

# PEATLANDS

international

2/2011

**Welcome to Stockholm!**  
**14th International Peat**  
**Congress 3 - 8 June 2012**

# Talking of: sustainability

Klasmann-Deilmann is the most successful group of companies in the international substrate industry. With production and sales companies in Germany and abroad as well as trade partners in more than 70 countries, we lead the world market in this sector. Our growing media provide the basis for successful plant cultivation for professional horticulturists throughout the world.

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For members | Latest news | About us | Peatlands and peat | Events | Publications | Join us!

About IPS



Currently it has 1,450 individual and institutional members from 36 countries.

The vision of the IPS is to be the authoritative international organisation on all aspects of peatlands and peat.

[Read more»](#)

The International Peat Society (IPS) is a non-governmental, non-profit multidisciplinary organisation of scientific, industrial and regulatory members.

Video bank



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Latest news

IPC 2012: Abstract deadline today  
 IUCN UK: Publication of Commission of Inquiry on Peatlands Report  
 Consultation on the Guidelines for the Practical Implementation of...  
 International Peat Congress 2012 - New abstract deadline 30 November  
 Peat News 8/2011 published  
 IPS Press Release on Responsible Peatland Management Strategy  
 Preview Peatlands International 1/2011

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Online shop

Peat in Horticulture - Peat in the Stranglehold of Interest Groups, ...  
 Russian-English-German-Finnish-Swedish Peat Dictionary  
 Chemical, Physical and Biological Processes in Peat Soils ~...  
 11th International Peat Congress, Québec 2000  
 12th International Peat Congress, Tampere 2004 - Volume 1+2

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Document database

Resolving peatland management and conservation dilemmas through...  
 IPS Poster A3  
 Peat News 9/2011  
 Mire stratigraphy and peat resources in Latvia  
 Peat News 4/2011  
 Peat News 6/2011

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Open positions

Senior Research Associate for publication of annual CO2 budget  
 Postdoctoral research fellow in peatland science  
 Graduate Research Opportunity in Ecosystem Ecology  
 PhD in Plant Biology, Université Laval, Québec, Canada. Modelling...

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Peatland News



Carbon-credits.ie: Carbon Credits Can Be a Way to Preserve Peatlands in Ireland - PR Web (press release)  
 Group accuses Aceh leader of peatland destruction - Jakarta Post  
 Drought makes peat bogs release far more carbon - Planet Earth  
 Global-warming droughts threaten to unlock the CO2 in our peat bogs - WalesOnline  
 Aceh's 'green' governor breaks Indonesia's moratorium by granting oil palm ... - Mongabay.com  
 Peatland palm oil has twice the CO2 emission as previously thought - Biofuels Digest  
 Climate Change Will Affect Peat More than Expected - PlanetSave.com  
 Peatlands 'overlooked' as carbon store - BBC News

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Scholar



P.G. Langdon et al Nov 2011: Regional climate change from peat stratigraphy for the mid- to late Holocene in Central Ire...  
 M. Long & N. Boylan Nov 2011: Discussion on 'Peat slope failures and other mass movements in western Ireland, August...  
 Parsekian, Andrew D. et al 2011: Geophysical estimation of free-phase gas content and distribution in peatlands  
 El Bilali & Patterson Nov 2011: Influence of cellulose oxygen isotope variability in sub-fossil Sphagnum and plant m...  
 Whitfield et al Nov 2011: Managing Peatland Ecosystem Services: Current UK Policy and Future Challenges in a Changing Wo...  
 Lindvall et al Nov 2011: A Holocene peat record in the central South Atlantic: an archive of precipitation changes  
 Khan Nov 2011: Effects of temperature and soil moisture on methyl halide and chloroform fluxes from drained peatland pas...

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The new IPS website.  
 The ultimate reason to join us as a member.

www.peatsociety.org

## On our way to the Stockholm International Peat Congress, June 2012!

Dear IPS members,  
dear partners, dear friends,

The International Peat Society and our Swedish IPS hosts are pleased to invite you to the 14th International Peat Congress, held in Stockholm, Sweden on 3 - 8 June 2012.

The International Peat Congress (IPC) takes place every fourth year. The theme of the 14th IPC is "Peatlands in Balance" and at its core will be presentations and documentation of the latest research results on peat and peatlands in the broadest sense from the boreal, temperate, and tropical regions of the world.

The Congress will offer an excellent opportunity for all stakeholders – scientists, policy makers, and industry representatives – to meet and share new knowledge on all aspects of peat and peatlands.

### Swedish mires and more

In addition to various presentations in full-day sessions, there are altogether 15 different Mid-Congress Tours around Stockholm area, from topics like "Peat geological history in the pioneer L. von Post trails – changes of peatlands during the last 90 years" to "Wetlands and peat in the Uppsala municipality with Linnaeus Culture".

During those field trips, different aspects of peatland forestry, agriculture and peat production as well as characteristics of the Swedish mire landscape and pristine peatlands are studied. We believe that there is something interesting and new for all of you. In addition, when will you have the possibility again to see Stockholm's City hall, the very place where the Nobel prizes,

probably the most famous prizes of the world, are presented? This Congress will also be the first time when IPS' own trophy, the € 1,000 Award of Excellence, can be given to groups and projects.

Furthermore, do not forget to register for one of the two Pre-Congress Tours. One of them is created especially for students and the second for peat producers. There are also two Post-Congress Tours directed to Northern Sweden, towards the magic Nordic mires and towards the famous midnight sun.

Benefit from early registration fees and register now at the Congress website at [www.ipc2012.se](http://www.ipc2012.se). We hope to see all of you in Stockholm!

### New IPS homepage – Visit and share with your colleagues

A few weeks ago, IPS has established its brand new homepage. The new website contains, in addition to the content we had on our old pages, a database of downloadable IPS publications and the full IPS membership list.

All IPS members should have received their personal user names, passwords and instructions to log in and view this special content by email. At the same time, you were asked to open your contact data so that other members can see and email or phone you for joint projects.

You are also able to browse and download scientific papers from the proceedings of IPS congresses, conferences and symposia for free. New content will be added daily.



Also all previous issues of Peat News and Peatlands International will be published online in the member section. In addition to this, you have the possibility to post open scientific or industry career opportunities and to browse recent peatland news and scholar links. We hope that these features will be actively used. Please have a look and explore the new pages at [www.peatsociety.org](http://www.peatsociety.org)!

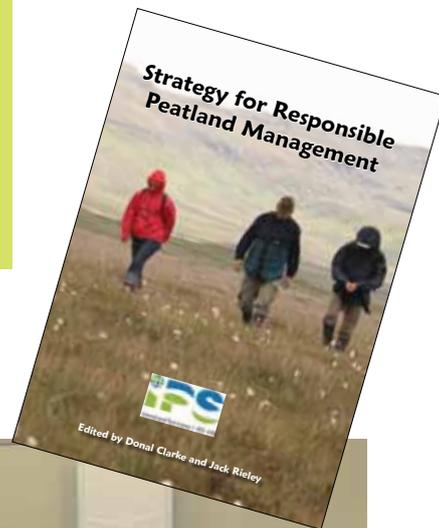
With best regards from the  
IPS Secretariat,

*Jaakko Silpola*

Secretary General of the IPS  
email: [jaakko.silpola@peatsociety.org](mailto:jaakko.silpola@peatsociety.org)

# From the President's Desk

Donal Clarke



## Strategic thoughts

**The Strategy for Responsible Peatland Management (SRPM) was adopted in October 2010 and distributed soon afterwards. In September 2011 a reminder press release in 19 languages was issued and feedback suggests it has since been extensively noted.**

Since its launch the SRPM has contributed to the development of public policy in a number of countries, including Germany, Ireland, Estonia, Finland, the Netherlands and Canada. It is being used as a support for the development of sustainable peatland strategies in Ireland and Finland and the preparation of a 'sustainable peat supply chain' in the Netherlands. The SRPM has also been used as a guidance document in the Veriflora certification system developed in North America, and in the initial stages of the development of codes of conduct and possible eventual certification procedures in Europe.

The IPS endorses the efforts to achieve certification systems for responsible peatland management. As an agency the IPS is neutral in its support of any specific certification system. It does however recommend that any certification system;

- Follow the principles set out in the SRPM.
- Meets international certification standards of ISO 9001, ISO 14001.
- Establishes mutual recognition of other responsible peatland management certification systems.

Following the publication of the SRPM, the IPS is seeking to support it further by facilitating the development of Guidelines for the



The IPS Executive Board at work in Espoo, Finland on 16 November 2011. Photo: Susann Warnecke

Practical Application of Wise Use. A consultative process to develop and finalise these guidelines is currently under way.

Other initiatives currently being considered or undertaken by the IPS include:

- The preparation of a comprehensive set of best practice guidelines for after-use of cutaway peatlands.
- The updating of information on the extent and uses of global peatlands. This information would be of assistance as a tool in the management of the world's peatlands.
- The development of a position paper on the conservation and management of peatlands in emerging nations.

The shape of, and funding for, these projects as yet remain to be determined but the Executive Board had given them its support and hopes they can be developed in co-operation with other NGOs.

The support for and development of these projects represent steps in the continuing evolution of the IPS.

In this context the 2012 elections to the Executive Board represent an important milestone for the Society.

If these and future projects are to be successfully progressed the continuation of a strong Board will be important. In the last year changes have been made to the election system so that the President and First Vice President will be directly elected by National Committees and not nominated by countries hosting future Congresses.

It was felt that the added legitimacy and transparency conveyed by election can only strengthen the Board. I strongly urge all National Committees to debate within themselves how they will vote next June to ensure we continue with a vibrant IPS, and how they can contribute to the debate at the Round Table for National Representatives on ways in which the Society can be further strengthened and improved.

*Donal Clarke*  
IPS President  
email: donalcke@indigo.ie

## Executive Board Elections 2012

At the Annual Assembly of National Representatives at the International Peat Congress in Stockholm on 8 June, elections will be held for the following six forthcoming vacant posts on the IPS Executive Board:

Function	At present	Status	Term of office
President	Donal Clarke, Ireland	To be elected.	2008 – 2012
1st Vice President	Björn Hånell, Sweden	To be elected.	2008 – 2012
2nd Vice President	Paul Short, Canada	To be elected.	2010 – 2012
Ordinary members (2-6)			
Satu Helynen, Finland (not for re-election)		To be elected.	2008 – 2012
Jutta Zeitz, Germany (not for re-election)		To be elected.	2010 – 2012
Open position		To be elected.	2010 – 2012
Valerijs Kozlovs, Latvia		Stays in office.	2010 – 2014
Erki Niitlaan, Estonia		Stays in office.	2010 – 2014
Lech Szajdak, Poland		Stays in office.	2010 – 2014

Nominations for the open positions can be sent to the IPS Secretariat by all IPS National Committees (that have paid their membership fees) until 31 January 2012, including an application letter and a CV of the person concerned.

Strong, committed and active players for our Board are needed to be able to deal with the challenges of the coming years, and to keep our Society a living pool of enthusiastic specialists and devoted peatland friends. The Executive Board meets approximately 3-4 times a year for 2-3 days, mostly in Europe, and quick email access between meetings is essential.

The election of the three Presidents and 1-3 ordinary Board members will be carried out by authorised Representatives of our National Committees at the IPS Annual Assembly on the last Congress day. The Board members will be elected for the terms 2012-2016. The Presidents will be elected independently from the venue of the International Peat Congresses.

The Second Vice President is at the same time member and contact person at the IPS Scientific Advisory Board. Half of the ordinary Board members change every second year. Please see the IPS Statutes and Internal Regulations for more details on the requirements and the election procedure at [www.peatociety.org/about-us](http://www.peatociety.org/about-us).

## IPS Award of Excellence 2012 for persons, groups, and projects

The IPS Award of Excellence can now be presented also to projects and groups for any peat and peatland activity. Neither the winner nor the applicants have to be IPS members. The Award continues to be € 1,000 – this is a great opportunity to receive funding for your projects!

Applications can be submitted as simple application letters, via email or on the IPS website. They should contain at least the contact details of both the applying person and the nominee plus an explanation why the Award should be given to that special person, group or project.

All proposals are reviewed by the IPS Executive Board in March and the Award is presented at the Annual Assembly in Stockholm in June.

Deadline for applications is strictly 31 January 2012.

More info and application: [www.peatociety.org/about-us/award-excellence](http://www.peatociety.org/about-us/award-excellence).

## IPS Elections 2012 – Commissions and Scientific Advisory Board

At the International Peat Congress in June 2012, it is also time to elect the Chairs, Vice Chairs and Secretaries of the nine IPS Commissions. All Chairs of the IPS Commissions are automatically members of the Scientific Advisory Board (SAB) which supports the Executive Board and Annual Assembly in decision-making:

- C1: Stratigraphy, inventory and conservation of peatlands (Dr Lars Lundin & Assistant Professor Maria Strack)
- C2: Utilisation of peat and peatlands for horticulture, energy and other economic purposes (Gerald Schmilewski & Pat Fitzgerald)
- C3: Agricultural use of peatlands and peat (Professor Dr Lech Wojciech Szajdak)
- C4: Chemical, physical and biological characteristics of peat (Professor Jürgen Schoenherr)
- C5: Restoration, rehabilitation and after-use of peatlands (Dr Catherine Farrell)
- C6: Peat balneology, medicine and therapeutics (Riitta Korhonen)
- C7: Ecology and management of forested peatlands (Dr Hannu Hökkä & Dr Florence Renou-Wilson)
- C8: Cultural aspects of peat and peatlands (Dr Michiel Gerding)
- C9 Tropical peatlands (Professor Jack Rieley)
- Standing Committee on Peatlands and Climate Change (Professor Mats Nilsson)

More information about the work of the Commissions, their contact details and Annual Reports of the previous years can be found at [www.peatociety.org/about-us/commissions-and-working-groups](http://www.peatociety.org/about-us/commissions-and-working-groups).



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# 14th International Peat Congress 2012

## Register now!

Text: Susann Warnecke

Peatlands in Balance



14th International Peat Congress  
- Sweden 2012 -

**There are good and bad moments at the IPS Secretariat. Definitely an excellent moment was the morning of 1 December 2011. Having just arrived at our office, one of the first emails I saw was the one from the Stockholm Congress organisers: 407 proposals for presentations were submitted by the extended abstract deadline!**

This was much more than the some hundred one month earlier. And much more than the 300 the evening before. Probably every third of our members had been sitting in front of his or her computer on 30 November, during the very last evening, working and writing to get ready for the biggest mire and peatland event this year. Well done, dear colleagues.

Actually, there is indeed a lot to expect. The carbon emission discussion, climate change studies, certification and life cycle analyses as well as the amount of attention that tropical peatlands and boreal waterways have received in the media in recent years, have definitely raised the profile of our formerly very specialised discipline.

Not only the technically oriented peat experts are interested in latest research results, but a lot of young enthusiastic specialists are flowing in. They want to know how mires work, how peatlands can be restored and how their values can be given to coming generations, but also how these areas can be utilised and, at the same time, preserved for the growing population of the Earth.

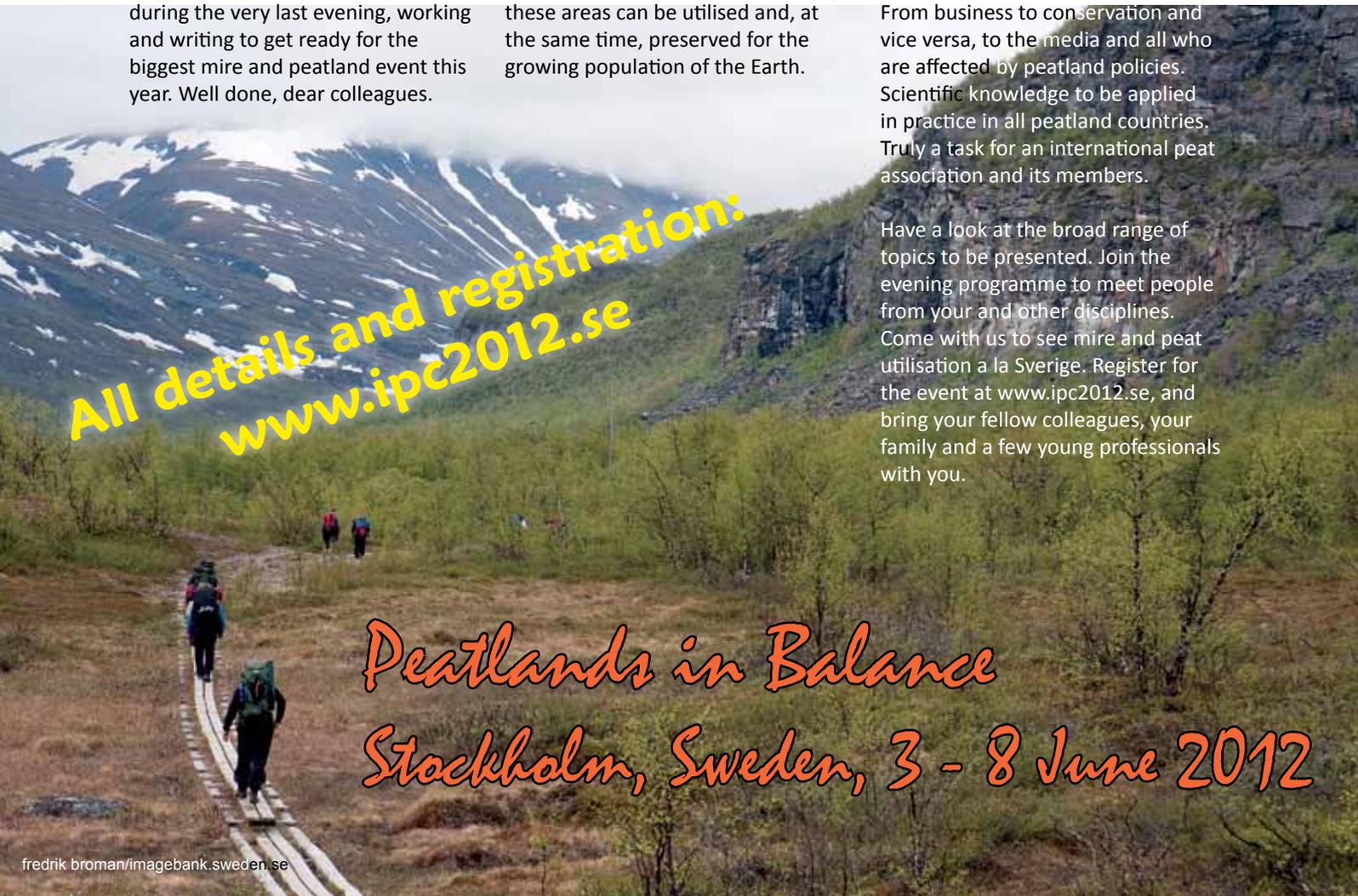
Many of those questions cannot be answered on one or two sentences, but have to be carefully studied, evaluated and explained in words that can be understood by both, highly educated experts and the general public.

This is our chance to move on, to give our knowledge and experience to the world. From and to scientists, students, policy makers and non-government activists to the energy, agriculture and horticulture sectors. From business to conservation and vice versa, to the media and all who are affected by peatland policies. Scientific knowledge to be applied in practice in all peatland countries. Truly a task for an international peat association and its members.

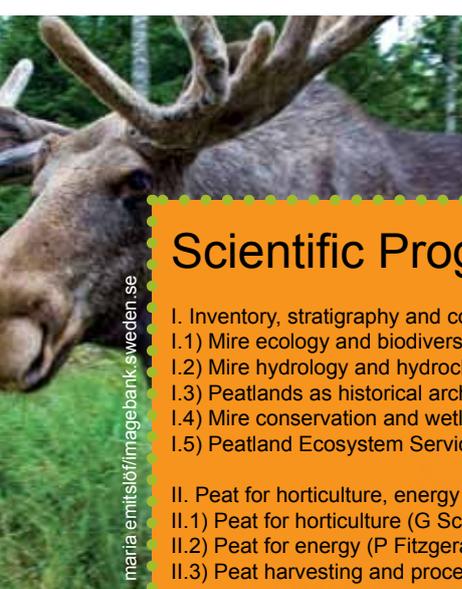
Have a look at the broad range of topics to be presented. Join the evening programme to meet people from your and other disciplines. Come with us to see mire and peat utilisation a la Sverige. Register for the event at [www.ipc2012.se](http://www.ipc2012.se), and bring your fellow colleagues, your family and a few young professionals with you.

All details and registration:  
[www.ipc2012.se](http://www.ipc2012.se)

*Peatlands in Balance*  
*Stockholm, Sweden, 3 - 8 June 2012*



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susann.warnecke/ips

## Scientific Programme

### I. Inventory, stratigraphy and conservation of mires and peatlands (Chair: L Lundin)

- I.1) Mire ecology and biodiversity (H Rydin)
- I.2) Mire hydrology and hydrochemistry (L Lundin)
- I.3) Peatlands as historical archives (G Sohlenius)
- I.4) Mire conservation and wetlands for landscape functionality (E Lode)
- I.5) Peatland Ecosystem Services (A Bonn)

### II. Peat for horticulture, energy and other uses (G Schmilewski)

- II.1) Peat for horticulture (G Schmilewski)
- II.2) Peat for energy (P Fitzgerald)
- II.3) Peat harvesting and processing technology (K Mutka)

### III. Agricultural use of peat and peatlands (L W Szajdak)

- III.1) Special session: MYRKLIMA - mitigation of climate change impacts of cultivated peat soils (K Berglund)

### IV. Chemical, physical and biological characteristics of peat (J Schoenherr)

- V. Restoration, rehabilitation and after-use of disturbed peatlands (C Farrell)
- V.1) Sphagnum farming (Joint II & V) (C Farrell; G Schmilewski)
- V.2) Special session: Mountain Peatlands - restoration, sustainable use, and Ecosystem services (C Trettin)

### VI. Balneological, medicinal and therapeutical use of peat (R Korhonen)

- VII. Ecology and management on forested peatlands (H Hökkä)
- VII.1) Peatland forestry and surface water quality (A Laurén)
- VII.2) Management methods for peatland forestry (F Renou-Wilson)

### VIII. Cultural aspects of peat and peatlands (M Gerding)

- VIII.1) Peatlands and tourism (M Gerding)
- VIII.2) Cultural and socio-economic aspects (M Gerding)

### IX. Tropical peatlands (J Rieley)

- IX.1) Sustainability of tropical peatlands: Assessment of the present and prognosis for the future (S Page)
- IX.2) Carbon balance and GHG fluxes in tropical peatlands (IX & X)
- IX.3) Social and economic uses of tropical peatlands (M Silvius)

### X. Peatland carbon budgets and greenhouse gas (GHG) fluxes (M Nilsson)

- X.1) Carbon balance & GHG fluxes in natural/semi-natural peatlands (M Nilsson)
- X.2) Carbon balance & GHG fluxes in disturbed and cut-over peatlands (E-S Tuittila)
- X.3) Carbon balance & GHG fluxes – politics and carbon financing (I-M Gren)

We promise that you will not leave with empty pockets, but with your backpack or suitcase full of papers and brochures, eyes gleaming with fresh impressions, a hand full of new partners, friends and their email addresses, maybe some cotton grass in your boots, and a few more memory sticks for your busy computer. We look forward to seeing you.

