Typical peat meadow landscape in the Netherlands. Photo: Hans Joosten.

IMCG Bulletin: June/July 2018

INTERNATIONAL MIRE CONSERVATION GROUP

www.imcg.net

Word from the Secretary-General

Dear mire friends

This double issue provides you with documents for the General Assembly (Utrecht, NL, August 31, 2018) and includes two background contributions to our mini-symposium "Land use on drained peatlands" on Thursday August 30. A topical issue, also in the light of renowned scientists recently warning for a Hothouse Earth: "Ultimately, the transformations necessary to achieve the Stabilized Earth pathway require a fundamental reorientation and restructuring of national and international institutions toward more effective governance at the Earth System level" (http://www.pnas.org/content/early/2018/08/07/1810141115) A pilot example of "fundamental reorientation" we will see at our mini-symposium: *Typha* from rewetted peat meadow as fodder for cattle: https://www.youtube.com/watch?v=0YW0s2ffyGU.

For those not attending the General Assembly: send all your remarks, questions and proposals to me before August 30, and we will try to give these adequate consideration.

Keep also sending news, photographs, papers and other contributions for the next Bulletin by September 8, 2018 to Hans Joosten at joosten@uni-greifswald.de.

Contents of this Bulletin

IMCG issues

2018 IMCG Field Symposium

The first version of the IMCG Field Symposium guide to the Netherlands excursion is online for non-attendants to know what they are missing ;-): http://www.imcg.net/media/2018/imcg2018_guide.pdf
Keep an eye on the website: http://www.imcg.net/pages/events/imcg-2018.php

Main Board nominations

Francis Muller (France, male, 60 years)

Born in Lorraine, France in 1958, studied pharmacy at the University of Nancy with thesis dedicated to the care for injured wild animals. After having been President of the Group for Study and Conservation of Nature in Lorraine (GECNAL), employed by the Lorraine Natural Sites Conservancy (CSL) for implementing the protection of several sites in two North-Eastern France départements. Managed several European-funded programmes concerning fish ponds, river valleys, bats and dry grasslands. Joined the Federation of French Conservancies in 2001 and became head of the French Mire Resource Centre (Pôle-relais tourbières) in Besançon in 2003. A first experience with IMCG happened as soon as 2004 with this unforgettable journey to the improbable fens of South Africa. I became treasurer of IMCG in 2010, and followed most of the Group's activities and excursions since then, whilst going on running our Resource centre in France. Our main task here is to gather the best practices for mires, to let them know to all who may use them and to promote mire protection actions all over the country. I am also particularly in favour of international co-operation and links, which IMCG can facilitate.

Samantha Grover (Australia, female, 43 years)

Soil scientist with 17 years of experience working in peatlands in Australia and around the world. Lecturer in Environmental Science at the Royal Melbourne Institute of Technology. Active in peatland research in the Australian Alps, Indonesia and Tibet with research interests focussing around carbon and water fluxes through the soil-plant-atmosphere continuum, with multidisciplinary collaborations extending into microbiology, environmental history, culturally and environmentally sustainable land use and beyond. Sam has an extensive network of peat-enthusiast colleagues in the Oceania region, having worked at Landcare Research in New Zealand in 2011. As IMCG Board member, she will share knowledge of peatland matters in both directions, keeping the Board and international community abreast of local and regional peat activities, as well as ensuring that the Oceania peatland community is up to date with IMCG matters. Shane Grundy, The Bushdoctor (NSW) Pty. Ltd, peatland restoration practitioner extraordinaire, will support Dr Grover in the role as representative of Oceania.

