport in boreal watersheds. Its important role in scientific research continues to grow as the data gathered offers invaluable insight into environmental changes over the last century and goes far in answering many of today's pressing questions at landscape and global scales. Synthesizing five decades of research, 'Peatland biogeochemistry and watershed hydrology at the Marcell Experimental Forest' includes hundreds of research publications, dozens of graduate theses, and some previously unpublished studies. Research at the MEF has been at the forefront of many scientific disciplines and the 15 chapters offer the depth and breadth of long-term studies on hydrology, biogeochemistry, ecology, and forest management on peatland watersheds at the MEF. Focusing on peatlands, lakes, and upland landscapes, the book begins with the pioneering research on hydrology done during the 1960s.It presents the innovative 1970's studies of atmospheric deposition, the 1980's research into nutrient cycles including carbon, nitrogen, and methane emissions, and the 1990's investigations into mercury deposition. The book concludes with a look at the latest and on-going studies such as the current research into controls on methylmercury production and landscape-level carbon storage and cycling. Covering 50 years of research and written by a veritable who's who in peatland and forestry science, this important milestone in the collection of ecological data highlights bright prospects for future research, including the continuation of existing long-term measurements, the initiation of new monitoring programs, and plans for unprecedented studies on climate change.

Orru, M., 2010. Dependence of Estonian peat deposit properties on landscape types and feeding conditions. Eesti turba omaduste sõltuvus maastikutüüpidest ja turbalasundi toitumistingimustest. Tallinn University of Technology Press, Tallinn, 121 p.
This doctoral thesis aims at determining the relations between peat properties and the feeding conditions of the landscape, as determined by relief, geological setting and character of the Quaternary deposits. Based on analysis of 33,600 peat samples, the author distinguishes 20 peat districts. In Estonia, there are 9,836 peatlands with an area over 1 hectare. Peat reserves (with > 0.9 m peat on ≥ 10 ha) on 1,598 peatlands amount to 2.37 billion tonnes. For the remaining 8,238 peatlands data on area, peat thickness and peat type are stored at the Geological Survey of Estonia. Downloadable under: http://digi.lib.ttu.ee/i/?507 (25 Mb!)

New RHP Bog Flora
On request of its members, the RHP, knowledge centre for horticultural substrates and soil improvers, has produced a "RHP Peat Bog Flora" for people who are involved in the production of horticultural peat in Europe. Peatlands under extraction for horticultural peat have to be free of weeds. But not every plant on a bog is a weed and it is difficult for many employees to separate 'good' and the 'bad' species. The RHP Peat Bog Flora describes 86 plant species illustrated by more the 280 pictures. For every species, the harmfulness in horticulture is indicated. The Flora is published as a small handy and practical book, which can be used easily on site. For more information: www.rhp.nl.

Renou-Wilson, F., Bolger, T., Bullock, C., Convery, F., Curry, J., Ward, S., Wilson, D. & Müller, C. 2011. BOGLAND: Sustainable management of peatlands in Ireland. STRIVE Report no. 75. Environmental Protection Agency, Johnstown Castle, 177 p.
The full report "Bogland: Sustainable management of Peatlands in Ireland (STRIVE Report no. 75)" is available at http://www.epa.ie/downloads/pubs/research/land/strive75-bogland-for-web.pdf.
The more policy-related "Sustainable Management of Peatlands in Ireland PROTOCOL DOCUMENT (STRIVE Report No. 76)" is available at http://www.epa.ie/downloads/pubs/research/land/strive76-bogland-protocol-for-printing.pdf
Also the complete report (~1000 pages) which includes each individual report will be soon available on the EPA website.

IMCG Main Board

UPCOMING EVENTS

See for additional and up-to-date information: http://www.imcg.net/imcgdia.htm

9th Intecol Wetland Confernce Wetlands in a Complex World
3 - 8 June 2012, Orlando, USA
for more information visit:
www.conference.ifas.ufl.edu/INTECOL/

14th International Peat Congress - Peatlands in Balance
3 - 8 June 2012, Stockholm, Sweden
for more information visit: www.ipc2012.se

IMCG Field Symposium and Conference
Andes, July 2012
for more information keep an eye on www.imcg.net

Joint BES IUCN Symposium 2012 - Investing in Peatlands – Demonstrating Success
Bangor University, UK, 26 - 28 June 2012
for more information visit:
www.britishecologicalsociety.org/meetings/current_future_meetings/2012_annual_symposium/index.php

Rewetting of Raised Bogs
27- 28 June 2012, Schneverdingen, Germany
More info: www.dgmtev.de

5th International Meeting on the Biology of Sphagnum
10. - 19. August 2012, Tartu, Estonia
for more information visit:
natmuseum.ut.ee/Sphagnum2012

Mires and their catchment areas
6 - 8 September 2012, Schorfheide-Chorin, Werbellinsee, Germany
More info: www.dgmtev.de

Mires and peat as a raw material - GeoHanover 2012
1 - 3 October 2012, Hannover, Germany
More info: www.dgmtev.de

ISHS-IPS "International Symposium on Growing Media and Soilless Cultivation"
17-21 June 2013, Delft, the Netherlands
More info: www.grosci2013.nl

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