*Susann Warnecke*

IPS Communications Manager  
susann.warnecke@peatsociety.org



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susann.warnecke/ips

# Peat extraction increasing biodiversity at Torreblanca, Mediterranean Spain

Text: P. Colpaert and E. Climent Arquimbau

**Peatlands are exceptional ecosystems because of the biodiversity they contain. Nevertheless, many peatlands on the planet are being used for peat extraction for several applications.**

The oldest of these is the use as a fuel, while right now the most important use on a global scale is agricultural use. The extracted peat is used in substrates while many peatlands are transformed into plantations. In the last decade many ecologists are opposing these uses. The use of peat would decrease biodiversity. Is this always the case? In the peatland in the natural park

Prat de Cabanes - Torreblanca in Castellón, Spain, peat extraction increases biodiversity.

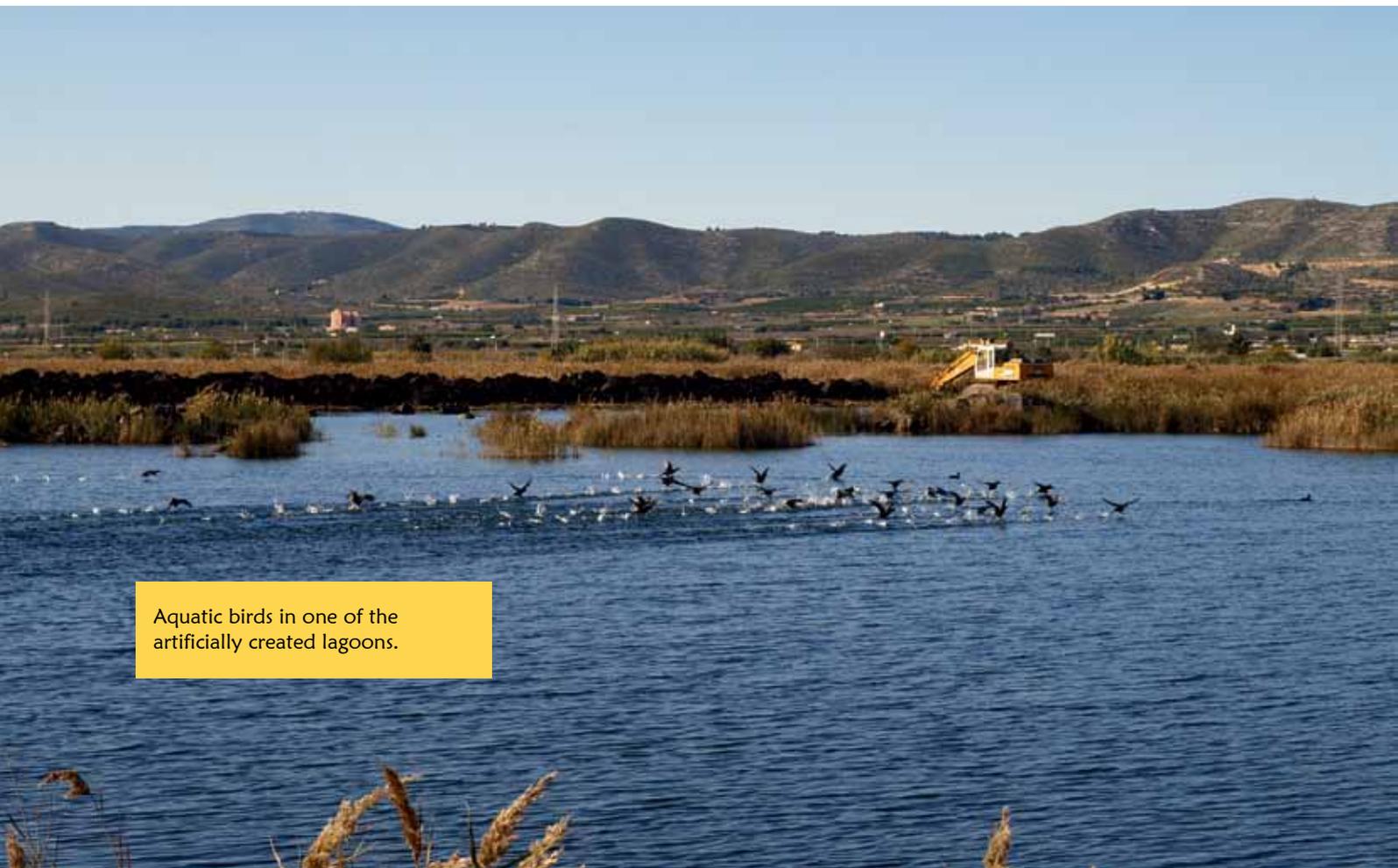
The best studied peatlands are the northern Sphagnum peatlands. However, also herbaceous peatlands are being harvested, albeit on a much smaller scale. The company Industrias fertilizantes orgánicas, SA utilises the peatlands in section D of the natural park Prat de Cabanes - Torreblanca. Black peat extraction in the Prat de Cabanes - Torreblanca has been documented for about 150 years. For most of the time, this peat was used for combustion and only in the last decades agricultural uses are given to this black peat. Few studies

have been realized on the effects on ecology and meteorology of this peat extraction.

To describe the environmental, social and economical aspects of the peat extraction activities in Torreblanca, the strategic objectives and actions as stated in the Strategy for Responsible Peatland Management will be followed and treated in the same order as these were dealt with in the Strategy.

## **Biodiversity**

The vegetation of the peatlands in Torreblanca can be divided in six groups (Almenar Gil, D. 2010).



Aquatic birds in one of the artificially created lagoons.



Colony of red-crested pochards.

The largest vegetation type are the sub halophytic reeds. The principal plant species in these reeds are *Juncus maritimus*, *Phragmites australis*, *Inula crithmoides*, *Schoenus nigricans*, *Aster tripolium*, *Sonchus maritimus*, *Artemisia gallica*, *Centaurea dracunculifolia* and *Elymus elongates*.

A second vegetation type are the meadow reeds. This vegetation type is usually found close to the sub halophytic reeds, but grows much lower, giving the zone a meadow like appearance. The main species found here are *Schoenus nigricans*, *Plantago crassifolia*, *Artemisia gallica* and *Inula crithmoides*.

The third type of vegetation are the reedbeds. These consist of almost exclusively *Phragmites australis* and can be found on the borders of the canals, ponds and the permanently waterlogged zones of the wetland.

A next group of vegetation are the sedges of *Cladium mariscus*. These sawgrasses grow close to the reedbeds, but are smaller in number in this natural park.

The fifth vegetation group are the plants that occur in the salt marshes. These salt marshes occur in two zones, one close to the coast in Torrenosta and another one near Torre de la Sal ("salt tower"). The typical vegetation in this habitat are shrubs with succulent leaves such as *Sarcocornia fruticosa* and *Arthrocnemum macrostachyum*, accompanied with *Limonium narbonense*, *Juncus subulatus* and *Inula crithmoides*.

As a last type, the ponds can be distinguished. These ponds are

formed after peat extraction and give home to aquatic plants of the genera *Zannichiellia*, *Ruppia* and *Potamogeton*.

In the decision-making process for suitable areas for peat extraction, it is of high importance to take into account the types of vegetation growing in the different zones of the peatland. Some vegetation types, more specifically those mentioned in the RAMSAR Convention, are legally protected and all activities are kept out of these protected zones.



On the right: Wet peat extraction in Spain with an excavator.



Great cormorants and a grey heron on one of the older lagoons.

According to the RAMSAR Convention on Wetlands, in the Prat de Cabanes - Torreblanca, four types or priority habitats can be distinguished:

- 1150: Coastal lagoons
- 2250: Coastal dunes with *Juniperus* sp. pl
- 3170: Mediterranean temporary ponds
- 7210: Calcareous marshes with *Cladium mariscus* and species of the *Caricion davalliana*.

However, the presence of one of these types, namely the coastal lagoon, is a direct consequence of the peat extraction in the natural park. This case is a very rare example

of how an industrial activity can contribute to the survival of a threatened habitat type.

During peat extraction, special care is taken to create corridors as well as large and small islands in the new lagoons. This way, both reed beds and underwater plants in the ponds can develop. And perhaps more important, also fish and birdlife get more chances.

The creation of the islands proceeds as follows: when a new extraction is started, the upper layer of vegetation is removed locally and thrown in an existing lagoon in such a way that it forms an underwater pyramid. Often the top is just visible above the water level. The reed roots close to the surface will regrow fast, while

all plant material under that will be transformed into new peat. In the meantime, this will be an ideal substratum for all sort of water life. The small islands visible on the top are greatly appreciated by aquatic birds that use them to rest on. The larger islands and corridors can easily be accessed by birds and are often used for nesting purposes.

The created lagoons form permanent water bodies, something becoming more and more scarce in Spanish wetlands. In most Spanish wetlands, the free water dries out during the summer and thus threatens the life present in it, such as the fish *Valencia hispanica*. This threatened fish species is listed as critically endangered and its numbers have decreased by 80% in the last 10 years, due to habitat destruction for urbanisation, agricultural pollution and the introduction of alien predators (Crivelli, A.J., 2006).

The creation of artificial lagoons might give this fish species a new chance to re-establish. Also the European pond turtle, *Emys orbicularis*, although classified as lower risk/near threatened, the critically endangered European eel and the present amphibians will be given more chances in this newly created habitat type.

### Hydrology & water regulation

Peat extraction is done with wet extraction techniques by means of an



Colony of Eurasian coots in the oldest lagoon.

excavator. The wet extraction of peat as done in this coastal peatland in Spain has the big advantage that the water levels of the wetland are not changed. This is in accordance to the directives of the 'Plan de Ordenación de los Recursos Naturales'.

In point 4.2.2 of the Strategy for Responsible Peatland Management, objectives related to hydrology are explained. The first objective is that one should try to keep or restore water levels and flow regimens as close to the natural reference conditions as possible. In this case of wet extraction of black peat there is no doubt this objective is met.

### Climate and climate change processes

In point 4.3 of the Strategy the role of peatlands in climate and climate change is discussed. First of all, it should be said that the peat extraction in Torreblanca is done with as minimal CO<sub>2</sub> emissions as possible. All peat extraction is carried out on a distance of less than one km from the factory so CO<sub>2</sub> emissions from internal transport are reduced to a minimum.

Because of the wet extraction method, the function of the peatland as a carbon sink is not affected. CO<sub>2</sub> and CH<sub>4</sub> emissions will not increase for the peatland whether or not peat is extracted. As explained further in the paragraph about after-use, rehabilitation and restoration, the peatland grows back at an extremely fast rate compared to classical Sphagnum peatlands, so new CO<sub>2</sub> fixation in the peatland is substantial. It would be worth a detailed study to see how much new CO<sub>2</sub> is deposited in the peatland when natural restoration takes place.

Millán Millán, M. (2010) studied the effect of coastal lakes in Mediterranean Spain and their effects on the inland climate and the climate in other European countries. The presence of open water in the forms of lakes in Mediterranean Spain has important consequences for the rainfall in other regions. If enough evaporation occurs by these

coastal lakes, the humid air will condensate at lower altitudes than when there is only supply from the sea. Condensation at lower altitudes gives rise to the typical summer rainstorms Spain used to have.

In the last decades, however, these have become more and more scarce because the humid air is passing over the highest mountains. Millán Millán, M. (2010) also explains how the absence of coastal lagoons has as a consequence that more water gets lost from the Mediterranean basin, distorting the salt concentration ratio between the Mediterranean sea and the Atlantic ocean and, as a final



One of the peat extraction zones.

consequence, summer inundations in the UK. Peat extraction in the Prat de Cabanes - Torreblanca leaves lagoons in places that became land before and will thus help in restoring this important hydrological cycle.

### Economic activities

The company Industrias Fertilizantes Orgánicas, SA, responsible for the peat extraction in the Prat de Cabanes - Torreblanca, employs 17 workers directly and many more in an indirect way in the region of Torreblanca. In this area, other industrial activities are as good as non-existent and economic revenues used to come from tourism and construction, two sectors that were hit extremely hard by the economical crisis. The presence of a primitive road network in the degraded

zones of the peatland would also permit the establishment of wildlife watching tours or some other forms of economic activities related to the rich biodiversity in the wetland.

### After use, rehabilitation and restoration

Scientists studying peatlands usually recognise two principal uses of peatlands: industrial utilization and conservation. Besides these, there exists also another use of peatlands: recreation. Leupold, S. (2004) describes the different forms of recreational use of a peatland and the benefits it has for the peatland.

The principal recreational uses are ecotourism, fishing, aquatic sports and educational walks. The big advantage of a restored peatland is the presence of small roads that give easier access to the zones of interest. In the case of the peatland of Prat de Cabanes - Torreblanca, ecotourism can be considered as the most important alternative use because of the presence of the created islands and corridors that increases the visibility of birds in the peatland and a network of old roads that will allow amateur ornithologists and nature lovers to reach zones where it would be hard if not impossible to get without these.

Another use of the peatland after the extraction would be the

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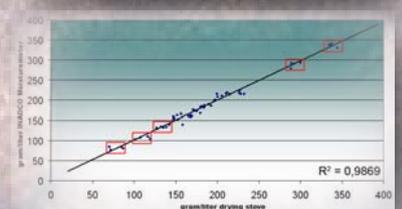
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Great Cormorants resting on the tops of the underwater pyramidal structures.

most common use and that is the restoration to its state before extraction started. In the case of the peatland Prat de Cabanes - Torreblanca, this means the creation of a high biodiversity, even higher than before the extraction started. In the non-excavated regions of the natural park, the vegetation is very homogenous and hard to penetrate. Few zones with permanent water can be found because the vegetation covers the whole surface and, when the phreatic level lowers during the summer, most open water disappears - and with this water also the life dependent on it.

In the last decades, the use of water for agriculture and neighbouring towns has decreased the available water for the peatland. Taking this into account, the created lagoons help to maintain the necessary water volumes to maintain aquatic life. This way, the creation of artificial lagoons stimulates the survival of endemic fish species such as *Valencia hispanica*, a fish in danger of extinction whose principal threats are habitat destruction and introduced predators.

The main reason of habitat destruction would be desiccation and water pollution. The large water volumes in the artificial lagoons also

have a much larger buffer capacity against pollution from human activities than the small natural lagoons and creeks that were there in the past.

### Human and institutional capacity and information dissemination

The company utilizing the peatlands in Prat de Cabanes - Torreblanca did, on various occasions in the past, ask for studies to get an idea of the impact of their activities on biodiversity and peatland evolution after the extraction. Some of these studies have been done to illustrate that the creation of lagoons does not mean that the original vegetation before peat extraction - reed beds - are not lost forever, but will come back after time.

### Engagement of local people

The peatland described here is free to enter and explore for all people interested in doing so, except for the extraction areas themselves that are closed to the public for security reasons.

The local government organizes bird watching tours in the southern and northern parts of the peatland. Also several routes are available to explore the park. Through this

engagement of the government, tourists come to visit this natural park and thereby help the local economy by staying in local hotels and eating in nearby restaurants.

### Good governance

In the case of Prat de Cabanes - Torreblanca, the government of the Valencian community is responsible for the legislation regarding the use of the peatlands in the natural park. The directives for the peat production are described in Article 15 of the public journal of the Valencian community nº 4427. The legislation determines the minimum size of the created lagoons, the distance to roads or agricultural zones, the shores of the lagoons, the minimal distance between the seashore and the extraction zones, the island sizes and so on.

The directives stipulated in the official journal are followed strictly during the peat extraction and the workers using the excavators are well aware of the importance of these regulations.

### References

- Almenar Gil, D. 2010. Estudio de la regeneración de la vegetación en parcelas de extracción de turba en el Prat de Cabanes - Torreblanca. CÁDEC. Taller de Gestió Ambiental, S.L.
- Crivelli, A.J. 2006. Valencia hispanica. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4. [www.iucnredlist.org](http://www.iucnredlist.org). Downloaded on 11 March 2011.
- Leupold, S. 2004. Recreation - a complementary alter-use option for cutaway peatlands? Wise use of peatlands volume 2, Proceedings of the 12th International Peat Congress. p1190-1193
- Millán M. Millán. 2010. Sequía en el mediterráneo e inundaciones en el Reino Unido y centroeuropa. Cosas que los modelos climáticos globales no ven del ciclo hídrico de Europa, y por que. Cuides monográfico 2010.

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# Turf Cutting and Conserving Raised Bog Habitat in Ireland

Text: Catherine O'Connell

The turf cutting row that is raging in Ireland at present is in response to a move by the Government nature conservation agency – the National Parks and Wildlife Service (NPWS) – to protect the last 130 raised bogs of conservation importance in Ireland by the end of 2013. It only concerns turf cutting on these sites and no other ones. If we are to achieve our goal the first step is to ensure that families affected have a source of fuel.

## EU Habitats Directive

The issue goes back to 1999 and is related to Ireland signing up the European Union (EU) Habitats Directive which committed us to protecting active and degraded raised bog habitats and taking steps to restore damaged sites to their original state. This led the Government to identify the active raised bog habitat areas remaining

and to declare them to the EU as Special Areas of Conservation or Natural Heritage Areas. Geographically, the raised bogs are concentrated in the central midlands of Ireland.

## Protecting Sites owned by Industrial Interests

Some of the 130 sites of conservation importance were owned by Bord na Móna (the Irish Turf Development Board) and so the first positive step was to convince Bord na Móna to sell them to the National Parks and Wildlife Service. The EU paid 75% of the money that bought some 20 sites which are now owned by the National Parks and Wildlife Service. Other parts of the 130 bogs were owned by Coillte (Forest Industry) who had planted trees on them in the past. In recent years the EU paid between 50 and 75% funding to Coillte to remove the trees, block up drains helping to restore the active living layer on 29 of the 130 sites. Still other companies owned part

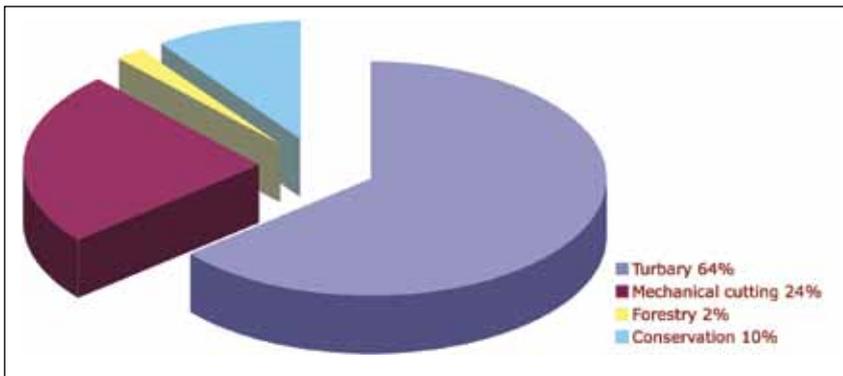
of these bogs and were extracting moss peat for gardening. Again the National Parks and Wildlife Service compensated each company to gain ownership of the sites.

## Private Turf Cutters

The major stakeholder in the 130 bogs are the people who have turbary rights. Back in 1999, rather than deal with the issue of buying out the interests of the turf cutters, Minister Síle de Valera announced the Derogation on the Cessation of Turf Cutting. It only affects the 130 sites. She gave turf cutters 10 years to stop cutting, offered to either buy their plots or swap their plot in one of the 130 sites for another turf bank in a nearby bog of no conservation interest. The cessation was to be enforced on the 130 sites in batches: on 31 by the end of 2009; the next 24 sites by the end of 2011 and the last 75 sites by the end of 2013. The Derogation was introduced without consultation with the private land owners who owned the bogs and

Clara Bog Special Area of Conservation, Co. Offaly.  
Photo: Catherine O'Connell





The utilisation of raised bog resources in the Republic of Ireland. Of the original area of 308,742 ha, 64% have been lost to turbary, 24% to mechanical extraction and 2% to forestry, leaving 10% intact and worthy of conservation. Source: Malone, S. and O'Connell, C. A. (2009) Ireland's Peatland Conservation Action Plan 2020 Halting the Loss of Peatland Biodiversity. Irish Peatland Conservation Council, Kildare, Ireland.

who were dependent on them for fuel to heat their homes. To this day there is a huge source of anger on this issue. Her scheme met with some success and almost € 4 million was paid out to gain control of a selection of turf banks in 24 of the 130 bogs. However the vast majority of the turf cutters continued as before to the present day flouting the nature conservation efforts.

### Scientific Monitoring

At the same time as the Derogation on the Cessation of Turf Cutting was introduced, the scientific research branch of the National Parks and Wildlife Service began to monitor the effects of turf cutting on 31 of the 130 raised bog sites. After 10 years they have substantial scientific evidence that will stand up to scrutiny that turf cutting on the margins of these bogs has partially killed off the active peat forming parts of the bogs. This is mainly to do with draining and burning of the bog that is associated with turf cutting as well as the physical removal of the bog habitat, which is then burned in the fireplace. Even common sense comes to the same conclusion – if you keep cutting away at something, eventually it is gone, and each turf cutter operating on the 130 sites is cutting into the bog by 3 m each year. If you multiply this up by the estimated 20,000 turf cutters active on these sites, the extent of the problem becomes evident. On the basis of their research the NPWS gave the EU Active Raised Bog Habitat the lowest or “RED” (Bad) rating in the Assessment for Priority Habitats and Species Report to the EU in 2006 and Degraded Raised bog an “AMBER” (unfavourable) rating.