Shane Grundy (Australia, male, 50 yrs)

Tapio Lindholm (Finland, male, 65 yrs)

Leading expert in the Finnish Environment Institute and also Docent of Botany at the University of Helsinki. Age in this moment 65, so my career is close to the end. I have worked with boreal ecosystems mainly with mires and forest at the National level. My responsibilities in the Finnish Environment Institute are mainly mire and forest protection and restoration of damaged habitats. I am also working with mire specialists to assess the status of mires in Finland. In addition I am working in Finnish-Russian nature conservation and in the Barents area co-cooperation in nature conservation, which covers the northern parts of Norway, Sweden, Finland and Russia. So in practice my working area has been from the Atlantic Ocean to the Ural mountains. I am also involved in the Green belt of Europe initiative, especially the Fennoscandian part. I have been long time taking part in IMCG activities, including as a Main Board member. A more recent challenge is the chairmanship of the Finnish Peatland Society, which I would like to develop into a modern scientific society.

General Assembly Documents

Agenda IMCG General Assembly, Utrecht, the Netherlands, August 31, 2018

1. Opening and Welcome
2. Minutes of the General Assembly of August 28, 2016 in the Cameron Highlands, Malaysia
3. Biennial report (2016 – 2018) on the state of affairs in the IMCG and on its policy
4. Balance sheet and the statement of profit and loss
5. Election of the Main Board
6. Nomination of Honorary Life Members
7. Conference resolutions
8. Next venues
9. Any Other Business
10. Closing of the General Assembly

Agendapoint 2: Minutes of the General Assembly of August 27, 2016 in the Cameron Highlands, Malaysia
(Based on notes of Alexandra Barthelmes and Rob Stoneman).

In the absence of the chairman and in accordance with art. 13.1 of the IMCG Constitution, the Main Board chose Ab Grootjans as the General Assembly Chairman. The General Assembly discussed the following agenda:

1. The Report of the Executive Committee on the state-of-affairs
2. Honorary memberships
3. Global Mountain Peat Initiative
4. Resolutions
5. Other business

Ad 1: A powerpoint presentation was presented covering organisational issues (prepared by Hans Joosten, finances (prepared by Francis Muller), and membership (prepared by Jan Sliva). With respect to Organisational issues an overview was given of the activities of IMCG and the responsible officers.
With respect to the Finances: From 31-12-2013 (€ 2963.37) to 31-12-2015 (€ 1762.91) the IMCG budget had decreased by € 1200.46. Like in previous years IMCG expenses are larger than its income. The decision of the General Assembly of 2014 to install a membership fee of 25 € (incl. exemption on request) was not implemented. In spite of the small budget available to IMCG, the activities run well, because substantial finance flow related to IMCG goes via self-financing of members and via (bi-and muttilateral) donations outside the IMCG administration.

With respect to the membership: on 01 August 2016 IMCG had 658 Ordinary Members and Supporters, incl. 52 without valid email address, meaning that 606 members (in 63 countries) receive our electronic messages. The distribution of the membership was as follows: 72 members in Africa (11 countries), 23 members in Asia excl. Russia (7 countries), 29 members in Australia/Oceania (2 countries), 1 member in Central America / Caribbean, 401 members in Europe excl. Russia (33 countries), 23 members in Russian Federation (Europe + Asia) and 12 members in South America (5 countries). In comparison: in 2002 IMCG had 276 members in 47 countries.

Ad 2: According to IMCG Constitution art. 4.7: "Honorary members shall be those individuals who have been nominated as such by the Main Board by reason of their exceptional merits to the objects of the Society, and who have been granted the status of honorary member by the General Assembly, and who have accepted this status." The IMCG Main Board nominated Nikolay Bambalov (Belarus, appreciation prepared by Merten Minke) and Olivia Bragg (appreciation prepared by Richard Lindsay). The General Assembly decided to grant the statuses as proposed. The appreciations are available in the IMCG Bulletin of August 2016.

Ad 3: Faizal Parish gave a presentation, suggesting the foundation of a Mountain Peatland Initiative. Mountain peatlands are rarely covered by research and are everywhere in the world overused and degrading with similar processes and problems. Faizal stressed that there is no funding source available so far, so that for the time being participation has to be interest-based.
The General Assembly discussed a focus on developing countries, inclusion of the Caucasus, a partnership between the Australian Alps and Tibet, the impact of climate change, the similar destructive effect of overgrazing on mountain peatlands all over the World, and the applicability of UK restoration expertise to other areas. On the need for a definition of 'mountain peatlands' it was argued that conceptional work can follow later.
The General Assembly approved the start of the initiative.