### European Union Action

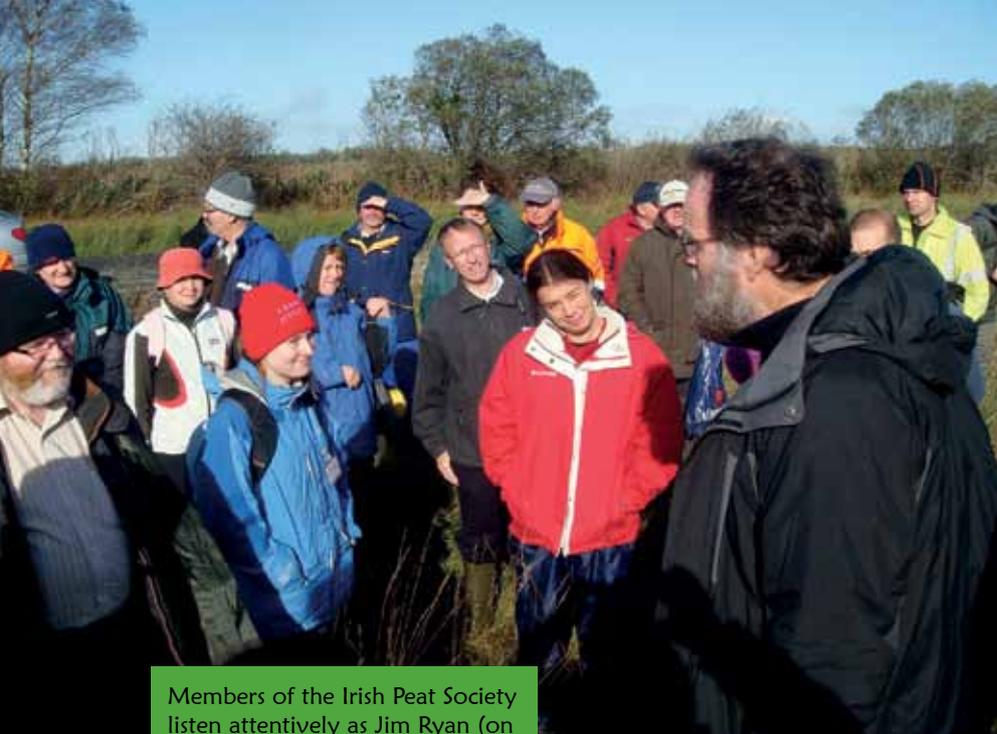
The European Union informed the Irish Government that it was illegal for the Minister to have announced the Derogation. They warned that due to the fact that Ireland was actually loosing our raised bogs and that Local Government over the years had failed to protect the sites through planning control and impact assessment we were facing penalties (European Court of Justice Case C-392/96). The Commission found that Ireland failed to comply with its obligations under both the Habitats and the Environmental Impact Assessment Directives. In January 2011 the European Commission issued a letter of formal notice to Ireland. The end result of this action which will proceed if we continue to break EU environmental law will be fines at the level of € 26,000 per week with a large lump sum up front – something the country can ill afford given the current economic situation.

### Government Response

The newly elected Government in 2011 have given assurances to the EU and have taken steps to deal with the issue of conserving raised bogs. Ministers Phil Hogan and Jimmy Deenihan introduced a new package of compensation measures for turf cutters. This involved setting turf cutters up with one of the following options: relocation to alternative turf plots, providing compensation payments of up to € 15,000 over a period of 15 years or delivering 10 tonnes of turf from the State every year to each household. Clinics were held throughout the midlands of Ireland to assist

Outside the Clara Bog Visitor Centre from the left: Catherine O'Connell (IPCC), Conor Skehan (Chair of the Peatlands Council) and Tadhg Ó Corcora (IPCC). Photo: Catherine O'Connell





Members of the Irish Peat Society listen attentively as Jim Ryan (on right) from the National Parks and Wildlife Service outlines the effects turf cutting and the building of a road through Clara bog have had on its hydrology. Photo: Catherine O'Connell

www.peatlandscouncil.ie). The outcome from the consultation will play a significant role in shaping the Government-developed strategy in 2012. Much ground work has already been achieved in this area in terms of new research information and strong direction following the publication in 2011 of BOGLAND: A Protocol for Sustainable Management of Peatlands in Ireland by the Environmental Protection Agency. The Strategy for Responsible Peatland Management 2010 developed by members of the International Peat Society, together with the National Strategy for Peatland Management in Finland 2011 and peatland management policies and techniques used in Canada and Germany will play an important role in advising the development of the Irish strategy. Indeed, the work of the International Peat Society in the development of peatland management strategies has already been brought to the attention of the Peatlands Council.

turf cutters in understanding the measures. In addition the Ministers set up the "Peatlands Council" – an independent mediation body.

### Peatlands Council

The independently chaired Peatlands Council was established to provide mediation between affected parties including turf cutters, farmers, industry, government and environmental NGOs all of whom are represented on the Council. The Council meets regularly and to date has been beneficial in helping all interests to reach a greater understanding of the issues involved in managing our raised bog resources.

Members of the Peatlands Council have engaged in a number of initiatives that may bring resolution to conflicts in certain localities. For example Bord na Móna have assisted the NPWS with the organisation of a state of the art relocation site for turf cutters on Clara Bog in Co. Offaly. Bord na Móna are hopeful of being in a position to repeat this project for turf cutters on 9 other sites from the list of 130 to be conserved. The recent annual meeting and workshop of the Irish Peat Society visited Clara

Bog and the Kilaranny Bog relocation site as an example of a successful resolution to one site. The NGO representatives on the Council have proposed a Home Energy Efficiency Programme for turf burning households whereby they would improve insulation and switch to a wood stove as their energy system. This initiative is being considered by the Sustainable Energy Authority of Ireland (SEAI).

The Peatlands Council is also to provide advice to the Government on issues relating to the management of Ireland's peatlands in the long term. A key part of the Council's remit is to help shape the development of a National Peatlands Strategy.

### Irish Government Peatland Strategy

The aim of the strategy is the management of all peatlands in Ireland. A public consultation on the content of the strategy is underway with a completion date of the 16th December 2011 (see

### Resistance from Turf Cutters

Turf cutting interests in Ireland are well organised. In spite of the ban being in place since 2009 on 31 sites Contractors cut turf from at least 6 sites in 2011 thanks to a survey carried out by Friends of the Irish Environment (www.friendsoftheirishenvironment.net). Many of the voices heard in the media are those of the Turf Cutters and Contractors Association who are

Turbary rights on Ballynafagh Bog Special Area of Conservation, Co. Kildare. Areas from which turf has been cut in the past are used as spreading grounds where turf can be dried. The larger the spreading ground the greater the capacity for turf cutting and ultimately the greater the loss of active raised bog habitat. Photo: D. de Brí



Members of the Irish Peat Society exploring the Clara Bog Visitor Centre at the 2011 Study Tour and Conference Workshop which had as its theme: Towards the development of a Peatland Strategy for Ireland. The development of such attractions are a significant community benefit of conserving peatlands. Photo: Catherine O'Connell



At Clara House Holistic Spa ([www.claraholistic.com](http://www.claraholistic.com)) clients can avail of a peat beauty and cleansing treatment, another use of peatlands that potentially could become more widespread in Ireland. Photo: Catherine O'Connell

encouraging their members to stand firm against the Government and the EU on this issue and not to engage at any level in the Cessation Scheme.

The National Parks and Wildlife Service have shown very little leadership in the peatland areas affected which has given the Turf Cutters and Contractors Association



lots of space to scaremonger the individual turf cutters involved. They talk of 'bog evictions, flood alerts, fire alerts and fuel price alerts' following the closure of the bogs. They believe that a way can be found to allow turf cutting and conservation to co-exist and are preparing a plan for the 130 peatlands of conservation importance that are at the centre of this debate. They intend to present this plan to officials in the European Union.

### **Irish Peatland Conservation Council**

As the leading NGO campaigning for the conservation of a representative sample of Irish peatlands, the IPCC welcome the establishment of the Peatlands Council and the invitation extended to us to participate in its work. In 2009, IPCC published "Ireland's Peatland Conservation Action Plan 2020". An analysis of the utilisation of raised bogs presented in the plan showed that 64% of the original area of 308,742 ha of the habitat has been lost to turf cutting or turbary (see pie chart inset). IPCC's position on the issue of conserving raised bogs is that the 130 sites designated represent less than 10% of the original area of raised bog in the country, a representative portion of the bogs which are claimed by some to be the best in the Atlantic biogeographical region of Europe. The Netherlands, Germany and the UK have cut almost all of their active raised bog habitat away.

### **Conclusion**

The key issue in conserving raised bogs in Ireland is the provision

of fuel for those affected by the conservation designation. Turf cutters, not Contractors are at risk. What are their options - to continue to oppose the legislation eventually forcing them to challenge EU or National Environmental Law, or worse still to be put in jail. Better to decide to work with the National Parks and Wildlife Service and the EU on a package that will secure a source of turf for them in the future and/or eventually allow them to convert their homes to a more sustainable source of energy using new incentives developed by the Government. The choice is obvious but it all depends on robust leadership to win the trust of the turf cutters, good will and a lot of latitude on both sides.

Irish raised bogs are beautiful, historical and full of wildlife and are really worth protecting. We cannot cut them all away. We all need to work together to help. In an ideal world it would be lovely to think about families happily bringing home their turf next spring from non-conservation worthy bogs and for restoration work to have begun in earnest on the some of the best remaining raised bogs on the western fringe of Europe. But this ideal is a long-term goal right now. There are strategies to write and alliances to be made.

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# Peat Day 2011 in Helsinki: Finland's Energy Sector Does Need Peat

Text and photos: Ismo Myllylä



In his opening speech, Tomi Yli-Kyyny, Chairperson of the Association of Finnish Peat Industries and CEO of Vapo Oy addressed the need for new peat production areas in Finland.

According to Mr. Yli-Kyyny, ensuring the availability of peat requires in turn that areas released from peat production can be replaced by new ones. Unless this happens, the only practical alternative for peat in Finland is coal.

## **Member of the Finnish Parliament: Peat before coal**

Esko Kurvinen, Member of the Parliament, and Oulu town councillor, who gave another introductory speech at the Peat Day, outlined his understanding by saying that the use of peat should

not be hampered or prevented, at least while the alternative is coal.

“The order should be clear. First it is necessary to reduce the use of imported coal, and only then the use of domestic peat. Coal should not be used as a substitute for peat,” he stated.

According to Mr. Kurvinen, Finland cannot afford to increase the current dependency on imported energy any more. He also reminded the audience that peat is clearly a better alternative than coal.

“The greenhouse gas impacts of peat and coal are more or less similar. However, the advantage of peat is the fact that it is domestic. Peat sustains the reliability of energy management, it is an essential supporting fuel for burning wood in

energy production, and it provides – directly and indirectly – employment for people in the very regions where other jobs are scarce.”

Mr. Kurvinen also brought to mind that Finland possesses strengths in energy production that we can be proud of: We are employing a vast scale of different forms of energy, are widely applying cogeneration of heat and electricity, and have a decentralised energy production. Moreover, the industry has also been developing its energy consumption methods and efficiency for decades, and has, as a consequence, taken them to the highest level in the world.

Two-thirds of the energy consumed in Finland is imported. Finnish energy sources are wood and peat, as well as hydro and wind power. Finland does not have any fossil energy resources like coal, oil or natural gas.

Mr. Kurvinen pointed out that the government should operate very level-headed in respect of the use and taxation of peat. In his opinion, the widely accepted national mire and peatland strategy provides a solid basis for further handling of the issue. “The strategy is a better document than it is reputed to be. I myself intend to promote the use of the strategy as it is,” he said.

## **Energy sector needs peat**

Director Jari Kostama of Energiategollisuus ry (Finnish Energy Industries) reminded the audience that the use of wood in power and heat production facilities has been growing fast. This, however, has not

**Peat is an important and essential fuel for the Finnish energy management sector, with coal being its only alternative. This was one of the outcomes of the Finnish Peat Day, held by the Association of Finnish Peat Industries on 18 October in Helsinki.**

In his opening address, Tomi Yli-Kyyny, the Chairperson of the Board of the Association of Finnish Peat Industries and the CEO of Vapo Oy, emphasised the importance of peat.

“Finland has set a challenging objective of raising the share of biofuels in its energy production to 38%. Increased consumption of wood-based fuels has an important part in this. Such increased consumption requires using peat as supporting fuel.”

eliminated the need for peat: “The energy industry wishes to use peat now and in future for a number of reasons. Due to its combustion technology properties, peat facilitates burning of forest chips and other fuels derived from biomasses and waste of varying qualities.”

“Being a domestic resource, peat also improves the terms of trade of the national economy, has significant positive regional and local economic effects, and is also important in terms of security of supply. Furthermore, peat also restrains overheating of the wood fuel markets – wood has to have a competitor,” admitted Mr. Kostama.

Peat holds a significant part in the energy industry objective to move on large scale from the use of imported fossil fuels to domestic fuels. According to the objective of Energiategollisuus ry, covering a period of up to the year 2050, this would mean a continued use of peat at about the current level, while wood is used in maximum volumes. The share of peat in the overall heat production would be approximately 20%.

“If no peat was available, the replacing fuel would be coal. Wood and other renewable sources of energy are in any case used as much as possible,” said Mr. Kostama.

Some 85 attendees were carefully listening to the presentations of the Finnish Peat Day at Kalastajatorppa on 18 October.



Member of Parliament Esko Kurvinen from Oulu says that he is very interested in energy issues. In Northern Finland the importance of energy is increased by the cold climate and the energy-intensive industry concentrated in that region.

### Peat is crucial for energy supply

The role of peat in the Finnish energy supply was discussed by Ilkka Kananen, Director of Huoltovarmuuskeskus, the National Emergency Supply Agency. He noted that the level of energy self-sufficiency in Finland is fairly low, just 35%. In addition, it should be taken into consideration that 80% of the imported energy originates from only very few suppliers for oil, electricity, natural gas, coal, and nuclear fuel.

According to Mr. Kananen, peat does indeed have an important position in the Finnish energy supply. The adequacy of the resource is good, and peat is available across Finland. Moreover, peat is also not dependent on international logistics, it can be used in combination with other fuels, and it serves as a reserve fuel for biofuels. Besides, peat technology is ready and reliable.

“In order to ensure security of supply, new peat reserves should be brought into production by improving the handling of the planning and permit



processes; the position of peat should be modified in the climate treaty, and the impact of weather should be reduced in peat production by developing harvesting and drying technologies,” Mr. Kananen suggested.

### Review of the National Peatland Strategy is moving ahead

The status of the national peatland strategy was reported on by Environmental Manager Veikko Marttila of the Ministry of Agriculture and Forestry. He had headed the strategy workgroup and noted at the Peat Day that the issue is moving ahead in the public administration.

“Comments made on the strategy have been rather consensual and predominantly positive. The strategy has been considered necessary, and the proposals it contains useful.”

He continued that “the government programme supports the promotion of the strategy, although no firm policies have been developed. Currently the issue is being worked on by three government ministries, and it is intended to complete the draft proposal by the end of November. Based on this proposal the Cabinet will make its decision,” Mr. Marttila anticipated.

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# Estonian Mire Inventory Completed

Text: Jaanus Paal, Eerik Leibak

## **In 2009 - 2010 the project “Estonian Mire Inventory Completion for Maintaining Biodiversity” was successfully implemented.**

This project was principally a continuation of the project “Estonian Wetlands Conservation and Management Strategy” accomplished in 1997 (Paal et al., 1998) which concentrated only on larger mires, while most of protected mires were disregarded. The conclusions of the 1997 inventory included certain proposals for an addition of wetlands with high conservation value to the protected areas network.

In the following years a lot of such proposals have been realized by the Government of Estonia, largely in the course of implementation of the EU Habitats Directive. On the basis of these results, a preliminary list of mires with low conservation value was compiled as well. This list, later discussed and developed together with the Estonian Ministry of the

Environment, was thought to serve as a source of potential new peat fields, to avoid extraction from bogs with high conservation values. However, the Ministry did not find enough juridical founding to establish it as a ministerial regulation and it worked thus only on recommendation level.

The general aim of the present inventory project was to complete the inventory of all mires in Estonia, and on the basis of these results to develop a national strategy for mire management. The results of the project will be:

- to obtain source data for optimizing the network of protected mires;
- to enable wise and sustainable use of peat as a natural resource by producing objective primary material for planning of peat use on both regional and time level;
- to help local municipalities and different governmental departments in the process of issuing relevant permissions,

approvals or other documents concerning the use of natural resources within mires and their surroundings;

- to provide local people living in the surroundings of mires with an overview concerning the future of those wetlands and thus enabling people to have some perspective views and confidence in the future of their home (milieu) 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 the European Environment Agency (EEA) and Norway Grants, but also by the Estonian Environmental Investment Centre and Mr. Ahti Heinla. Altogether 110 experts and 42 assistants participated in the field work.

For the inventory, field worksheets were used in which *inter alia* the

Left page: A transitional mire in good natural state. Mahtra mire. Photo: Jaanus Paal.

following characters 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, flora and aesthetical value, other values - hydrological, fauna, recreative, didactic, etc.);
- representativity of habitat;
- global assessment (importance for nature conservation).

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

During two field work periods 13,901 peatlands were inspected, on the basis of which 13,850 data sheets were added into the database. Most of these concern mires (8,676 sheets), others represent paludifying grasslands and forests, peatland forests, floodplain habitats, drained (decomposed) peatlands, etc.

### Conclusions on assessment of habitats

All peatlands together cover 1,009,101 ha or 22.3% of Estonian territory (Orru, 1995). According to the

present inventory, mires form at least 233,000 ha or 5.2% of our territory. Adding numerous tiny (less than 0.5 ha) mires which were not inspected, and those mire habitats which occur as marginal patches within other habitats (and the surfaces of which are calculated among the surfaces of the latter ones), the total coverage of mires in Estonia may reach to ~5.5% of the territory (240,000–245,000 ha). In any case, the remaining 17% are covered by paludifying grasslands and forests, peatland forests, degraded peatlands and other (former) peatlands.

The surface of the majority of mire site types in Estonia has decreased during the last 60 years 2.6-2.8 times: from 642,200 hectares to 232,900 (-245,000) hectares.

By different site types, the conservation status of 67-95% of the inspected mires was assessed to be excellent or high. This result proceeds from the fact that due to the direct or indirect impact of human activities numerous mires have been covered by a dense tree layer (allogenic successions have been taking place) and those habitats with low conservation status are often not qualified as mires any more but as peatland forests. In that way, the total number and surface of mires are decreasing but the conservation status of extant mire

habitats remains relatively high. The results concerning the estimates of global assessment (conservation importance) are quite similar to those of the conservation status. There are only two site types in which habitats of high conservation importance form less than half of the total surface of the respective site type: poor fens (46%) and minerotrophic quagmires (48%). The percentage for heath moors (51%) is comparable with the latter ones. Habitats with high conservation importance of other site types form 72-90% of the total surface of each site type.

In comparison with the total surface covered by habitats of different mire site types, the area of respective protected mires varies by site types from 42% to 81%. Thus, mire habitats are protected in Estonia much more sufficiently than some grassland or fresh forest habitat types. We can also admit the high global assessment values of the already protected mires, which means that the network of the Estonian protected areas has been established deliberately. Nevertheless, for every mire site type there were discovered some additional areas with high conservation value, addition of which to the existing network of protected areas should be solved in the nearest future. Moreover, some mires are protected only partially at present.



Numerous mires are influenced by beavers damming up the streams. Karula National Park. Photo: Jaanus Paal



Spring fens are very sensitive to human impact. Tatra spring fen.  
Photo: Jaanus Paal

Estimates of mire areas within the Sites of Community Importance (SCIs) have been previously assessed by the Estonian Ministry of the Environment. For the majority of the habitat types, their estimates of the total surface 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. The only exceptions are types 7160 (Fennoscandian mineral-rich springs and spring-fens) and 7230 (alkaline fens) for which the earlier estimates of protection have been remarkably overestimated.

The occurrence of habitat types within the SCIs is mostly higher than 60% and, according to the traditions of the European Commission, they are considered as sufficiently represented. We may largely recognize such a conclusion and do not foresee large-scale establishment of additional sites for most of the mire habitat types in the future.

However, there are two mire habitat types for which a number of additional sites are to be designated: the

mentioned types 7160 and 7230. The present occurrence of these habitat types within the SCIs – 48% and 65%, respectively – may formally seem sufficient, but habitats of these two types are the most threatened in Estonia. From the hydrological point of view, only less than 25% of spring fens and less than 10% of the species-rich alkaline fens were stated to be in more or less natural conditions (Ilomets, 1994) and their favourable conservation status cannot be guaranteed outside the Natura 2000 network.

Though the Natura 2000 network has been established to protect different rare and/or threatened habitats on larger (European) scale than only within one state (as it is too often

done), and though Estonian mire habitat types are mostly listed in Annex I of the Habitats Directive, it is clear that not all valuable sites are of equal importance. It has often happened that a lot of attention is paid and finances applied to keep a single representative of a certain habitat type in a country (region), not asking whether habitats of the same type could be common in other countries (regions).

And, vice versa, a country (region) may be heedless of those habitat types which are very widespread and common within it but not in other countries. Therefore it should be recommended to widen the concept of responsibility species also to responsibility habitats.

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



In north eastern Estonia large mire areas have been dramatically destroyed by oil shale quarries.  
Photo: Jaanus Paal

and surface of large bogs is much lower in Latvia (comparable to the situation in southeastern Estonia) and e.g. 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 spring-fens) and 7230 (alkaline fens) might also become candidates of responsibility habitats for Estonia, especially due to the rarity of intact calcareous habitats in most of the other countries of the Boreal bioregion. Even Estonian *Cladium mariscus* fens (type 7210) almost lacking in 2/3 of the country, will occupy the 3rd place in Europe after France and Sweden by their total surface.

The main threat to Estonian mires has come and will still come from drainage activities. It has been much easier to seek compromises between conservationists and peat producers, than between environmental authorities and amelioration societies/bureaus. Drainage is usually not subject to the environment impact assessment obligation yet.

In order to sustain the use of peat and preserve valuable sites, the Estonian State Audit Office suggested in 2005 to the Ministry of the Environment to stop the issuing of new permissions for mining regarding mires or their parts which have not been mined so far. To dissolve this static situation we need an agreement, concluded on as large a social and scientific basis as possible, which mires are necessary to be preserved and which of them will be left free for admissible human activities. More than 115,000 ha of the total area of bogs are situated within different protected areas



Mixotrophic quagmires also belong to the threatened habitat type. Karula National Park. Photo: Jaanus Paal

at the present. The remaining bogs (ca 35,000 ha) cover an area that is larger than has been used by peat producers during all the industrial history of Estonia. The results of the present inventory will help to select the areas with lower conservation value for economic usage and enable to find a compromise between nature conservationists and peat producers.

The full description and results of the project (Paal & Leibak, 2011) can be ordered for postal charges from the Estonian Fund for Nature, elf@elfond.ee.

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## Literature

- Ilomets, M. 1994. Miks peame hoidma Eestimaa soid? – Eesti Loodus, No 3: 80-83.
- Orru, M. 1995. Eesti turbasood. Eesti Geoloogiakeskus, Tallinn.
- Paal, J. 1997. Eesti taimkatte kasvukohatüüpide klassifikatsioon. Classification of Estonian vegetation site types. Eesti Keskkonnaministeerium & UNEP, Tallinn.
- Paal, J., Ilomets, M., Fremstad, E., Moen, A., Børset, E., Kuusemets, V., Truus, L. & Leibak, E. 1998. Estonian Wetlands Inventory 1997. Publication of the Project „Estonian Wetlands Conservation and Management”. Eesti Loodusfoto, Tartu.
- Paal, J. & Leibak, E. 2011. Estonian Mires: Inventory of Habitats. Publication of the Project „Estonian Mires Inventory Completion for Maintaining Biodiversity”. Regio Ltd., Tartu.



When mowing has ceased, the paludifying grasslands and fens with a shallow peat layer will grow over with bushes. Photo: Jaanus Paal

# Workshop on Peat and Humic Substances in Zittau, Germany

## *Current research in chemical, physical and biological characterization of peat*

Text: Yvonne Seel

**A small group of about thirty scientists and researchers from Germany, Poland, Hungary, Latvia, Russia and the Netherlands met in Zittau, Germany to discuss their latest research results in peat characterization.**

At the end of September 2011, IPS Commission IV and the Section IV of the German Peat Society (DGMT) held the Workshop 'Peat and Humic Substances' in Zittau, Germany. Discussions under the topic 'Current research in chemical, physical and biological characterization of peat' included new findings in peat and humic substance analysis.

The workshop was organized by the Institute of Process Development, Peat and Natural Products (iTN) of the University of Applied Sciences Zittau/Görlitz in cooperation with the

International Graduate School (IHI) Zittau who also provided the venue.

Before the official start, the workshop participants had the chance to walk around Zittau's town centre. In a 1.5 hour guided tour, the sights of the 1255 founded town in the border triangle of Germany, Poland and Czech Republic, were visited.

The Workshop started on 28 September with a public lecture about the Lusatian Peatlands in the silvics system by Rainer Gemballa from the Public Enterprise Sachsenforst, Germany. Mr. Gemballa's talk was well attended, both by workshop participants and interested citizens of Zittau.

The lecture was followed by the poster presentation and a 'Get together' where, for example,



Zittau's International Graduate School was venue of the conference.  
Photo: Monika Guhr



current conditions of fens in the Stolowe Mountains National Park in Poland were discussed as well as the characterization of dissolved organic carbon extracted with HWS from some Hungarian soils.

The second day started with a keynote lecture by Māris Kļaviņš from the University of Latvia. He spoke on peat and their humic matter properties and new areas of application. Following, in different presentations peat types in concepts

The participants during the field trip of the workshop.  
Photo: Monika Guhr

and trends and their optimization for the isolation of humic substances were discussed and experiences exchanged. Furthermore, the interaction of humic acids with actinides was presented. The focus here was on the influence of heteroatomic functional groups, other than carboxylic groups. Another discussed topic during that morning session was the hydrochemical indicators of runoff formation in mountainous peatlands of temperate climate.

In the afternoon, we visited the nature reserve 'Dubringer Moor' in Northern Saxony. A local guide gave an introduction into the unique flora and fauna at different habitats of the percolation bog. He also spoke about the ongoing renaturation but also pointed out former and current damages and hazards to the bog. After returning from the field trip, everybody was invited to a dinner reception with typical Lusatian food.

On Friday, 30 September, the scientific sessions continued. This

day's keynote lecture was held by Christian E. W. Steinberg from the Humboldt-Universität zu Berlin, who spoke about inducible gene expression as response to humic exposure and went into detail from genes to functions in short-lived animals. Afterwards, a paper on the influence of extracellular fungal peroxidases on recalcitrant biopolymers was presented and discussed. The rest of the morning featured talks on the UV-protective effect of humic substances. All presentations were lively discussed.

In the afternoon the focus was more on peat materials and soils. Decomposition stability of selected fen soils depending on substrate quality was presented whereas the final presentation by György Füleky from Szent István University, Hungary

pointed out the phosphate sorption capacity of peat materials.

In his final words, Prof. Schoenherr, Chair of Commission IV, invited everybody to the upcoming International Peat Congress 2012 in Stockholm, Sweden and to the next *Workshop Peat and Humic Substances* in Zittau, Germany, which is planned for 2014.

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During the workshop.  
Photo: Yvonne Seel

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# Baltic Peat Producers' Forum 2011 brings more than 200 peat experts to Riga



**Already for the 11th time, peat producers from Estonia, Latvia and Lithuania met for the annual Baltic Peat Producers' Forum - this time in Riga, the beautiful capital of Latvia, to discuss "After-use of cut-over peatlands: measures and methods" on 14-16 September.**



According to the organisers, more than 200 participants had signed up for the event, which underlined the importance of this almost traditional seminar. In addition to representatives from the Baltics, guests came also from Belarus, Belgium, Canada, Denmark, Finland, Germany, the Netherlands, Russia and Sweden. This shows well the internationalisation and vertical expansion of the peat and growing media sector.

The Forum was opened by Ivans Cuprunis, Chairman of the Board of the Latvian Peat Producer's Association, and Rolands Bebris from the Latvian Ministry of Environmental Protection and Regional Development. Greetings from the International Peat Society were brought by Secretary General Jaakko Silpola, after which Prof. Laimdota Kalnina from the University of Latvia spoke about after-use

options and activities in her country. The programme continued with presentations by Juris Nusbaums on peatland recultivation in Latvia, Dr. Romas Pakalnis on possibilities of cutover bogs in Lithuania and Prof. Janus Paal on sustainable use and protection of Estonian mires. After that, Dr. Mara Pakalne gave more details on raised bog restoration in Latvia.

Later during the day, Bernd Hofer from Germany spoke about long-time after-use experiences in Germany and Hein Boon from the Netherlands introduced the Dutch project for responsibly produced peat. The short, but interesting discussion thereafter was chaired by Dr. Norbert Siebels

of Klasmann-Deilmann GmbH from Germany.

In the afternoon, the participants heard reports about the peat production season 2011 from Giedrius Kavaliauskas for Lithuania and Erki Niitlaan for Estonia. The session continued with Prof. Maris Klavins' speech on peats as sorbents, and Oskars Purmalis' report on humic acids in peat and their application.

Following that, presentations were given by Valery Kovalov of Beltopgas and D. Sc. Academician Ivan Lishtvan on peat resources and their utilisation in Belarus, after which Marie Kofod-Hansen and

Gunilla Öberg from Sweden took the opportunity to invite all present to the International Peat Congress in Stockholm next year.

Last, but not least, Georgijs Sicovs reported about the application of radiolocation for geological mapping of peatlands, Kanstantsin Pachepka spoke about Vitebskoblgas' new peat factory, Rob van Rijnsouw from Sloopweg Machinefabriek gave advice on fire safety, Marc Peray introduced Premier Tech Chronos' new technologies and Jazeps Kivlenieks spoke about SIA Agrovita. The presentations can be downloaded at [failiem.lv/u/dtzrvon](http://failiem.lv/u/dtzrvon) and photos are available at [failiem.lv/u/vnkqabc](http://failiem.lv/u/vnkqabc).

The following day was reserved for an excursion to Amaciems, a quite interesting and unique holiday park surrounded by excavated peatland lakes as well as the famous Sigulda Nature Reserve. We thank the organisers for all their efforts - this was another great opportunity to learn about peatland matters of all kind, to meet colleagues and discuss current matters. See you next year in Estonia!

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# Visions and Visionaries at the 46th German Peat and Humus Day in Bad Zwischenahn

Text and photos: Susann Warnecke



Stephan Patzer.



Johannes Welsch.

**The 46th Annual Seminar of the German peat and growing media producers, the Deutscher Torf- und Humustag, took place in Bad Zwischenahn in Lower Saxony on 27 October 2011. The conference was held in German, but attended by many international specialists, too.**

The seminar day was opened by Stephan Patzer, Chair of the Working Group on Growing Media, Potting Soils and Constituents of the Industrieverband Garten (IVG), the main organiser of the event. He was joined by IVG Chief Executive Johannes Welsch in moderating the presentations and guiding the following discussions.

Visions were the main topic of the seminar - and the question how to recognise and foster visions and visionaries was skillfully introduced by psychologist Stephan Meyer of Denkstelle Unternehmensentwicklung. After these inspiring thoughts, Paul Waller from the United Kingdom raised more serious issues by speaking about the tightening situation of peat and its use in horticulture in the UK. He was followed by Dr. Reinier de

Man who introduced the Dutch sustainability project for peat and their project group's efforts for a certification system for peat to the interested audience. Aidan Campion and Munoo Prasad of Bord na Móna continued with the properties of Irish peat when used in growing media.

Especially interesting was the following presentation by Dr. Axel Precker on mires and peat reserves in Western Siberia. After that, Georg Embert from the German Federal Ministry of Food, Agriculture and Consumer Protection discussed different aspects when harmonising legislation and rules for goods being traded within the European Union.

Karin Luyten-Naujoks of the Bundesgütegemeinschaft Kompost explained advantages and disadvantages of thermal vs. organic utilization of green waste in her speech. This was continued by Prof. Dr. Elke Meinken from Hochschule Weihenstephan-Triesdorf who raised the question whether residues from biofuel plants can be used to replace peat in certain circumstances.

At the end of the conference, Herman Oosterkamp of

Kalloveen, the Netherlands, took the opportunity to discuss the efficiency of different after-use opportunities for cutover bogs, for instance bog restoration by spreading suitable Sphagnum fragments on rewetted areas.

The seminar day was followed by a delicious dinner in the famous Spieker restaurant where discussions continued until late into the night. Thanks to the organisers and sponsors of this interesting day!

More information on the Industrieverband Garten and their events can be found at [www.ivg.org](http://www.ivg.org).

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# *Sphagnum* farming workshop in the Canadian Maritimes:

*A chance to overview the international research efforts and challenges*

Text: Josée Landry, Rémy Pouliot, Greta Gaudig, Sabine Wichmann and Line Rochefort

There is a growing worldwide interest to grow *Sphagnum* fibres on a renewable basis. The various requests received from different parts of the world over the past five years on how best to grow *Sphagnum* prompted the Peatland Ecology Research Group (PERG) to organize a workshop to assess the progress made since the first *Sphagnum* workshop hosted in Bremen, Germany in 2005.

## General description of the workshop

The second *Sphagnum* farming workshop was held in the Canadian Maritimes, more specifically in the Acadian Peninsula of New Brunswick on 20<sup>th</sup> and 21<sup>st</sup> June 2011 (Fig. 1).

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 were invited to bring slides of their subjects of predilection to stimulate the discussions within a structured framework of questions. Since the most intensive investigations on *Sphagnum* farming have been conducted so far by research groups in Canada and Germany, those participants gave most input to the workshop, but works done by Chilean, Finnish, Japanese and South Korean groups

were also considered (examples on Fig. 2).

To illustrate the progress made by the Canadian group, the *Sphagnum* farming station in Shippagan, New Brunswick was visited at the end of the first day (Fig. 3). The participants were able to compare the evolution of the different large scale production cycles, created 7, 5, 3, 2 and 1 years ago, as well as earlier during the summer 2011. To end the workshop pleasantly, participants were taken on a field trip to the beautiful island of Miscou, where they were able to enjoy the view of the ocean and to visit a unique coastal bog (Fig. 4).

## What was the main message of each session?

1) *How to favour rapid establishment of a Sphagnum carpet?*

This session started by addressing one of the first questions that comes to mind when starting a *Sphagnum* culture: Which species to favour? This choice is obviously strongly dependent on what species are native or available where the *Sphagnum* farming is taking place, as well as the final use of the *Sphagnum* fibre. If *Sphagnum* is used for restoration, then the species of the *Acutifolia* section (such as *Sphagnum fuscum* or *S. rubellum*) can be



Fig. 1: One discussion session during the *Sphagnum* workshop. Photo: Francis Muller



Fig. 2: Examples of *Sphagnum* farming around the world. Japan on the left-top side, South Korea on the right-top side, Chile on the left-bottom side and Canada on the right-bottom side. Photos: Yoshikazu Hoshi (left top) and Line Rochefort (others).

favoured since they regenerate well and are relatively tolerant to drier conditions.

However, if *Sphagnum* fibres are to be added in growing media, those *Sphagna* with good absorbency, stability and providing good structure should be prioritized. In that case, *Sphagnum* from the section *Sphagnum* (as *S. magellanicum*) seems more appropriate since these broad leaf species have very good absorbent and physical properties. *Sphagnum* from the section *Cuspidata* (as *S. cuspidatum*) are not an interesting choice, as they grow fast but also tend to decompose quickly. Few studies have yet focused on the comparison of performances between the various *Sphagnum* species in growing media. Although it appeared that *S. affine* is a good candidate, *S. fimbriatum* performs as well as *Sphagnum* from the *Sphagnum* taxonomical section when it comes to plant growth when these species are added to growing media.

Another question regarding the species is whether to use mono-specific species or mixtures of species to promote rapid establishment of the *Sphagnum* carpet. First, if the hydrology can be accurately controlled, it is easier to do mono-specific cultures even with less tolerant species. In optimal conditions, when water is near or equal to the surface, *Sphagnum magellanicum* and *S. papillosum* do not establish better if accompanied by other *Sphagnum* species.

However, when water access is limited, *S. magellanicum* and *S. papillosum* establish better when accompanied by species of the *Acutifolia* section. As the first two years of establishment are crucial for *Sphagnum* growth, weather has a major role to play in the success of *Sphagnum* carpet establishment.

A wet year with well-distributed rain events of more than 2 mm is optimal for the establishment of *Sphagnum* mosses.

A lot of efforts are made to optimize the conditions under which *Sphagnum* is cultivated. *Sphagnum* can efficiently grow on numerous substrates. Good results have been obtained on black peat, blond/white peat, floating mats and even on clay. The substrate is not that important but the humidity on the interface is crucial. It appears that even when the 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 support surprisingly high conductivities, as proven by studies



Fig. 3: A visit at the Sphagnum farming station in Shippagan, New Brunswick.  
Photo: Line Rochefort

in abandoned mining lakes. As long as the pH is between 3 and 6, that the conductivity stays below 500 $\mu$ S/cm and that the water level is kept high, *Sphagnum* should grow. It is to be noted that, regardless of the species, the quality of the fibres for after use will strongly be influenced by the type of harvest and time of harvest (prioritize drier periods).

### 2) How to optimize operations on a large scale for a farming system?

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 a challenge. 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.

Here are the main aspects that should be taken into account when

preparing for the opening of a *Sphagnum* farming station:

1. Evaluate if a proper water supply is available. The chances of efficiently controlling water are increasing with a good automatic water control pumping system.
2. Ensure that the evapotranspiration on site is as low as possible as well as the infiltration, 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.
3. Identify the initial conditions of the site: peat stratigraphy, soil chemistry, peat depth, water direction, presence of existing vegetation.
4. 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).

However, a challenge is to find the optimal combination of machinery, as it has to be adapted to the field it is used on (Fig. 5).

### 3) How to increase the accumulation rate of *Sphagnum* carpets?

In the context of *Sphagnum* farming, controlling the hydrology is really



Fig. 4: View of Miscou coastal bog.  
Photo: Francis Muller



the key to obtain optimal biomass accumulation rates. Under optimal conditions of humidity, the addition of vertical structures (ex: wooden sticks) does not increase biomass accumulation. However, the presence of structures enhances growth and biomass accumulation

under low humidity conditions by creating favourable microclimates and providing growth support (Figure 6: example of greenhouse experiment about structure addition).

On floating mats, structures have been proven useful since they keep the fragments in place. Vascular plants providing structures can be interesting in situations where

the *Sphagnum* fibre produced is used for restoration. Conversely, when *Sphagnum* fibres are used in growing media 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.

As for *Sphagnum* establishment, mono-specific culture is 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 fertilization. Fertilizing with nitrogen or phosphorus promotes length increment, but not biomass accumulation. Fertilizing is useful in the context where *Sphagnum* is used for restoration because it facilitates vascular plants and *Polytrichum* which are desirable species for restoration. However, this is not the case when producing *Sphagnum* for growing media or floral moss.

Weed control is a concern for *Sphagnum* farming, because the removal of these undesirables is not that easy. Trials of repeated mulching did not give any interesting results. For tussock forming species, repeated cutting starting right before seed formation and a second time in autumn with a trimmer seems helpful. More investigation must still be conducted to find the most efficient techniques, but a starting material as exempt of weeds as possible will facilitate weed control for the beginning.

Other uninvited guests can sometimes occur in *Sphagnum* cultures, such as birds, mammals, algae, fungi and signs of chlorosis. The workshop participants tried



Fig. 5: Spreading *Sphagnum* fragments with a lateral manure spreader in former block cut peatlands in Canadian *Sphagnum* farming experimental station.  
Photo: Josée Landry



Fig. 6: Example of greenhouse experiments on structure addition to favour *Sphagnum* growth in a context of biomass production. Photo: Rémy Pouliot

to understand the phenomenon behind the presence of chlorosis on *Sphagnum* in a controlled environment (Fig. 7). Few hypotheses have emerged.

When *Sphagnum* is watered by the top under a very strong sun, leaves can burn. In the greenhouse, since the water level is always kept high, the *Sphagnum* might be pumping a large quantity of water by capillarity, causing the accretion of minerals on *Sphagnum* tips. Investigation is still needed to solve this problem.

In order to promote biomass accumulation, finding ways to slow down decomposition rates is a very crucial avenue and phenolic rich material have the potential in doing so. To conclude, there is still a lot of interesting avenues to explore. Studies of eco-hydrology at micro scale have to be promoted to push further investigations on evapotranspiration versus precipitation.

4) *What are the advancements in end products research?*

The participants made a concerted effort to list the end product possibilities and here is an overview

of what came up: floral moss; addition in growing media; pure *Sphagnum* as a growing substrate; packaging for mailing of special flowers, small mammals, 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 this discussion was if *Sphagnum* material would cause N-immobilization for horticultural plants. This hypothesis has been tested and in the trials no immobilization of nitrogen was observed, even a small delivery was noted.

Storage of fresh material has also been a subject of discussion. It seems that storage at 4°C or below zero are two efficient ways. It could also be interesting to compress the material in a way to diminish its volume. Still, trials are needed. When storing important quantities of *Sphagnum*, it is important to avoid overheating by making relatively large 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 (Fig. 8). Also, technical possibilities to sort and separate the material have to be developed.

5) *To what extend is Sphagnum farming economically feasible?*

The implementation of a *Sphagnum* farming culture requires some investments, especially for the damming system (if farming is done on peatlands formerly harvested by vacuum), for water control devices, for maintenance, for adapted machinery, for harvest and for the conditioning of final *Sphagnum* biomass.

The incomes will mainly depend on the productivity of the culture, on special markets and on valuation or remuneration of ecosystem services



Fig. 7: Dead Sphagnum tips by what appears to be a stress of growing in a controlled environment under a too great evaporative demand. Photo: Line Rochefort

### What's next?

The international dialog about all aspects of Sphagnum farming will be continued, next with the *Sphagnum* farming session at the 14<sup>th</sup> International Peat Congress 2012 in Stockholm where the next workshop is planned to be organized.

### Acknowledgements

The authors would like to sincerely thank all the 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.

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(for example: Carbon certificate or *Sphagnum* as agricultural plants). In the end, economical feasibility of *Sphagnum* farming is directly related to the market and to society decisions.

#### 6) What are the potential environmental impacts?

Impacts on environment will depend on the starting point of the *Sphagnum* farming. Benefits or repercussions of that kind of culture will not be the same according to the country where *Sphagnum* farming is done. Here are a few examples of potential positive impacts that could come out from *Sphagnum* farming:

1. a possible carbon storage system,
2. a contribution to biodiversity conservation,
3. a diminution of the pressure on natural ecosystems and
4. an end of degradation of peatlands in some regions.

*Sphagnum* farming can also provide services such as provision (sustainable), habitat (for rare species), regulation (for water balance) and cultural services (conservation of open landscapes,

preserving peat as archives, etc.). As with any activities occurring in peatlands, people involved have to be careful to avoid negative environmental impacts 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 participants, we gave a first attempt to define the term *Sphagnum* farming jointly, and as a basis for further discussions: 'Production and harvest of Sphagnum fibre on a cyclical basis over a given area.'



Fig. 8: Example of a Sphagnum carpet with the presence of *Polytrichum* and vascular plants that would potentially have to be sorted out in order to add the Sphagnum to growing media. Photo: Rémy Pouliot

# Use of Ukrainian Peat: Problems and Prospects in Energy and Horticulture



Fig. 6: Volodymyr Hnieushev on a peatland where production stopped 30 years ago. The process of peat formation and peat accumulation has resumed successfully.

Text: Volodymyr Hnieushev,  
Oleksander Stadnik  
Photos: Volodymyr Hnieushev

**Ukraine is the most southern European country where peat resources have an industrial value: the geological reserves of peat are estimated near 2.17 billion tonnes. The comparatively warm climate activates processes of disintegration of organic matter of the peat-forming plants, being the main reason for the high rate of decay.**

The character of the water feed to a wetland and the composition of its plant vegetation are the main factors in the formation of fen peat: amounting to 96% of the general balance. Ground waters, which are rich in mineral salts are first forming a mineral constituent of plants, and afterwards the peat matter.

Many peat deposits are forming and developing on the floodplains of rivers. Water from these rivers, especially in the period of spring flooding, is bringing a lot of mineral particles into the peat deposit from the nearby territories. All factors above explain the high ash-content of Ukrainian peat.

The average ash-content of 76.8% of the reserves was analyzed by the authors and it was discovered that 52.2% of them have an unstandardized ash-content for fuels, higher than 23%.

During many decades, the peat in Ukraine was utilized in two main directions: as a fuel and as a basis for compost making. Tens of tonnes were brought into every hectare of the existing fields, for improving the fertility properties of the soils. Presently, peat-based fuel is produced mainly in the form of peat briquettes. Peat pellets have not such a popularity among producers. The production of composts was almost shut down due to high transportation expenses to the fields.

## **Peat use in horticulture and its challenges**

In Ukraine, fen peat is a base for fertile soils for horticulture. Fen peat has one big advantage above widely world known, raised bog (white) peat: fen peat has 1.5-2 times more humic matters compared to the raised bog peat. Humic matter is a

natural stimulator which can be used for the structure forming regulation of poor humus soils. They improve water, air and nourishing regimes of the fertile soil. Sprinkling in small doses for plants, of the humic matter with Na, produces a considerable increase of crop.