On 4: A resolution for Malaysia and Brunei was discussed to reflect the experiences and insights of the trip, to give advice to authorities and managers on peatland management, and to show that the international community is extremely interested in the fate of the ASEAN peatlands. The proposal was made to include in the resolution a short summary of insights and the 'non-controversial' issues. After discussion it was decided that no resolution should be adopted yet. GEC proposed to first compile a report and requested input from the participants, e.g. to be submitted to the IMCG Bulletin over the coming months.

Ad 5: No other businesses were brought forward and the chairman closed the meeting of the General Assembly.

Agendapoint 3: Biennial Report (2016 – 2018)

After Piet-Louis Grundling had resigned as IMCG-Chair in July 2016, his tasks were for the time being assumed by secretary-general Hans Joosten. Next to Piet-Louis and Hans Joosten, the Executive Committee consisted of Francis Muller (treasurer), Ab Grootjans (member) and Rodolfo Iturraspe (member). The additional (10) Main Board members were: Olivia Bragg, Beverly Clarkson, Eduardo Garcia-Rodeja, Tatiana Minaeva, Tapio Lindholm, Eric Munzhedzi, Faizal Parish, Line Rochefort, Jan Sliva and Leslaw Wołejko.
The Main Board had decided in 2016 not to organize new elections (constitution allows to keep MB members for 6 years), but to organize elections for a completely new Main Board in 2018.

The IMCG Website www.imcg.net was regularly updated and maintained by Michael Trepel. The production of the monthly IMCG Bulletin was coordinated by Hans Joosten, whereas distribution was handled by Michael Trepel. The membership administration was taken care of by Jan Sliva.

Two successful IMCG Field Symposia were held in the reporting period. A Field symposium (29 participants + organisators and local stakeholders), Conference ('Tropical peatlands in a global context') and the General

Assembly were organized from August 19 – 29, 2016, in Malaysia and Brunei by the Global Environmental Centre (Faizal Parish, Julia Lo, Serena Lew, Noor Azura Ahmad and collaborators).
An equally impressive Field Symposium 'Mire ecosystems of Northeast Europe' and a workshop 'Ecological restoration in the permafrost zone' were held from July 22 to August 4, 2017, in the Polar Urals and the Russian Arctic, Russia (around 50 participants of which 18 non-Russians), organized by Tatiana Minayeva, Anastasia Markina, Nadezhda Goncharova, Ruslan Bolshakov and collaborators. The Russian field symposium also produced printed proceedings in Russian and English under the title "Mire ecosystems of Northeast Europe and ecological restoration problems in permafrost zone" (eds. Minayeva T.Yu., Goncharova N.N. & Sirin A.A.).

The IMCG European Mires Book ('Mires and peatlands of Europe – status, distribution and conservation (780 p., 134 authors, edited by Hans Joosten, Franziska Tanneberger and Asbjørn Moen) was (after 27 years of work!) published in May 2017 and launched at a side event of the Climate Convention in Bonn on May 9, 2017.

IMCG was actively represented in the European Habitat Forum EHF by Rudy van Diggelen.