So, why is raised bog peat more widespread and popular? There are a couple of reasons, but one of them is very significant: raised bog peat has a lower potential to become dense, which allows roots' aeration to last longer. Fen peat has the property to become more compacted after watering, and that increases clogging. Due to these factors, the ability of air to penetrate into the peat decreases dramatically, which, as a result, slows down the growth of the plants. Our producers found a way to prevent the process of compaction of peat by adding anti-compaction materials, such as bark from trees, sand and zeolites. Zeolites are natural minerals with a micro cellular molecular structure, which have good absorption and ion-exchange properties. Ukraine has a large deposit of zeolites in the



Fig. 1: Anti-compression materials which improve the ability of air to penetrate into the peat: a - sand; b - bark; c - zeolite.

Zakarpattia District and therefore is not difficult to buy this inexpensive material for the above stated purposes.

The consumers can prepare a mixture of peat and anti-compaction materials by themselves or just use a prepared mixture (Fig. 2). Thus, the use of anti-compaction materials allows extending considerably the ways of use of fen peat for fruits and vegetable growing. All people who are involved in horticulture know that humic matter, the natural component of fen peat, allows fast growing of plants.

**Energy peat**

Good energy peat is based on dense, highly decomposed peat. However, as mentioned above, Ukrainian peat has a high ash-content which reduces the heat of combustion of the peat fuel. On the basis of an analysis of 17 peat deposits, an equation was made

by one of authors of this article. This equation demonstrates the negative influence of the ash-content ( $A^d$ ) on the heating value (LHV) of peat as a working fuel:

$$LHV = 11.60 - 0.14 \cdot A^d, \text{ MJ/kg.}$$

During the many years of activity of the Ukrainian peat industry, only those peat deposits with low ash content were extracted. This is why considerable reserves of peatlands were classified as unpromising. However, the demand for local fuels is a motivator to use now peat even with a high ash-content. Today's fuels in Ukraine are made from a mixture of peat and wood or different types of biomass. In this case, fen peat is being used as a binding component.

The addition of peat increases the strength of fuel briquettes and pellets. By our observation, an addition of 30% and more peat to

the wood pellets increases their water resistance considerably. Wood pellets and mixed pellets from wood and fen peat were submerged in water for a couple of minutes, then removed and dried. Wood pellets fell apart immediately but dried pellets that were made from a mixture of wood and peat remained unchanged. Besides that, their moisture content increased insignificantly. These factors are significantly saving fuel quality, for instance during transportation and storage in high humidity.

Fuel pellets and briquettes are mainly produced for the public sector. However, some countries are using milled peat and a mixture of wood waste as a biofuel in power plants. Such projects are under construction in Ukraine as well. The leader of this

Fig. 2: Mixture of zeolite and peat for horticulture.



Fig. 3: Taking samples of fen peat, the ash can be seen as river sand.





Fig. 4: Layer of sand in the peat deposit.

is concentrated in the 0.1-1.0 mm grade. The ash-content which can be achieved during mineral processing of the peat is 10-14%. The conducted experiments showed that air flow separation mineral processing

The efficiency of the tested methods is satisfying for the use in production terms, but it is necessary to search for new efficient methods of peat with a high ash-content. The authors of this article are heavily involved in these investigations, and are planning to present more detailed results of their experiments during the sessions of International Peat Congress of IPS in Stockholm. So far it is possible simply to say that both “problems” of Ukrainian peat are successfully overcome by using innovative methods and technologies – and that Ukrainian peat has a good prospect for many uses.

trend is a young Ukrainian energy company, “Green Energy T.” In collaboration with Finnish colleagues, the company is already working on the construction of several power facilities in Ukraine. For those projects and under these conditions, it is very important to provide enough fuel with a low ash-content. Consequently, the decrease of the mineral content of the peat has such importance. These minerals have a different nature and origin, but for most floodplain deposits, quartz sand is the main mineral component (Fig. 3).

achieved half of the potential of that process.

Therefore, at the present time, a large amount of work is focused at the improvement of techniques and technologies of a air flow separation mineral processing of peat and other dry methods.

In our opinion, the principle scheme of fuel production from peat with a high ash-content must include such technological operations as drying, grinding, dust decreasing, dry mineral processing (air flow separation or friction mineral processing) and pressing. In Ukraine, the process of mineral processing of peat with a high ash-content will enable an additional use of about 0.3 billion tonnes of peat for the energy sector.

## Literature

- Стадник О.С., Гнеушев В.О. Використання торфових ресурсів України з урахуванням їх балансу у природі. / Проблеми раціонального використання соціально-економічного та природно-ресурсного потенціалу регіону: фінансова політика та інвестиції. - Зб. наук. праць. – Вип. XVI № 4. - Київ: СЕУ / Рівне: НУВГП, 2010. - С. 480-488.
- Физика и химия торфа: Учеб. пособие для вузов/ И.И. Лиштван, Е.Т. Базин, Н.И. Гамаюнов, А.А. Терентьев. - М.: Недра, 1989. - 304 с.
- Гнеушев В.О. Переробка торфу в паливні брикети: Навч. посібник. - Рівне: НУВГП, 2008 р. - 212 с.
- Корінчук Д.М. Розробка композиційного палива на основі торфу і рослинної біомаси для використання в теплоенергетичних установках. Автореферат дисертації на здобуття наукового ступеня кандидата технічних наук. - К.: Інститут технічної теплофізики НАН України. 2010. 20 с.

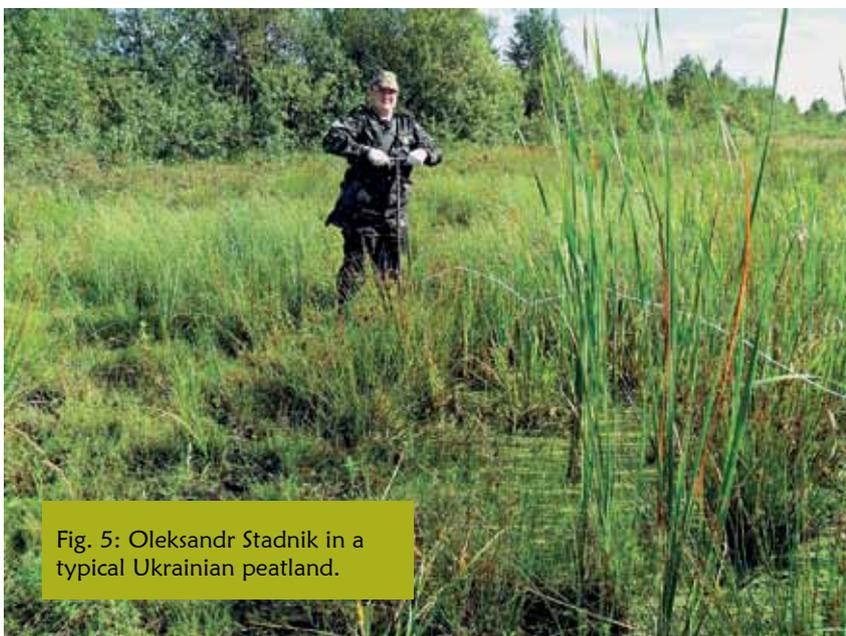


Fig. 5: Oleksandr Stadnik in a typical Ukrainian peatland.



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# Griendtsveen AG's fully automated peat briquette production line is a success!

Text and photo: Jan Schram

**In Germany, peat harvesting is only permitted on heavily degraded peatlands, which are in agricultural use. Before starting the peat extraction, the top spade depth (spit) has to be removed to get a clean surface to produce peat for high added value application in horticulture.**

After peat extraction, the area must always be rewetted and rehabilitated. Also from this perspective, the top spit has no value and is in most cases not used. Quite often the top spit is left on the side, oxidizing slowly away. This was the reason that Griendtsveen started two years ago to experiment on making high quality peat briquettes.

It turned out soon that, for making briquettes with good burning qualities, the peat should be really dry; 12% moisture content proved to be a good value. But drying peat is not easy. As we all know, peat does

not easily release its moisture! Many tests were carried out with different dryer types. After evaluating the drying results with a belt-dryer, a drum-dryer and a feed-and-turn-dryer, the feed-and-turn-dryer came out as the winner.

Another challenge was the feeding system for the dryer. For economical reasons, we looked for a solution with a bunker, that required to be filled only once or twice a day and would have a capacity to feed the process for about 12 hours without interruption. We developed a system (patent pending!) that scrapes the material from the top of the bulk and works its way down to the bottom of the bunker. This proves to be a very reliable feeding system that ensures continuous feed in of homogeneous, loose peat. Other feeding systems tended to squeeze the peat together into lumps that were difficult to dry.

Drying is an energy consuming process. This threatened our goal to produce good quality peat briquettes for a price that would be accepted by the market and allows for a reasonable profit. In our case, we are using residual heat. This heat is produced as a by-product of a biogas CHP plant (combined heat-and-power) at a farm in the neighborhood. The heat is produced anyway, so why not use it? Good for the environment and good for the business case!

After a long period of solving many

small problems, everything looked promising. Then we started to do extensive duration tests. We found out that various different parameters determine the quality of the drying and briquetting process: humidity of the peat, type of peat, available heat from the CHP plant, outside temperature, outside humidity etc. We succeeded in developing an overall supervisory PLC (programmable logic controller) programme that adjusts speeds and airflows based on many measured process values. This way, uninterrupted production is guaranteed and quality of the briquettes is maintained, while many external and internal parameters do not have to be monitored by an operator.

**Main characteristics: average heat consumption: 450 kW, production: 2,000 tonnes/year**

Now this process is fully developed, and as all children's diseases have been cured, the process is available for the market on a commercial basis. Griendtsveen AG has co-operated closely with RIELA GmbH (supplier of the drying equipment) and with Höcker-Polytechnik GmbH (supplier of the briquetting equipment). Systems supplied will be realized exclusively and in close co-operation with these partners.

At the moment we are involved in a project in the Baltic region for two production lines, 4,000 tonnes/year each. In this project we will also supply a biomass burner and boiler equipment for the supply of the required drying energy. Peat or woodchips will be used as fuel.

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Griendtsveen's Director Guus van Berckel proudly shows the peat briquettes.

# Conference on „Necessity of Peatlands Protection” in Tlen, Bory Tucholskie, Poland

Text: Lech Wojciech Szajdak

**The Polish National Committee of IPS and Commission III on “Agricultural use of peatlands and peat” held an international conference on “Necessity of Peatlands Protection” in Tlen, Bory Tucholskie, Central Poland on 1 - 2 September 2011.**

The idea of the organization of this conference came to life during a meeting of the Polish National Committee of IPS at the beginning of 2010. Several enthusiasts representing the Polish peat family supported this idea, revealed great optimism and were willing to realize this project. As a result, the conference was jointly organized together with the Institute for Agricultural and Forest Environment of the Polish Academy of Sciences

and the Polish Committee of Land Reclamation and Agricultural Environment Engineering of the Polish Academy of Sciences.

The conference took place in the village of Tleń, located in the Bory Tucholskie National Park – in the heart of Poland. The location of the conference was chosen due to many long-term studies held there. The aim of the studies conducted in Bory Tucholskie was to learn about biotic and abiotic processes and mechanisms, which proceed in organic soils. Heterogenic properties of humus in organic soils contain chemical compounds characterized by unknown and well-known structures that have an impact on the chemical, biochemical, physical and biological processes in this raw material.

The National Park forms the core of the Tuchola Forest Biosphere Reserve, designated by UNESCO in 2010. It covers the area of 250 thousand ha, including forests, peatlands, lakes, and meadows. The Bory Tucholskie Forest shows one of the biggest forest complexes in Poland. The whole area is thickly forested (mainly pine, oak, and birch), and rich in unpolluted rivers and lakes. This area represents a natural habitat for a variety of plant and animal species.

The conference was especially addressed at young scientists who have been involved in peat issues recently. Fifty Polish, Estonian, Russian, Belarusian, Ukrainian and Romanian scientists attended the conference.

The introduction speech was given by Prof. Lech Wojciech Szajdak, Vice

The participants at the venue of the conference on “Necessity of Peatlands Protection” in Tlen. Photo: Piotr Pinskiwar



Mire near forest reserve “Leon Wyczółkowski Old-Polish Yew Trees” in Wierzchlas. Photo: Piotr Pinskiwar



Chairman of the Polish National Committee and the host of the conference. The program of the conference included oral and poster sessions and one field trip. During three sessions, distinguished leading scientists, young researchers and students presented 44 papers including 13 oral lectures and 31 posters.

### Protection of peatlands

The main topics of the sessions were: (1) peatlands and forest areas, (2) protection of peatlands in agricultural and forestry landscape, and (3) multifunction of peatlands.

Stanisław Bałazy from the Institute for Agricultural and Forest Environment of the Polish Academy of Sciences, Poznań pointed out the significance of wetlands and grasslands for the diversity of entomopathogenic fungi in forests

and farmlands. He suggested that the share of the entomopathogenic fungi in pastures was significantly higher in regularly mown grasslands compared to peat bogs.

The majority of the discussed fungi are of anemochorous, zoochorous or hydrochorous mode of spore dissemination onto neighbouring rural or forestry areas, principally by air currents or winds, local watercourses and adults of many insect species, such as different dipteran groups including tendipedids, culicids, bibionids, tipulids and tabanids as well as dragon flies, beetles and others, swarming in such habitats and then migrating far among the cultivated fields or surrounding forests.

Thus, they increase local pathogenic

potential especially by oligophagous and polyphagous entomopathogens.

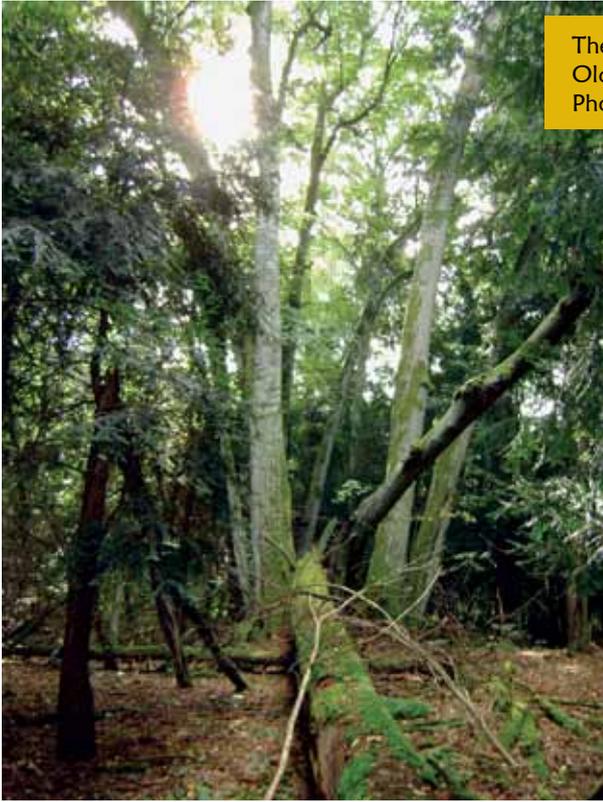
Raimo Kolli from the Estonian University of Life Sciences, Department of Soil Science and Agrochemistry, Tartu presented the application of the ecosystem approach in dealing with functioning regularities and protection of histosols. He proposed that the most dominating peat soil variety is fen soil with thick, well-decomposed (sapric) peat, which is followed by bog soil with thick slightly-decomposed (fibric) peat. Among peaty soils (with a share of <10%), the majority form Histic Gleysols.

In general, a consensus exists in management and protection of well-known (more profoundly researched) and largely distributed fen and bog soils, as well as of extraordinary (spring, quaking) peat soils. More sophisticated is the management and protection of peaty soils, which are located at the border of peat and mineral soils. Nowadays, special

interest exists also for the restoration of cutaway peatlands and management of technogenic peat soils.



Prof. Argenta Titlanova, Novosibirsk, Russia presents the results on “Peat decomposition in transitional mires in Central Poland”. Photo: Piotr Pinskiwar



The reserve "Leon Wyczółkowski Old-Polish Yew Trees" in Wierzchlas. Photo: Lech Wojciech Szajdak

for modelling past climate change and a possible prediction of the future.

Jan Łukaszewicz from the Forest Research Institute, Sękocin Stary, Raszyn showed examples of the actions of State Forests units, aiming to save forested bogs. The presented results of researches conducted by the Forest Research Institute (mainly

suggested that Sapropel as non-hazardous fertilizer activates many biochemical pathways in plants, leading to the increase of self-purification. It stimulates seed sprouting and root growth of cultivated plants. Sapropel fertilizer usage modifies the soil structure, positively impacts the hydrophilic - hydrophobic properties and water and air contents.

Jacek Nowak from the Research Institute of Pomology and Floriculture in Skierniewice pointed out that the standardization's status works towards a unification of methods of physical analyses of horticultural substrates in the European Union. Standardization and characterization of the quality of horticulture substrates became a very important issue when modern technologies of plant cultivation in greenhouses were introduced. Moreover, physical properties of those substrates seem to be a fundamental criteria of quality traits determination. Those methods are widely applied and accepted by the majority of substrate producers as well as laboratories controlling the quality of growing media.

Krzysztof Janku from the Institute for Agricultural and Forest Environment of the Polish Academy of Sciences, Poznań pointed out the secondary succession of *Salix* spp. - the most abundant representative of shrub species in the study area - in order to show how that has changed during the last half of the century. The study showed peat meadows of the Wyskoć Ditch valley heavily transformed by the excavation of the peat. In this process, peat pits were created. His study was based on recent (2011) field surveys, and comparison of air photographs from an over 50 years period revealed that scrub succession is progressing and is a result of agricultural management change.

Mariusz Lamentowicz from Adam Mickiewicz University, Department of Biogeography and Palaeoecology, Poznań suggested that geological and palaeoecological studies are prerequisite to begin neo-ecological studies. Furthermore, the past perspective is useful to start measurements of modern processes e.g. hydrological monitoring or carbon exchange. He postulated that the combination of palaeo- and neo-ecology provides a good basis

in the RDSF Białystok) underline interrelationships between forests and peat bogs. Changes in one of them are reflected in the condition of the other. However, in many cases changes in species composition of peatlands were stated.

**Technology and utilization of peat**

The participants of the session pointed out the standard equipment for picking up samples of organic soils and standard methods for their investigations. The standardization of equipment, devices and methods of investigation is needed for a better comparison of the results.

Jacek Gorski from Geomor-Technik, Szczecin showed new tools and devices used for peatland investigations. He explained the differences for utilization for each of the equipment. His oral speech was accompanied by a rich presentation of tools and devices.

Anatol Sakowicz from the Consulting Office in Wrzesnia explained the methods of extraction of sapropel and its utilization in agriculture, horticulture and pomology. He

**Chemical and physical properties of peat**

During this session, the most recent progress and advancements in soil chemistry, soil biochemistry, soil physics and microbiology of organic soils and their interactions with various components were extensively discussed. Important features of organic matter create their ability to constitute water-soluble and water-insoluble complexes with hydrous oxides and metal ions and to interact with organic substances such as free amino acids, alkaloids, amines, carbohydrates, fatty acids, alkaloids, fatty acids, etc.

Argenta Titlyanova from the Siberian Branch of the Russian Academy of Sciences, Institute of Soil Science and Agrochemistry, Novosibirsk, Russia showed her results on the rate of the peat formation and mineralization

at two depths: 30 cm (the aerobic zone) and 60 cm (anaerobic zone). In the course of the mineralization, a part of losses was replenished by plant residues, including roots of *Eriophorum vaginatum*. She postulated that the apparent loss of peat was lower than the real annual loss. She suggested that the differences between the two layers manifest themselves in the nature of the mineralized residues. At the depth of 30 cm, about 70% of the mass loss is due to mineralization of the moss-cotton grass peat, and 30% is due to the partial mineralization of the plant roots that existed in the mixture initially, and penetrated into the bogs in the course of the experiment. At the depth of 60 cm, about 65% of the decomposed material is represented by roots. The chemical composition and the structure of humic substances is responsible for the water-retention character of organic soils. However, water management of organic soils is strongly influenced by the following two processes: humification macro-pore and micro-pore formation.

Ryszard Oleszczuk from Warsaw University of Life Sciences - SGGW, Department of Environmental Improvement reviewed existing equations and compared field data of moisture content (using gravimetric method) and the values of moisture quantity measured in the peat-moorsh layers by TDR method (using equations presented in the literature). He gave recommendations for the best calibration curves of TDR in lowland peat-moorsh soils in Poland.

Paweł Burandt from the Department of Land Reclamation and Environmental Management, University of Warmia and Mazury in Olsztyn recognized the contemporary hydrological conditions of the nature reserve of "Nietlickie Bagno" on the background of historical cartographic material. Hydrological observations and measurements conducted in the periods differed by the intensity of water outflow and showed significant consequences for the reserve. He found out that the water resources of the reserve are formed by snow and rainwater supply. He postulated that the underground phase of water circulation prevails over the surface outflow.

Katarzyna Styła from the Institute for Agricultural and Forest Environment of the Polish Academy of Sciences, Poznań showed the differences in activities of enzymes participating in redox potential and nitrogen cycle and concentrations of chemical compounds in acrotelm and catotelm of Stążka Mire. Stążka Mire is an UNESCO reserve located in the Bory Tucholskie. She revealed significant differences in the activities of enzymes and the amounts of chemical components between these two layers. She also postulated different rates of the transformation of organic matter in these two layers.

## Excursion and supporters

The symposium included one field trip through Bory Tucholskie. Bory Tucholskie has been transformed into UNESCO Nature Reserves, which preserve the forested areas, particular plant species or peat bogs. The participants saw the most famous forest reserve "Leon Wyczółkowski Old-Polish Yew Trees" in Wierzchlas at Lake Mukrz near Wierzchucin, the landscape reserve.

The trees are under protection since 1827. Furthermore, the reserve represents the highest number of yews in Europe. In addition, some trees are more than 700 years old. Naturally, the participants also got the chance to see several picturesque mires and rivers.

Words of gratitude were given to the sponsors, Consulting Office, Geomor-Technik and Kronen for their support.

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Brda River in the Tuchola Landscape Park. Photo: Lech Wojciech Szajdak

# Some Aspects of Raised Bog Conservation in Northern Poland

Text: Maria Herbichowa, Paulina Ćwiklińska and Agnieszka Sadowska



Fig. 1: Location of the Czarne Bagno bog.

bog in 2006. The area of this mire once equalled 226 hectares. The bog's remnants (102.86 ha) have been protected in a nature reserve since 2006. The reserve is also a part of the 'Łebskie Bagna' Natura 2000 site.

In 2006, within the LIFE – Nature project, the Management Plan of the reserve was elaborated. One of the basic conservation aims was blocking the outflow of water from the bog dome, which succeeded by installing 105 dams in drainage ditches. The progress in water damming is being monitored by a set of automatic divers.

Vacuum peat production was carried out within the Czarne Bagno Reserve in the 1980s. The cut-away area of about 12 ha was left without any reclamation with a highly unstable ground water table level, and the spontaneous succession of plants was scant. When our experimental work began, no more than 5% of the area was covered with vegetation and the moorshing process was in progress (Herbichowa et al. 2007).

The restoration is now being conducted using a modified Canadian method (Quinty, Rochefort 2003). In the first step, we blocked the ditches within the cutover area. Preparing the field for reintroduction involved removing the upper layer of decomposed peat. Within the prepared area, the diaspores (shoot fragments) of seven *Sphagnum* species (*Sphagnum palustre*, *S.*

**In Poland, plateau raised bogs, also known as “Baltic bogs”, are concentrated in the northern part of the country where the climate is relatively humid and cool.**

As an effect of various forms of human activity, no Polish plateau raised bog has remained in a pristine state and almost 50% of them have been totally destroyed.

Since the end of the 18th century, these bogs have been drained, used for small scale peat extraction and afforested and some of them have been damaged by industrial peat production. The total number of remaining Baltic bogs in Poland is estimated at about 70.

According to the research carried out by the NGO Naturalists Club in 2003-2007, within the LIFE-Nature Project “Conservation of Baltic raised bogs in Pomerania, Poland” (LIFE04NAT/PL/000208 PLBALTBOGS), only 24 plateau raised bogs in NW Poland (Pomerania region) were classified as “having a chance to be maintained or restored” (Fig. 1).

During the LIFE-Project, in order to maintain or restore the favourable conservation status of active raised bogs, different activities were undertaken:

1. ten nature reserves were established,
2. all bog protection reserves were supplied with management plans,
3. valuable raised bogs were submitted to the European Commission to become Natura 2000 sites,
4. water conditions were improved in seventeen bogs by blocking the outflow in drainage ditches and ground water level monitoring has begun,
5. in twelve raised bogs young birch and pine trees were cut and removed, an appropriate infrastructure was constructed, enabling access to eight areas, and
6. experimental reintroduction of peat-forming vegetation in the cutover areas was initiated.

Restoration of the vegetation was begun in the Czarne Bagno raised



Fig. 2: Introduction of *Sphagnum* mosses into the cutaway peatland, autumn 2007. Photo: M. Herbichowa

*magellanicum*, *S. russowii*, *S. rubellum*, *S. cuspidatum*, *S. fallax* and *S. capillifolium*) were spread manually and covered with straw mulch (Fig. 2).

The amount of shoots planted created an initial coverage equalling 6-10% in each sub-plot area. The *Sphagnum* material was picked from the closest nearby sites. All species used for reintroduction are present in the contemporary flora of the Czarne Bagno bog outside of the post-excavation fields.

Up until now about 3 ha of the cutover area (seven polders) were treated in this manner. Four polders which are undergoing an intensive regeneration process of *Sphagnum palustre*, *S. magellanicum*, *S. russowii* and *S. cuspidatum*, are being constantly monitored.

The preliminary results show that this method of restoration can prevent further degradation of seriously damaged mires and give a chance for peatland vegetation to recover. The rate of moss regeneration depends on the season of diaspore introduction, the presence of a protective straw layer, soil moisture conditions and the amount of introduced moss

shoots. The *Sphagnum* development in subplots established in summer is much slower than in those which were set up in autumn.

The moss shoots are relatively sensitive just after being spread on the ground and if they suffer from high temperatures and low air humidity their survival rate is low. Introducing shoots in autumn gives the *Sphagnum* optimal growth conditions if the straw layer is replenished yearly at the beginning of the vegetation season.

A crucial factor in stimulating a succession of mosses is maintaining an appropriate water regime in the peat bog. Water table fluctuations observed within the restored areas are unavoidable. It usually takes about 10 years to achieve a stable high water table, especially in intensively drained, vacuum-extracted peatlands.

Despite of the observed gradual water level rise in the Czarne Bagno, the fluctuations are still very high (Herbichowa et al. 2007, 2008). Water table levels drop in summer to as much as 50 cm below ground level, whereas, in spring and autumn, some parts of the restoration field are completely flooded. It seems that

flooding, even when prolonged, does not negatively affect the introduced species, but desiccation during periods of drought and high air temperatures are critical factors.

Considering the above observation, we can assume that *Sphagnum* species used for restoration purposes must be resistant to soil moisture fluctuations and desiccation. Theoretically, the hummock *Sphagnum* species should be the most suitable. In the Czarne Bagno, however, not only *Sphagnum russowii* and *S. capillifolium* tolerate difficult moisture conditions, but also *Sphagnum palustre* and *S. cuspidatum* as well (Fig. 3).

The last of the mentioned species, which is typical to very wet habitats, has increased its coverage in restoration plots from 6% (initial coverage) to 39% within one year and survived well the period of dropping water levels in summer.

The application of mixed shoots of various *Sphagnum* species is also a favourable solution. Specimens of the more durable species, which grow relatively quickly, can be used as 'nursing species' for the other, more fragile ones.



Fig. 3: Regeneration of *Sphagnum cuspidatum* - two years after introduction. Photo: P. Ćwiklińska

The amount of introduced plant material also seems to have a significant influence on the moss succession. Experimental results show that regeneration of *Sphagnum* is 2-3 times faster in plots where an initial 10% of the area was covered with moss shoots than in those where the introduced shoots covered only 6%.

Within the growing moss layer some vascular plant species are able to settle (Fig. 4.). Their diaspores originate from places where *Sphagnum* material was gathered or from the surroundings of the post-excavation area. In the vegetation seasons 2008-2010, numerous specimens of *Drosera rotundifolia*,

*Erica tetralix*, *Eriophorum vaginatum*, *Rhynchospora alba* and *Oxycoccus palustris* bloomed and bore fruits.

An unfavourable process, which occurred in the restoration area, is an expansion of seedlings and young specimens of *Betula pendula* and *Betula pubescens*. These species compete with the *Sphagnum* mosses and, as an effect of intensive transpiration, decrease the soil moisture. Even if it is time-consuming, young seedlings of birch must be manually removed from restoration plots. The optimal factor for limiting birch growth is maintaining a high water table level.

The long term objective of peatland restoration is to return the cutover areas to functional peat accumulating ecosystems and CO<sub>2</sub> sinks (Rochefort

et al. 2003). Some research carried out in Europe revealed that after only a few years of restoration work in a raised bog, the CO<sub>2</sub> emission from peat deposits drops (Augustin 2007). Carbon dioxide emission in the Czarne Bagno has been monitored since 2011. Long-term observations are needed to evaluate the success of our restoration work.

We must be aware, when planning restoration work, that we cannot achieve the primary state of vegetation or hydrological regime in a mire, which was seriously destroyed e.g. by vacuum peat production.

However, the above described method of restoration gives a real opportunity for peat-forming species to establish on cutover areas and, hopefully in the future, to once again begin the peat accumulation process.

## References

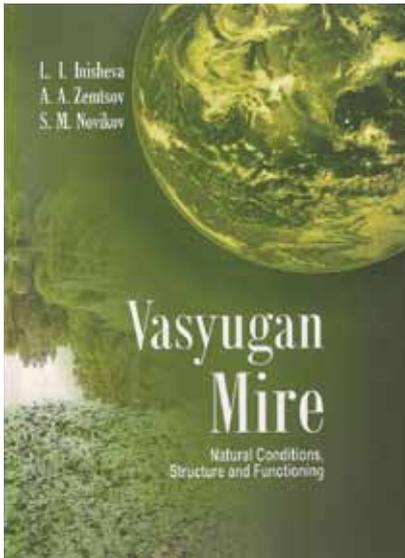
- Augustin J. 2007. Peatland rewetting and the greenhouse effect. International Mire Conservation Group Newsletter 3: 29-30.
- Herbichowa M., Budyś A., Ćwiklińska P. 2008. Experimental re-introduction of mire plant species in milled, raised bogs in Northern Poland. In: Farrell C., Feehan J. (Eds.). After wise use – the future of peatlands. Proceedings of the 13th International Peat Congress, Tullamore, Ireland 8 - 13 June 2008. International Peat Society, Jyväskylä, Finland.
- Herbichowa M., Pawlaczek P., Stańko R. 2007. Conservation of Baltic raised bogs in Pomerania, Poland. Experience and Results of the LIFE04NAT/PL00028 PLBALTBOGS Project. Wydawnictwo Klubu Przyrodników, Świebodzin.
- Quinty F., Rochefort L. 2003. Peatland restoration guide. Canadian Sphagnum Peat Moss Association, St. Albert.
- Rochefort, L., Quinty, F., Campeau, S., Johnson K. and Malterer, T. 2003. North American approach to the restoration of *Sphagnum* dominated peatlands. Wetlands Ecology and Management 11, 3-20.
- Maria Herbichowa, Paulina Ćwiklińska  
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Fig. 4: Young clusters of *Sphagnum palustre* and *S. russowii* give an opportunity for the establishment of vascular plants typical of the bog flora. Photo: P. Ćwiklińska



# Vasyugan Mire – Natural Conditions, Structure and Functioning

Review: Lech Wojciech Szajdak



**Vasyugan Mire – Natural Conditions, Structure and Functioning, by L.I. Inisheva, A.A. Zemtsov and S.M. Novikov. Tomsk State Pedagogical University Press, 2011, 160 pages, 32 figures, and 147 references.**

Every person that has seen only a small part of Vasyugan Mire is amazed, surprised, and charmed by this marvel of nature. It is a unique place to find amazing different kinds of peat in nature and in the world. The mire is located in West Siberia between the Ob and Irtysh Rivers. It is the largest mire in the world with an area of about 5,269,437 ha.

However, the greatest extent of this mire reaches 573 km from west to east and 320 km from north to south. It is located in two geochemical parts: southern taiga and forest-steppe. More than 200 rivers flow down from Vasyugan Mire. Furthermore, the peat accumulation reaches 18.7 billion tons there; it amounts to

16% of the peat stock in the West Siberia region. In the world, there is no other territory in comparison to West Siberia where the mires would occupy similar huge areas.

The scientific investigations of the Vasyugan Mire have started in the 19th century and continue still. Those investigations involve broad aspects of geography, geology, hydrology, biology, ecology, chemistry, and biochemistry.

Therefore, the obtained results are very rich and relevant to different sources. The authors of the book are well-known scientists conducting long-term investigations on the territory of the Vasyugan Mire. They spent a lot of time during field expeditions there and published many papers dealing with different aspect of the Vasyugan Mire. Therefore, they had the real right to write this book. Their deep respect and feeling for the Vasyugan Mire is present in every page of this book.

The book consists of the following chapters: i) introduction, ii) short history of research, iii) environment of formation of mires in taiga and forest-steppe subbelts of Western Siberia, iv) structure of mire biogeocenosis, v) structure of peat resources, vi) on the problem of rational use of Vasyugan Mire, vii) contemporary regimes in geochemically connected landscapes of oligotrophic series, viii) conclusion, ix) references.

The data on the Vasyugan Mire is based on contemporary research. The authors showed the complexity of natural conditions and biogeocenosis structure

occurring in the Vasyugan Mire. Furthermore, clear calculations of carbon sequestration in peat deposit are given. The book explains the structure of peat resources and chemical properties of the peats of Vasyugan Mire.

The authors succeed in providing a comprehensive overview of the structure and functions of the Vasyugan Mire. All materials and results included in the book are very well documented in the text, in the form of suitable tables, figures, diagrams, pictures and tables.

The book is intended for telmathologists, peat scientists, ecologists, biologists, soils scientists, biochemists, chemists and other environmental scientists and specialists but will be also of interest to researchers in microbiology, organic geochemistry, geochemistry, and environmental sciences. The book is well-suitable for undergraduate and post-graduate students and researchers, and other soil-plant science specialists.

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A close-up photograph of a red langur monkey (Presbytis rubicunda) perched on a tree branch. The monkey has reddish-brown fur and a dark face. It is looking towards the camera. The background is a dense forest with many thin tree branches and some green leaves.

Figure 1c: One of OuTrop's three focus primate species: the red langur (*Presbytis rubicunda*).

# Biodiversity research and conservation in Borneo's peat- swamp forests

## Background

A recent article in *Peatlands International* (1/2010, pp28-31) highlighted the carbon emissions resulting from Indonesian tropical peat-swamp forest drainage and efforts underway to help mitigate these emissions. Indeed, following the UNFCCC COP15 and 16, carbon has been the talk of the town and Indonesia's peat-swamp forests have been at the forefront of this discussion, owing to their exceptionally high carbon content. Much less talked about is these forest's biodiversity, which, at present, does not have the same potential for direct economic trading as does carbon and which is frequently considered a "co-benefit" of protecting peat-swamp forests for the sake of conserving carbon stocks.

Borneo's peat-swamp forests were traditionally believed to have very low biodiversity value. This view led to the majority of the Kalimantan's peatlands being given over to logging concessions in the 1970's and, famously among peat scientists, the ill-fated Mega Rice Project in the 1990's. This project aimed to convert 1 Mha of peatland into rice paddies, but, as predicted by experts, failed dramatically and turned much of the area into a fire-prone wasteland. Although impossible to quantify, thousands of orang-utans, and countless numbers of other species, would have perished as a result.

### The Sabangau Forest

It was at around this time that the first real research into the biodiversity of Kalimantan's peat swamps was conducted in the Sabangau Forest, by a team led by Jack Rieley and Susan Page, working in collaboration with the University of Palangka Raya. Among this crew

Text and photos: Mark E. Harrison, Susan M. Cheyne, David A. Ehlers Smith, Simon J. Husson, Helen C. Morrogh-Bernard and Bernat Ripoll Capilla

were two under-graduate students, Simon Husson and Helen Morrogh-Bernard, who had just learnt of a new technique for estimating orang-utan abundance through line transects of their sleeping platforms or "nests", and set about conducting the first orang-utan population surveys in the area. To their – and the conservation world's – surprise, this research revealed that the 6,000 km<sup>2</sup> Sabangau Forest is actually home to the world's largest single orang-utan population, currently estimated at ~6,900 individuals.

This finding was important on a number of levels. Firstly, it helped leverage political and financial support for conserving Sabangau Forest and its important orang-utan population – the majority of the forest in between the Sabangau and Katingan rivers is now protected as the Natural Laboratory of Peat-swamp Forest (NLPSF) and Sebangau National Park, although much still needs to be done to secure long-term conservation success.

Secondly, it brought the importance of Borneo's peat-swamp forests for orang-utan conservation to the

fore, serving as a catalyst for surveys in other peat-swamp areas. This confirmed that many of the largest Bornean orang-utan populations are to be found in peat-swamp forest, including in the Mawas (ca. 3,500 individuals and home of the Tuanan orang-utan research site, coordinated by the University of Zürich) and Katingan swamps (ca. 3,600 individuals). Both these areas are now the subject of habitat protection initiatives, coordinated by the Borneo Orang-utan Survival Foundation and PT. Rimba Makmur Utama/Starling Asia, respectively. Although carbon focused, these projects highlight the substantial benefits for orang-utan conservation accrued from the conservation of these forests.

Finally, this finding and subsequent increased attention served as a platform for the establishment of the Orang-utan Tropical Peatland Project (OuTrop) in 1999, and the development of much further biodiversity research in Sabangau. OuTrop is a UK-based not-for-profit NGO and charity, which works in

Figure 2: A clouded leopard, captured by an OuTrop/WildCRU camera trap in Sabangau.





Figure 1a: Another of OuTrop's focus primate species: the Bornean orang-utan (*Pongo pygmaeus*)

collaboration with the Centre for the International Cooperation in Sustainable Management of Tropical Peatlands (CIMTROP), directed by Suwido Limin at the University of Palangka Raya. Our goal is to support conservation in Central Kalimantan through: (1) conservation-orientated research, providing important information for, and training to, local conservation practitioners; and (2) encouraging and supporting locally-led conservation initiatives, via the provision of funds, expertise, capacity building, international and media contacts, and logistical support.

**Biodiversity Research by OuTrop and CIMTROP**

OuTrop and CIMTROP now operate a multi-disciplinary biodiversity research programme in the NLPSF, Sabangau, including research into our namesake – the orang-utan – plus a wide variety of other areas. One of our most important discoveries has been the demonstration of the “compression effect” on the area’s orang-utan population, following logging disturbance.

The forest in the NLPSF is comprised of three main habitat sub-types: mixed-swamp forest (intermediate

forest productivity and orang-utan densities), low-pole forest (lower productivity and orang-utan densities) and tall-pole forest (high productivity and orang-utan densities, unique to the Sabangau peat dome).

Following the cessation of the area’s last logging concession in 1996 until the establishment of the CIMTROP Forest Patrol Team in 2003, the NLPSF was subject to intensive illegal logging. This was focused in those areas with the highest abundance of large, commercially-valuable timber trees; i.e., the prime orang-utan habitats of the mixed-swamp and tall-pole forest.

Our orang-utan nest survey data demonstrate a population shift into the less-productive low-pole forest coinciding with this disturbance, as animals moved away from the logging. For a couple of years,

Figure 1b: Focus primate species three: Southern gibbon (*Hylobates albibarbis*)



overall population size remained constant, but then a dramatic crash occurred, with the total estimated number of orang-utans decreasing by one third during 2002-2003. This is attributed to the compression effect, as animals moved into sub-optimal logging refuge areas, leading to over crowding and, ultimately, death through starvation. This has important implications for our understanding of the impacts of logging disturbance on orang-utans throughout their range.

OuTrop’s Orang-utan Behaviour Project was established in 2003 and represented the first-ever orang-utan behavioural study in ombrogenous deep peat-swamp forest. This project has yielded many exciting revelations, including:

The first observations of orang-utan self medication, with animals chewing the leaves of the *Dracaena* plant into a lather and rubbing this into joints to relieve pain, mirroring closely the use of this plant as traditional medicine by local people.

Demonstration of frequent periods of energy shortfall, which is believed to be related to consistently low environmental fruit availability. This highlights the vulnerability of the population to further habitat

degradation, and supports the above compression effect theory of population collapse.

Increased understanding of orang-utan social dynamics obtained through genetic analyses, with higher mean relatedness among the area's females, compared to males; i.e., females remaining around their natal range upon reaching adulthood and males dispersing.

The success of this research naturally led to further primate research, with full-time behavioural research projects studying the Bornean southern gibbons and red langurs becoming established in 2005 and 2009, respectively (Figure 1). As for orang-utans, the initial focus of our research into these species was population surveys. These revealed that Sabangau is also vital for the conservation of these primates, both of which are endemic to Borneo. Sabangau is likely home to over 25,000 gibbons, making this the largest known population of this endangered species (precise red langur population estimates are currently being calculated, but it is clear that the forest is home to a very substantial population).

Key findings from these projects – both the first of their kind in peat-swamp forest – include the demonstration of reductions in gibbon morning singing bouts (important for maintaining group cohesion and territory defence) during periods with heavy smoke from forest fires; positive relationships between gibbon population density and forest quality (i.e., canopy cover, tree size



Figure 3: A Storm's stork, captured by an OuTrop/WildCRU camera trap in Sabangau.

and food availability); unravelling the impacts of logging on gibbon territory size; a lack of the red langur morning chorus heard at other sites, despite comparable densities; and the identification of important food resources for both species. These three concurrent primate behaviour projects complement each other excellently and are a data set unique to Sabangau.

Food availability and quality are well known to be very a important influence on primates and the three primate species that we study are all predominantly vegetarian. Consequently, and in order to gain a deeper insight into the ecology of the forest and its regeneration following disturbance, floral studies are also a key component of our research remit. We have now established 34 tree plots covering a total 3 ha of forest in

the NLPF, in which each tree has been given a unique tag number, identified to species, and measured for diameter at breast height and basal area.

These plots are used to establish habitat quality in different areas (i.e., species diversity and tree size), forest dynamics (recruitment, growth and mortality rates) and changes in these over time. Monthly surveys of primate fruit/flower/leaf shoot availability are also conducted in six plots covering 2.4 ha in our main research grid.

An exciting new arm of our research is the study of the area's cat

Figure 4: Subjects of OuTrop's biodiversity monitoring research include birds, such as this chestnut-bellied malkoha (a); ants, such as this *Camponotus gigas borneensis* (b); and frogs, such as this Collett's tree frog (c).



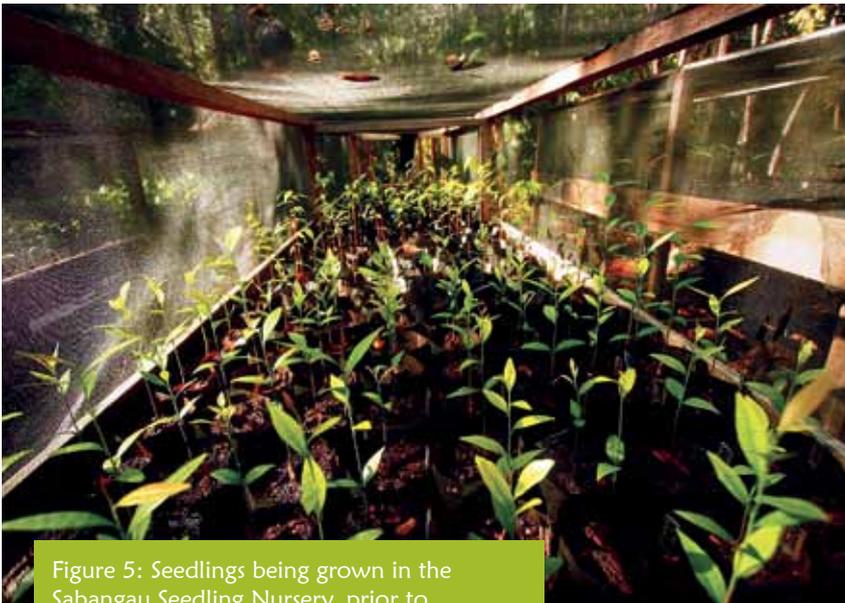


Figure 5: Seedlings being grown in the Sabangau Seedling Nursery, prior to transplantation into degraded/burnt areas.

populations. Here, we use laser-triggered camera traps to capture pictures of these highly-secretive animals and their prey base, which can be used to identify individual animals and, hence, estimate population density. This project has been hugely successful and has confirmed the presence of a number of (often threatened) species in the area that are virtually impossible to see directly, including clouded leopard (Figure 2), marbled cat, flat-headed cat, otter civet, binturong and Storm's stork (Figure 3).

While our research on primates and cats may grab more headlines, OuTrop's biodiversity research is equally as important for improving our understanding of peat-swamp forest's value for biodiversity conservation, understanding the ecology of the forest and the roles that different species play within this, and interpreting the impact of human activities – both 'positive' and 'negative' – on biodiversity. In particular, although frequently the focus of conservation initiatives, the slow breeding and rate of population change in the area's flagship ape species means that by the time any change in the population is detectable, it is probably too late to take corrective action.

Consequently, rapidly-responding indicators of changes in the

environment are required. To this end, we are conducting in-depth studies investigating the response of the area's bird, ant and butterfly fauna to changes in habitat condition as assessed through our tree plots. Pilot studies on other species groups are underway (e.g., amphibians, Figure 4) or planned for the near future.

Finally, we are also studying techniques for effective peat-swamp forest restoration. Seeds and seedlings are collected from the forest, nurtured and grown in the controlled conditions of our seedling nursery (Figure 5), and then transplanted into burnt/degraded areas, to assess the optimum approach for replanting.

### Supporting Education and Conservation

OuTrop's and CIMTROP's peat-swamp forest biodiversity expertise obtained through 12 years of intensive research places us in a unique position to assist in the conservation of Borneo's biodiversity. Through our student and volunteer programme, OuTrop has supported seven PhD, 24 masters and 40 undergraduate students' research, and trained over 300 volunteers from 18 countries in field research methods and conservation issues. Improving local capacity through training local

scientists and community members is critical for ensuring long-term conservation success. To date, over ten CIMTROP students/scientists and twenty local community members have received training with OuTrop, including learning research methods, and data storage and analysis techniques; increasing understanding of conservation and threats to the area's biodiversity; computer use; project management; and English language.

OuTrop and CIMTROP scientists are also regular contributors to conservation action plans from local to international level, on topics ranging from land use, to orang-utans, gibbons and fruit bats. This planning means little without on-the-ground action, and so OuTrop also provides financial and technical support for CIMTROP's Patrol Team and Fire Attack Force, which work to prevent illegal logging and other activities, dam illegal logging canals to restore natural hydrology, fight dry-season fires and improve local community relations.

Our research programme is intricately tied in with these activities and is tailored towards providing constructive feedback to conservation practitioners to maximise the biodiversity conservation success, and minimise the cost, of their forest protection initiatives. Such research is becoming more and more important, in light of the increasing amount of resources spent on biodiversity conservation, the often dangerous nature of conservation activities (e.g., fire fighting) and, of particular local relevance, the need for Reduced Emissions from Deforestation and Degradation (REDD+) projects to demonstrate positive impacts on biodiversity.

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# University of Helsinki and University of Palangka Raya launch joint capacity building project

Text and photo: Maija Lampela

**On 16th of September 2011, at the University of Palangka Raya (UNPAR), a 1.5 year long academic capacity building project “STEM - Support Tool for Sustainable Environment Management in Tropical Rural Communities” was launched.**

Partners in the STEM project are the Department of Forest Sciences of the University of Helsinki (UH), Finland and the University of Palangka Raya (UNPAR), Indonesia through the Master program “Natural resources and environmental management”, and the Centre for International Co-Operation in Management of Tropical Peatland (CIMTROP).

The STEM project aims for academic capacity building in several levels and fields. Main goals of the project are sharing knowledge in communications, internationalization, academic pedagogies, research methodology, global environmental policies, as well as restoration and rehabilitation of degraded peat swamp ecosystems and the carbon cycle.

The planned work includes public seminars, shared teaching, and producing publicity materials on the topic at the UNPAR campus.

Practical restoration experimenting outside of Palangka Raya and visits to study academic education methods on related topics in Finland form other important parts of the cooperation.

The STEM project is targeted mainly at UNPAR’s staff and students. To validate the cooperation between UH and UNPAR’s institutions, the Rectors of the Universities, Thomas Wilhelmsson for UH, and Henry Singarasa for UNPAR, have signed a Memorandum of Understanding (MoU) for cooperation in education, academic and research activities.

The project is funded by the Ministry for Foreign Affairs of Finland under the HEI-ICI program that is a Capacity Building Support Program for Higher

Education Institutions. It is due to be completed by the beginning of 2013.

Further information about the project can be given by the author, a description in Finnish is also available at [www.helsinki.fi/mmttk/esittely/uutiset/2011/111025\\_stem.html](http://www.helsinki.fi/mmttk/esittely/uutiset/2011/111025_stem.html).

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Master program students from the University of Palangka Raya taking part in lectures on natural resources and environmental management.



# Sharing Best Management Practices on Peatlands in Southeast Asia

Text: Noor Azura Ahmad

**Did you know that peat which has dried out too many times floats and refuses to absorb water? This is among the things learnt by participants in a Technical Workshop on Best Management Practices (BMP) for Sustainable Peatland Management held in Luwansa Hotel, Palangka Raya, Central Kalimantan, from 15th to 18th June 2011.**

The objective of the workshop was to build capacity among those involved in peatland conservation so that they can bring back new knowledge and shared experiences to be implemented in their respective countries.

The main organiser of the event was the Global Environment Centre (GEC) as the Regional Project Executing Agency of both the ASEAN Peatland Forests Project (APFP) and SEApeat. APFP and SEApeat are two closely related programmes which are supported by GEF/IFAD (Global Environment Facility / International Fund for Agricultural Development) and the European Union (EU) respectively. They work together to demonstrate, implement and scale up the sustainable management and rehabilitation of peatland forests by reducing deforestation and GHG emissions from peatland forest degradation in Southeast Asia.

Co-organising the event was Lembaga Pengkajian, Pendidikan, dan Pelatihan Lingkungan Hidup (LP3LH), a local institute for environmental study, education and training, led by Mr. Alue Dohong. Mr. Alue, who is the Director of LP3LH, is widely

known among peat conservationists for his expertise in canal blocking and carbon conservation. Other resource persons were Dr. Suwido Limin whose strong area is fire management and Dr. Darmae Nasir who specializes in the socio-economic aspect of peat management.

Thirty-four participants represented eight (8) ASEAN countries namely Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand and Vietnam. They were from various departments and ministries; including national environment protection agencies, forestry departments, fire departments, university experts and relevant NGOs; all involved in implementing programmes for peatland management.

To launch the workshop, Ir. Mursid Marsono, Head of the Central Kalimantan Department

Participants of the workshop with Ir. Mursid Marsono, Head of Central Kalimantan DOE (second from left, second row). Photo: Azura Ahmad



of Environment (BLH Kalteng) welcomed the participants and announced the opening of the event. The Indonesian Ministry of Environment (KLH) supported the conference and hosted a welcome dinner for the participants. The workshop began with an indoor session of a series of presentations regarding Best Management Practices (BMPs) on peatlands. All through the workshop, participants were encouraged to interact closely and share their experiences with each other.

The workshop gave an overview of peatlands in Central Kalimantan, principles of wise use, social-economic factors, practical aspects and good practices in peatland management. Among the topics covered was an introduction to peatland hydrology, benefits of canal blocking and its options plus effective fire fighting techniques for peatland fires. Among others, the experts compared the effectiveness and cost of dousing fire using deep-wells compared to using helicopters. Dr. Suwido also shared a technique used by patrolling volunteers, using 'water bombs' in plastic bags to douse small fires before they spread.

Following the indoor sessions, participants were taken to visit the Natural Laboratory for Peat Swamp Forest (NLPSF) which is managed by the Centre for International Management of Tropical Peatland (CIMTROP) in Sebangau. This was reached by bus, boat, and most interestingly; a rustic 'train'. The last uses a small motor to drive the 'car' between a jetty and the NLPSF,



The exciting ride to the Natural Laboratory for Peat Swamp Forest (NLPSF). Photo: Julia Lo

traversing over the dark waters of the Sebangau Lake. The large waterway is relatively shallow and harbours large clusters of *pandanus* type plants along its edges. This was one of the most unique and unforgettable experience for many in the group.

At the NLPSF, various researchers based there have posted their findings on the community notice board. This included biodiversity, especially orang-utans; and carbon emission studies. An interactive question and answer session made the knowledge sharing more memorable. Later, participants visited a climate study tower and a small canal block nearby. The canal block, known by the local Dayak community as 'tabat', had accumulated organic matter and degraded just enough to be an inherent part of the canal, proving the wisdom of the elders who construct such dams using local organic materials instead of cement or concrete.

The role of the Sebangau Lake for eco-friendly socialising and recreation was seen in the form of children enjoying an afternoon dip near the Kereng Bangkirai jetty. The importance of the peat swamp was reflected in our dinner which included catfish and freshwater prawns, rich sources of protein to the community. This precious



Two participants and Dr. Suwido (right) taking a closer look at some 'purun'. Incidentally, Dr. Suwido's hat is made of dried purun. Photo: Azura Ahmad

resource must be protected and kept sustainable.

The next day, the group visited block C of the ex-Mega Rice project sites in Kalampangan. Close to the CIMTROP Community Centre was a small agricultural project site. Various vegetables like eggplants, bird's-eye chillies and lemongrass were planted here. Goats were also kept to provide meat for people and fertilizer for the plants. The combination allows for a self-sustaining system that is important for the livelihood of the people.

Participants were then taken to dams 3 and 5 by motorcycle to have a closer look at their construction. Along the way, it was depressing to see the widespread destruction in the area due to excessive draining of the peatlands for the Mega-Rice project and subsequent fires that plagued the area. The dry, exposed soil readily turned to dust as the motorcycles passed. The dams, which were built to halt uncontrolled draining of the peat, have stabilized the water level and rehydrated the soil by raising the water table. Where the canals have been blocked, the vegetation was seen to be greener with more plant regeneration. Some of the species seen were tenggek burung trees (*Euodia roxburghiana*), *Nepenthes* spp. and kemunting plants. Also found was a type of sedge called 'purun', whose hardy grass-like



One of the participants sharing his experiences with the group. Photo: Serena Lew

stems are traditionally dried and woven into various items such as hats and baskets.

Close to an area which burnt two years ago, Hokkaido University had supported the building of a 45 metre high climatology research tower. This would help to gather more information about the link between peatlands and climate change. Those who took the challenge of climbing the tower were rewarded with a clear view of two orang-utans on nearby trees. It showed that biodiversity can still survive in degraded areas, as long as their needs for food and shelter can be met. A demonstration on fire suppression on peat was also held to give participants the opportunity to examine the deep well, water pump and hose set up; and to try their hands at putting out the blaze. Fire prevention and control is one of the key BMPs in protecting peatlands.

In the nearby Tumbang Taruna village, a programme called the "Buying Living Tree System" has been introduced by CIMTROP to engage the local community in carbon conservation efforts. The trees grown under this effort are from *Shorea*, *Melalueca* and *Dyera* species. Villagers are rewarded as long as the trees are growing. When the trees are harvested, the carbon is conserved in the wood, not released to the atmosphere as CO<sub>2</sub>. Villagers are allowed to harvest the trees to

support their livelihood or for their own needs, if they have kept the trees long enough and replacement trees are planted.

We also stopped by a vegetable smallholding, owned by Pak Sujadi, a transmigrant from Java, where corn, chillies, long beans and several other vegetables are successfully grown on the peat soil using sustainable agricultural practices. The knowledge was gained through technical assistance from a local university, from where he had learnt about environment friendly soil preparation techniques, fertilization methods and the rotation system. From his struggle to make a living on the acidic and waterlogged soil in the early days, the income from his land now allows him to lead a comfortable life, hopefully well into the future.

Participants trying their hand at dousing a small fire in Kalamangan. At the back is the goat shed. Photo: Azura Ahmad



The workshop ended with presentations by participants from the various countries on the best management practices in the use of peatlands or wetlands in their respective countries. Among the memorable ones were traditional techniques for using controlled fire in land preparation, raising catfish in blocked drainage canals, as well as land and fire management in peat areas. Through this exercise, everyone had the opportunity to exchange ideas, knowledge and lessons learnt with colleagues working in peat conservation, with which to improve and enhance the management of peatlands in their respective countries.

It is hoped that the bonds forged in this workshop would strengthen the network of people conserving peatlands through their specific roles in South-east Asia. For the full report and more photos, please visit the ASEAN Peat website at [www.aseanpeat.net](http://www.aseanpeat.net).

The Global Environment Centre (GEC) is a non-profit NGO established in 1998 to address key environmental issues. Based in Malaysia and supporting activities worldwide, GEC is focused on bringing together all parties to help foster lasting changes for environmental benefit.

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# The Hydrology of the Ayer Hitam Peat Swamp Forest, Johore, Peninsular Malaysia

Text: Marryanna Lion, Shamsuddin Ibrahim and Abd Rahman Kassim

## The study site

Peat swamp forests (PSF) are unique habitats for flora and fauna, containing a high proportion of endemic species. Peat swamp forests in Malaysia, which once occupied 2.4 million hectares, have been decreasing rapidly as they are transformed and developed into other land uses. The understanding of their ecology, especially hydrology, is vital to conserve the remaining stands and enable sustainable use of their resources.

Tropical peat swamp forests not only moderate extremes of climate but also act as hydrological regulators and provide essential food and economic resources for local communities. These forests, in their primary condition, play an important role as carbon sinks but become major carbon sources once the ecosystem is highly disturbed and becomes permanently degraded. Their hydrological importance derives

from their ability to enable rapid groundwater recharge and ensure slow discharge. For this reason, peat swamp forests provide water storage for agriculture, water supply to local communities and mitigate downstream flooding. This helps in maintaining soil moisture and reduces the risk of fires. Peat swamp forests are also rich in biodiversity, which is important for maintaining the gene pool regionally and globally whilst providing food and economic resources for local communities.

The State of Johore has expressed its interest in promoting best management practices in the Ayer Hitam Forest Reserve (Ayer Hitam), one of the few remaining Forest Reserves in Johore dominated by peat swamp forest. This effort is supported technically by Wetlands International (WI) that is very keen to use Ayer Hitam to demonstrate the importance of protecting and

conserving primary peat swamp forests for their ecological values and functions. The extent of the Ayer Hitam peat swamp forest is about 3,797 hectares; it receives water input primarily from rainfall and has no linkages to surrounding river systems. A man made channel was dug to drain the forest for crop production.

Currently, Ayer Hitam is surrounded by human settlements and activities (Figure 2). The principal land use in this area is agriculture, including oil palm plantations, citrus farms, pineapple farming and other crop production (Figure 3). A rapid assessment of the status of the hydrology within the forest, carried out between March and July 2011 revealed threats to the ecosystem from the present water management regime. Among the hydrological components assessed were the flow rate, water quality and water table.

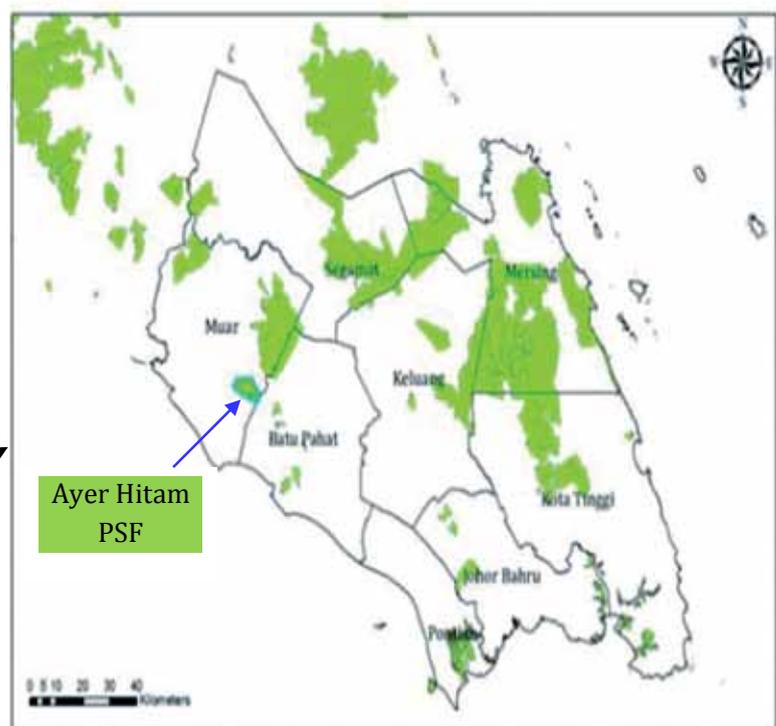


Figure 1: Location of the Ayer Hitam peat swamp forest. Map: Hamdan Omar

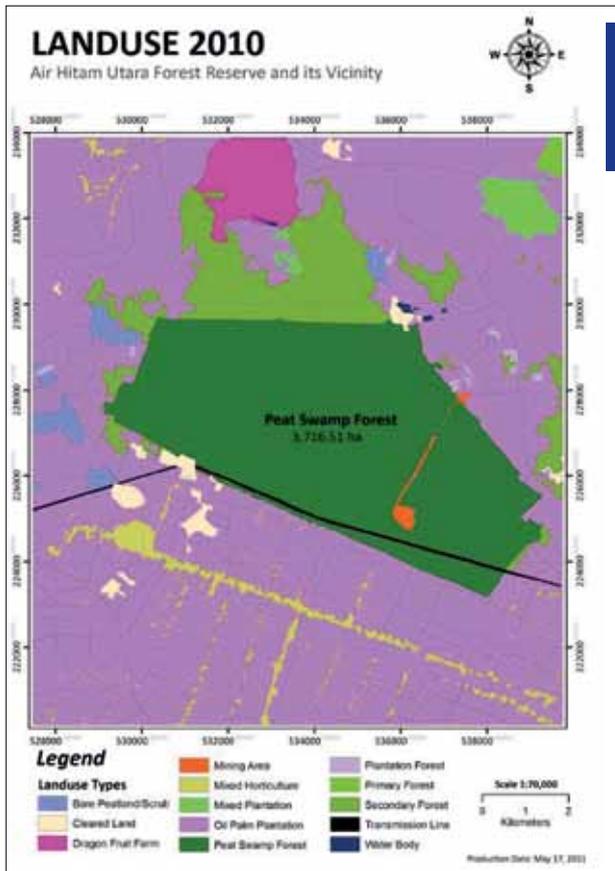


Figure 2: The land use map of the Ayer Hitam Forest Reserve shows that it is surrounded by human settlements and activities with oil palm plantations as major land use. Map: Hamdan Omar

was 498 mm in December 2006 and the lowest (10 mm) was in February 2002. The average annual total rainfall for this area for the past nine years is 1,703 mm.

**Water quality and quantity**

The water in Ayer Hitam is acidic with low concentrations of dissolved oxygen. Based on the physico-

these water quality measurements in Ayer Hitam in 2011.

The assessment of the man made canal (Figure 6) adjacent to the forest shows that its depth ranged between 14 and 37 cm with a cross sectional area between 0.078 to 0.734 m<sup>2</sup>. The water velocity rates were between 0.06 to 0.33 m/sec and the base flow discharge (Q) from four canals was 0.012 to 0.181 m<sup>3</sup>/sec.

The water table depth was determined from two monitoring stations, AHPA1 and AHPA2. The average water level recorded at AHPA1 ranged from -44.9 cm to -7.3 cm while, at AHPA2, it was 16.4 cm to -35.1 cm. The minus sign indicates that the water is below the peat surface. Large negative numbers mean that the water table is far below the surface while small values mean that the water level is high. When the values are positive, water is above the surface and the area is flooded.

**Threats to Ayer Hitam**

Ayer Hitam is now subjected to the following threats:

- Land clearing, land excavation and conversion to oil palm and other food crop cultivation (Figure 7)
- Over-draining: Continued draining of water from the peat swamp forest for an extended period will lower the water table, increase oxidation and lead to peat subsidence. The dry peat will become susceptible to fire, and release catastrophic amounts of CO<sub>2</sub> to the environment.
- The use of pesticide and fertilizers in crop cultivation and oil palm plantations can adversely affect water quality through leaching and direct loading of chemicals into the nearest canals and adjacent rivers during periods of high rainfall. This will have

**Rainfall pattern**

Ayer Hitam experiences a relatively dry period lasting for six months from May to October, followed by three months of heavy rainfall between November and April. The peaks of rainfall are in November and April. The highest mean monthly rainfall of 228 mm occurs in April whilst the lowest of 79 mm is in February. The highest rainfall recorded for this area

chemical parameters analysed (pH, conductivity, DO, turbidity and temperature), the water in Ayer Hitam generally falls between classes I to III of the Malaysian National Water Quality Standard (NWQS). The pH ranged between 2.16 to 5.12; conductivity (41.67 to 842.67µs/cm); dissolved oxygen (0.60 to 7.02 mg/l); turbidity (1.39 to 39.43 NTU) and temperature (26 to 31 °C). Figure 5 shows the mean concentrations of



Figure 3: Oil palm plantations are the major land use in Ayer Hitam.

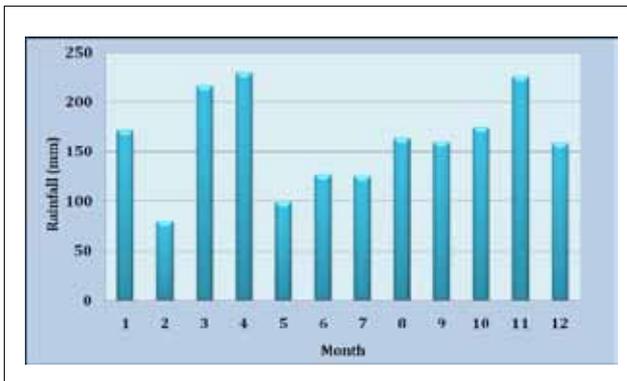


Figure 4: Average monthly rainfall for nine years at the Pagoh Agriculture Station, approximately 10 km from Ayer Hitam. Data: Malaysian Meteorological Department

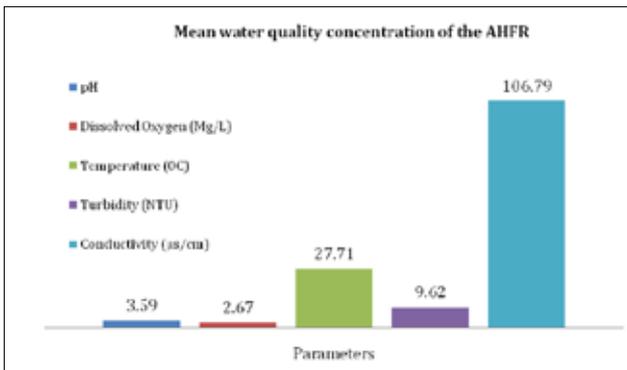


Figure 5: Mean water quality concentration at Ayer Hitam in 2011.



Figure 6: Man made canal in Ayer Hitam.



Figure 7: Land excavation is one of the threats to the Ayer Hitam Forest Reserve.

a detrimental affect on aquatic organisms.

### Discussion and Conclusion

The impact of the artificial drainage pattern on the ecology of the Ayer Hitam peat swamp forest has yet to be assessed systematically, but it seems that the impact of continuous draining is profound with more areas of primary peat swamp subject to fire during dry periods.

Forest and peat fires are a major threat to peatland ecosystems by removing large amounts of organic matter and nutrients from the ecosystem. In addition, the upper peat layers are burned and the organic residues later eroded away during rainfall, adversely affecting the water quality in adjacent streams and rivers. Surface runoff flows unimpeded into nearby canals and streams. Forest fires in peat swamps are a very good indicator that the ecological conditions have been

changed, either through natural processes or human interventions. In most cases human intervention leads to irreversible damage to the ecosystem, especially sensitive ecosystems such as peat swamp forests.

Ayer Hitam needs to be restored to maintain its socio-economic, ecological and hydrological functions and services. An integrated restoration plan should be formulated and implemented. If the area continues to be converted for agriculture, the water table will be further lowered, resulting in massive drying up and peat subsidence.

This situation makes the area highly susceptible to fires that will inflict irreversible damage to its ecological functions. A long term ecological monitoring programme is crucial in the area in order to gather data on these impacts and to understand the effects on ecological processes. It is also needed to inform and convince

the State Government to protect and conserve the last peat swamp forest in Johore.

As the possibly conversion rate of the peat swamp forest to other land uses is projected to be 6% every year, 222 ha of Ayer Hitam will be converted annually, taking only 16 years for the entire ecosystem to disappear, unless immediate actions are taken to restore and protect it. For this reason, stakeholders, including the Forestry Department (FD), Drainage and Irrigation Department (DID) and State Economic Planning Unit (UPEN), have put their concerted effort into keeping the forest intact. Wetlands International has been appointed as technical advisor to this initiative.

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# Lehtopeat – feel the magic of the peat

Text and photos: Heikki Ruha and Hannu Kolunsarka  
Logo photo: Hannu Hautala



**Lehtopeat Ltd is a Finnish family business that was founded in 1996 and has been operating since. The company is located in Ähtäri, a small country town in Central Finland, and it is specialized in manufacturing therapy peat also known as treatment peat.**

According to CEO Heikki Ruha, the goal of Lehtopeat is to offer natural alternatives to skin and body well-being and care in a world where most of the available products are saturated by all kind of additives. Lehtopeat does not only manufacture and sell peat products to its customers, but offers also a wide range of treatments to them. These unique treatments are developed by Heikki and his brother.

Maybe the most groundbreaking day was when they came up with the idea of using peat in massage treatments. The company's driving idea has always been indeed to develop treatments in which the therapeutic effects of the peat can be brought out the best possible way. In fact, the health effects of peat were the main reason why the brothers started the company.



A few of Lehtopeat's products.

## Quality of the peat investigated and effects proven

The therapy peat of Lehtopeat is extracted from the natural layers of the Lehtosuo mire located in Ähtäri, as a combination of peat and mire water. Before the peat was used for therapy purposes, the peat layers and peat types were studied carefully by geologist Riitta Korhonen from the Geological Survey of Finland. Chemical and physical properties, heat retention capacity and 33 trace elements were tested in the laboratory. The peat of Lehtosuo mire has a very high content of humic acids and heat retention capacity. The decomposition of the peat is H8 according to the von Post H1-H10 scale.

Only well decomposed peat is accepted as raw material for the peat products. Lehtopeat does not use any additives in its peat, so that the final products are 100% natural. The raw material for the therapy peat is extracted with great respect and by honouring nature; without the use of any heavy machinery. Against common beliefs, this harvesting process does not cause the peat resources to diminish but allows the formation of new peat without interruption. In this case, peat is definitely a renewable resource.

The effects of Lehtopeat therapy peat products are based on the biological components of the peat. In addition, its heat retention capacity has a significant part in the therapeutic functions and healing processes of the peat. According to Heikki Ruha, the peat's ability to store heat is amazing, making it an excellent tool to be used in massaging. The heat guarantees a total relaxation of the

whole body, because it flows deep within its muscles.

The most important effective ingredients of the peat are humic acids with 28.5% and fulvo acids with a share of 10%. In addition, peat contains many skin conditioning substances, such as iron, copper, magnesium, manganese and zinc. The therapeutic effects of Lehtopeat's therapy peat have been studied and tested by different organisations. Furthermore, the company has been working in co-operation with Finnish doctors and hospitals in an effort to test the effectiveness of its peat in dermatology care. For instance, Ainoklinikat and Hiusakatemia have successfully cooperated with the company.

Both, Lehtopeat therapy peat and its treatment methods have been developed by the company itself, with more than 15 years of experience in both selling products and giving different types of peat treatments. This long tradition guarantees that whenever a customer will enter a Lehtopeat natural product shop or salon he or she will be greeted with high-quality and professional service.

Lehtopeat is a registered trade mark and has been rewarded with the permission to use the Finnish Key Flag Logo. This is an honorary mention as access to the logo is granted only for those companies which, by their own work, contribute

to the export of Finnish know-how, in other words, for Finnish brands to be shipped to the world.

### **Increasing sales internationally**

According to Heikki Ruha, Lehtopeat's therapy peat is already sold abroad to some extent. However, the company's long term plans include a significant increase in the volume of overseas sales, for instance by searching new distributors for Lehtopeat's products. The current focus of growth is targeted to Belgium, France and the Netherlands. Worldwide, Lehtopeat is exporting its products, for instance, to Japan and Russia. The possibilities of an expansion to the Chinese market are currently being investigated. Further sales to Scandinavia are also included in the company's future plans.

### **Training for new distributors**

In Finland, Lehtopeat is training new companies and businesses in the secrets of giving therapy peat treatments, such as spas and beauty salons. In the future, it becomes possible also for international distributors to receive such trainings. This will possibly be taking place in the Netherlands and in Belgium, where the company will invest also heavily in product marketing and raising awareness. The company has the capacity to export products and train distributors worldwide, so all new contacts are very welcome.

### **Different from traditional peat treatments in Central Europe**

Most of us, or at least the female readers of this article, have come across some sort of peat treatment or mud bath at some point in their life, through their own experience, through television or other type of media. CEO Heikki Ruha explains the main difference between Lehtopeat's products and treatments to other similar peat products and methods on the European market:

The traditional way of thinking is that, when you want to execute a successful peat or mud bath, a

bathtub is required in which a person can be sunk into so that the product can spread all over the body. This is not the case with Lehtopeat treatments. Instead, they offer ready to use product packages which make it possible to execute

successful full body treatments even in the comfort of your own home. One significant difference is also that a truly Finnish tradition is strongly attached to the products: the use of a sauna.

### **The use of therapy peat in massage treatments**

Lehtopeat Ltd. is an innovative company when it comes to the use of peat as a tool in massage treatments. Its treatment methods are groundbreaking in Finland as well as worldwide and, as described above, studied and tested thoroughly.

Peat can be used for half as well as full body treatments. The best aspects of therapy peat are shown when it is heated to about 40 degrees before being spread to the wanted area of the body. This affects especially the deep muscles of the body, the set of muscles that is often left outside of the impact area of traditional massage methods. Hence therapy peat treatments and massages relax the whole body.

Heated peat also has, according to Heikki Ruha, other kinds of health and pharmaceutical effects which include improved blood circulation to the surface skin, improvement of metabolism, help with removal of various toxins from the human body and also different hormonal effects. It has been shown that peat has similar skin calming effect as cortisone, hence peat is an option in the case of treatment of psoriasis and other



Heikki Ruha applying a peat treatment.

types of dermatology problems. Basically the treatments are suitable for everyone despite their physical condition. The only exception are people with heart problems, they are not recommended to have a heat peat massage.

### **Products for every use**

Lehtopeat Ltd. has a quite extensive range of products, starting from facial washes and shampoos and continuing via face masks and sauna treatments to peat products that are suitable for use in massage treatments. All of them are manufactured from peat or mire water or from a combination of these two sources. More information on the products and their areas of application can be found at [www.lehtopeat.fi](http://www.lehtopeat.fi).

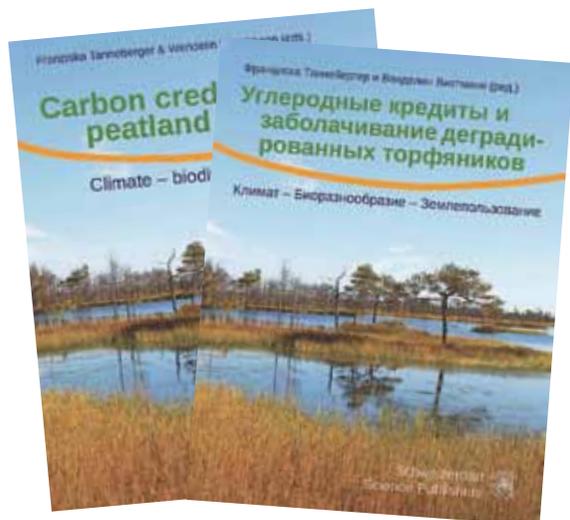
Heikki Ruha welcomes all who are interested in Lehtopeat's products and treatments to contact the company without hesitation and with an open mind. Help us to spread the wonderful magic of Lehtopeat's mire products and give people the possibility of experiencing the magic of the peat.

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## Carbon credits from peatland rewetting

Review: Michael Trepel



**Tanneberger, F. and Wichtmann, W. (eds.): Carbon credits from peatland rewetting - Climate - biodiversity - land use. Schweizerbart Science Publisher Stuttgart 2011. 224 p. English edition: ISBN 978-3-510-65271-6; Russian edition: ISBN 978-3-510-65272-3.**

Emissions from drained peatlands contribute significantly to global warming. In the last century, there was large-scale drainage of peatlands for land reclamation in most countries. These areas were used for agricultural and forestry purposes and partly for peat extraction. However, the environmental impact caused by draining and land use change was either not known or neglected. Especially in the last two decades we have observed globally increasing awareness of global change issues and, through research, increased our knowledge of land use induced emissions. Society debates on methods to mitigate and adapt to climate change.

While peatlands cover only 3% of the land surface, they are responsible for 6% of the global anthropogenic CO<sub>2</sub> emissions. Peatlands in Southeast Asia, Central and Eastern Europe are amongst the well known hot spots. It is also well known that rewetting

of drained peatlands reduces the emissions. The topic of the book “Carbon Credits From Peatland Rewetting” is how to put this good idea into practice.

This book presents the results of an implementation project entitled “Restoring peatlands and applying concepts for sustainable management in Belarus – climate change mitigation

with economic and biodiversity benefits” – a large-scale nationwide experiment in peatland rewetting. The goal of the project was to test, with the help of the project partners, whether it is possible to rewet Belarusian peatlands and achieve economic and ecological benefits from this activity.

The book is written for scientists and decision makers, as well as for climate change politicians and peatland site managers. There are ten chapters. The introduction and foreword elucidate the societal relevance of peatland rewetting as a mitigation activity in climate change policy. Chapter 2 describes the situation of peatlands in Belarus.

With 14.2% of the state area occupied by peatlands, Belarus belongs to the sub-set of countries that are very rich in peatland. These areas were used for agriculture over long time spans and were to a large extent systematically drained in the period 1960 - 1970s. Key terms (e.g. mire, peatland) and other important concepts are explained in separate text boxes and enable the reader not only to use each chapter as a reference for its specific topic, but also to use the whole book as a textbook on peatland ecology and management.

Chapter 3 deals with peatlands and climate. First, the carbon cycle and the processes for gas formation are explained. The factors controlling gas formation and exchange with the atmosphere are discussed. Here, as in all other parts of the book, the scientific knowledge presented is always up-to-date and knowledge gaps are identified. The methods for measuring gas emissions in peatlands are introduced. The text box explaining how to calculate the global warming potential of a peatland site is especially valuable for students and scientists who want to carry out similar calculations for other sites. However, this box also addresses decision makers and politicians, who can learn from it that the calculations behind the global warming potential data are transparent and reliable.

For calculations of the global warming potential of a site or of the peatlands within large regions, proxies which are related to the factors controlling gas formation are needed. The vegetation is such a proxy because vegetation forms integrate, within their species composition, the site conditions and especially water levels. For many vegetation forms, gas emission measurements are available from the literature.

The GEST (Greenhouse Gas Emission Site Type) approach connects the available emission data with vegetation forms and makes them available for calculations of the global warming potential of sites where no measurements are available. Using ecological knowledge on vegetation succession with or without rewetting, it is possible to predict the development of global warming potential for sites over a longer time span. The effect of a rewetting measure on the reduction of global warming potential can be quantified.

Chapter 4 discusses the biodiversity values of Belarusian peatlands. The Aquatic warbler is introduced as an umbrella species for biodiversity targets in peatland restoration. 47.9% of the European breeding pairs are estimated to breed in Belarus. An up-to-date review summarizes current knowledge and data on peatland rewetting and its effect on biodiversity. From this review, monitoring strategies are developed for an assessment of restoration measures on flora and fauna. This part of the book is very valuable for site managers who want to know and measure the effects of their activities.

Chapter 5 is entitled Driving forces and funding options. Behind these mysterious words the reader gets information on legal obligations for peatland restoration in Belarus and is informed first-hand about activities carried out in order to make global conventions aware of climate change mitigation in peatlands. This part describes the long and winding road taken to get peatlands better recognized in global conventions and restoration activities included as regular measures in the protocols. One option is to sell peatland rewetting, on either the voluntary or the compliance carbon market; both options are discussed in detail. How

these ideas were put into practice with voluntary emission reduction projects is presented at the end of this chapter.

Chapter 6 discusses land use options for rewetted peatlands. Paludiculture is introduced as an economically feasible land use for peatlands with high water level. Land use options include agricultural, industrial and energy uses. Using wet peatlands has many environmental benefits including lower global warming potential and higher biodiversity when compared to drained peat soils.

Chapter 7 introduces the partners involved in this research and implementation project, and presents the criteria for site selection for rewetting. Next to climate and biodiversity actions, policy actions, capacity building and communication, and awareness raising were important parts of the project. The lessons learnt during the project are summarized at the end of the chapter and are of interest for any peatland manager or decision maker.

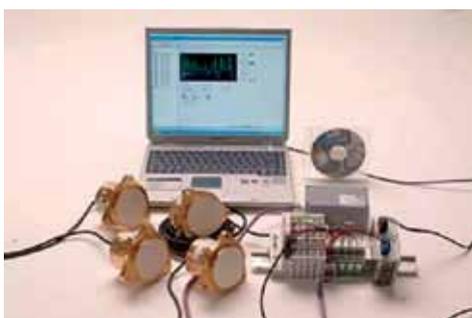
Chapter 8 describes the practical rewetting examples carried out during the project at seven sites. Chapter 9 recommends further

research and monitoring activities in rewetted peatlands. Gaps in the GEST model are identified. For some vegetation types (e.g. some abandoned fields and fallows) no emission data are available for many other calibration measurements. The recommended monitoring activities are easily transferable to other sites and make this part again also very helpful to other peatland managers.

Chapter 10 acknowledges the partners and authors who contributed to this successful project and publication.

This book is an excellent example how to combine basic and applied research in environmental science with decision making and policy. The results are all presented in clear language, calculations and methods are transparent. This book forms a basis for sustainable decision-making and policy. Schweizerbart Science publishers are especially acknowledged that they have published English and Russian editions at the same time. The books can be ordered at [www.schweizerbart.de/9783510652716](http://www.schweizerbart.de/9783510652716).

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# Famous Estonian conductor in peat



Text: Nick van de Griendt  
Photos: Tiit Mõtus

in The Hague. Amongst the guests at the reception for the handover session were the Estonian Minister of Culture, Mr. Rein Lang, several ambassadors and also IPS Executive Board member Erki Niitlaan. The sculpture can be seen when you attend a concert at the Estonia Concert House in Tallinn. More Peatart will be exhibited in Stockholm during the IPS 2012 Congress.

Nick van de Griendt  
email: [navdgriendt@sphagnum.nl](mailto:navdgriendt@sphagnum.nl)

In Tallinn, prior to the opening of the 85th season of the Estonian National Symphony Orchestra, there was a small celebration. Neeme Järvi, the new chief conductor, received his bust made from Estonian peat from Nick A. van de Griendt, made by the artist Dioni ten Busschen.

Neeme Järvi has been working for many years in the USA, Sweden and the Netherlands. Lately as maestro chief conductor of the Residentieorkest



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We welcome the following individual persons, institutes, companies, non-government organisations and/or their representatives as new IPS members. Updates in their membership lists are provided by our National Committees as soon as they occur or at least at the end of each year on request of the IPS Secretariat (status 20 December 2011).

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Canada: Lynn Hurdman (Northstar Multicorp Inc.)

France: Jean-Pascal Chupin (Florentaise), Philip Delaney (Dumona), Stéphane Drouet (Eurotourbes), Anne-Claire Godet (Falienor), Laurent Largent (CAS) as members directly associated with the IPS Secretariat

Sweden: Eva Andersson (Econova Garden AB / Weibulls AB), Markus Hassinen (Vapo Oy), Bent Jensen

(Ryd Torv), Ulla Kindfors (Hasselfors Garden AB), Anders Kroon (Södra Skogsenergi AB), Seved Lycksell (Skellefteå Kraft AB), Tord Magnusson (SLU), Stefan Östlund, Andreas Oscarsson, Hanna Runestad (Neova AB), Claes Rülcker (TorvForsk), Georg Sfiris (Göteborg Energi AB)

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United Kingdom: Greta Dargie, Mark Harrison, Adam McAleern

If you would like to join the International Peat Society, please contact the National Committee in your country (addresses at [www.peatsociety.org](http://www.peatsociety.org)) or fill in the membership application below.



## Membership Application Form

Hereby I apply for membership in the International Peat Society. Please forward my application to the National Committee in my country (Canada, Czech Republic, Estonia, Finland, Germany, Hungary, Indonesia, Ireland, Latvia, Lithuania, Malaysia, the Netherlands, Norway, Poland, Russia, Sweden, United Kingdom, United States, differing membership fees) or accept me as member associated with the IPS Secretariat in countries without an IPS National Committee (e.g. annual fee € 45 individual, € 265 organisations, € 22 student members in 2011). Further details and an online application form can be found at [www.peatsociety.org/join-us](http://www.peatsociety.org/join-us).

individual     corporate     research institute     government institute     student

Name:

Organisation:

Address:

E-mail:

Phone:

Fax:

GSM:

Website:

Place, date:

Signature:

send to: IPS Secretariat, Vapaudenkatu 12, 40100 Jyväskylä, Finland,  
Fax: +358 14 3384 410, e-mail: [ips@peatsociety.org](mailto:ips@peatsociety.org)

# Future IPS Meetings and Symposia



International Peat Society | IMTG MTC

German Peat Society (DGMT)  
Peloid therapy in outpatient and inpatient  
medical care – empiricism and evidence  
Hattingen, North Rhine-Westphalia, 9 - 10 March 2012  
More info: [www.dmteev.de](http://www.dmteev.de)

German Peat Society (DGMT)  
Seminar and Excursion on Peat and Peatlands  
Zeven, Rotenburg/Wümme, spring 2012  
More info: [www.dmteev.de](http://www.dmteev.de)

**14th International Peat Congress**  
**Peatlands in Balance**  
**Stockholm, Sweden**  
**3 - 8 June 2012**  
More info: [www.ipc2012.se](http://www.ipc2012.se)

German Peat Society (DGMT)  
Rewetting of Raised Bogs II  
Schneverdingen, Germany, 27 - 28 June 2012  
More info: [www.dmteev.de](http://www.dmteev.de)

Estonian Peat Society  
Baltic Peat Forum 2012  
More info: [www.turbaliit.ee](http://www.turbaliit.ee)

Finnish National Committee  
Meetings and excursions 2012  
More info: [www.suoseura.fi](http://www.suoseura.fi)

IPS Commission VII: Nordic Water 2012  
Catchment Restoration and Water Protection  
XXVII Nordic Hydrological Conference  
Oulu, Finland, 13 - 15 August 2012  
More info: <http://nhc2012 oulu.fi>

German Peat Society (DGMT)  
Mires and their catchment areas  
Schorfheide-Chorin, Werbellinsee, Germany  
6 - 8 September 2012  
More info: [www.dmteev.de](http://www.dmteev.de)

Mires and peat as a raw material  
GeoHanover 2012  
Hanover, Germany, 1 - 3 October 2012  
More info: [www.dgmtteev.de](http://www.dgmtteev.de)

German Peat and Humus Day  
Bad Zwischenahn, 18 October 2012  
More info: [www.ivg.org](http://www.ivg.org)

IPS Commission VII:  
International conference of the LIFE Project SEMEAU  
How to combine Forest Management, Local  
Development and Protection of Surface and  
Groundwater  
France, October 2012  
More info: [www.life-semeau.eu](http://www.life-semeau.eu)

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

Last minute updates will be provided also at  
[www.facebook.com/peatsociety](http://www.facebook.com/peatsociety).



## Events of related organisations

International conference Fuels of the Future 2012  
Berlin, Germany, 23 - 24 January 2012  
More info: [www.fuels-of-the-future.com](http://www.fuels-of-the-future.com)

European Geosciences Union (EGU) General Assembly  
Vienna, Austria, 22 - 27 April 2012  
More info: [www.meetings.copernicus.org/egu2012](http://www.meetings.copernicus.org/egu2012)

9th INTECOL Wetlands Conference  
Wetlands in a Complex World  
Orlando, Florida, USA, 3 - 8 June 2012  
More info: [www.conference.ifas.ufl.edu/intecol](http://www.conference.ifas.ufl.edu/intecol)

AEBIOM Focus 2012: EU legislation, sustainable  
feedstock supply and market opportunities"  
Brussels, Belgium, 25-26 June 2012  
More info: [www.aebiom.org](http://www.aebiom.org)

World Bioenergy Conference  
Jönköping, Sweden, 29 - 31 May 2012  
More info: [www.elmia.se](http://www.elmia.se)

Joint BES IUCN Symposium 2012  
Bangor University, United Kingdom, 26 - 28 June 2012  
More info: [www.tiny.cc/r5I51](http://www.tiny.cc/r5I51)

A frequently updated list of IPS events and symposia of related organisations is posted at [www.peatsociety.org](http://www.peatsociety.org). To inform us about future happenings of interest for IPS members, please contact [ips@peatsociety.org](mailto:ips@peatsociety.org).



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## PEAT MOSS EQUIPMENT FROM A TO Z

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The benefits of **FIBA-ZORB Liquid** include:

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Revisit our website, now updated and in 6 languages with downloadable content: [www.turftech.co.uk](http://www.turftech.co.uk)



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