Mires & Peat, the free-for-all online scientific journal published by IMCG and IPS, flourished under the editorship of Olivia Bragg (editor in chief), Jack Rieley (Deputy Editor-in-Chief), and further IMCG members Frank Chambers, Dicky Clymo, Stephan Glatzel, Ab Grootjans, Katherine Roucoux and David Wilson. M&P Website Administrator was Michael Trepel. Many IMCG members functioned as Associate Editors (see www.mires-and-peat.net), authors and peer reviewers.
During 2016, Mires and Peat published 34 peer reviewed articles, 26 in regular volume 18 (385 pages) and eight in special volume 17 on 'Greenhouse Gas Fluxes in Degraded and Restored Peatlands' with David Wilson and Stephan Glatzel as volume editors (151 p.). During 2017, 32 articles were published of which 24 (380 pages) in regular volume 19 and eight articles in special volume 20 (2017/2018) on 'Growing Sphagnum' with Stephan Glatzel and Line Rochefort as volume editors (113 pages). Regular volume 21 (2018) contains currently (August 2018) 17 articles, whereas four articles have in 2018 been added to special volume 20. Conspicuous is the rising number of papers in the standard volumes over time. Whereas in the period 2006 – 2014 an average of almost eight papers (range: 4 – 11) per standard volume was achieved, the number reached 13, 26 and 24 in the standard volumes of 2015, 2016, and 2017, respectively, whereas 2018 already stands on 17.
The Web of Science Impact Factor rose from 0.806 in 2014, via 1.095 in 2015 and 1.129 in 2016 to 1.326 in 2017.
A new financial arrangement on Mires & Peat was agreed with IPS in August 2016.

In July 2018 IMCG had 658 active members from 63 countries (report Jan Sliva), i.e. an increase of 8.5% and 1.6% since 2016, respectively. In comparison, in 2002 we had 276 members in 47 countries.
In spite of intensive search, we do not have a functioning email address of an additional 50 members, so these members do not receive the IMCG Bulletin and have been excluded from the statistics. The distribution over regions and countries is as follows:

IMCG Regions	**members**		**countries**	
date	2016	July 2018	2016	July 2018
Africa	72	76	11	11
Asia (excl. Russian Federation)	23	30	7	8
Australia/Oceania	29	28	2	2
Europe (excl.RF)	401	439	33	33
Russian Federation (Europe + Asia)	23	22	1	1
North America	45	47	2	2
Central America / Caribbean	1	1	1	1
South America	12	15	5	5
Total	**606**	**658**	**62**	**63**

Agendapoint 4: Balance sheet and the statement of profit and loss (report Francis Müller)

Over 2016 income of IMCG was € 2500.46 (mainly because of a € 2500 contribution of a cooperating partner), whereas expenses amounted to €231.49, leading to an end-of-year budget of € 4691,88. Some € 27,500 was moved via the IMCG account to facilitate fee payment of European IMCG members participating in the Malaysia-Brunei Field Symposium.
Over 2017 income of IMCG was € 0.41, whereas expenses amounted to € 255.88 (including € 98.55 banking costs), leading to an end-of-year budget of € 4436.41.
Substantial finance flow related to IMCG goes via self-financing of members and via (bi- and multilateral) donations outside IMCG administration

Agendapoint 5: Election of the Main Board

At our General Assembly in the Netherlands we would have had to elect a new Main Board. In order to guarantee an effective democratic election process involving all members, nominations had to be submitted to the Secretariat by July 6, 2018, so that ballots would reach everybody in time.
As by July 6, there were exactly 15 candidates for 15 Main Board positions, and in accordance with article 9.1 of the constitution, no voting was necessary and all candidates were included in the new Main Board.

Meet the new Main Board!


Olivia Bragg


Zhao-Jun Bu


Ab Grootjans


Samantha Grover


Piet-Louis Grundling


Rodolfo Iturraspe


Hans Joosten


Wiktor Kotowski


Tapio Lindholm


Tatiana Minayeva


Francis Muller


Faizal Parish


Line Rochefort


Rob Stoneman


Franziska Tanneberger

The new Main Board members for the period 2018-2020 thus include: Olivia Bragg (Scotland/UK, female, a little over 60 yrs), Zhao-Jun Bu (China, male, 46 yrs), Ab Grootjans (Netherlands, male, 67 yrs), Samantha Grover (Australia, female, 43 yrs) with support of Shane Grundy (male, 50 yrs), Piet-Louis Grundling (South-

Africa, male, 52 yrs), Rodolfo Iturraspe (Argentina, male, 63 yrs), Hans Joosten (Germany/Netherlands, male, 63 yrs), Wiktor Kotowski (Poland, male, 46 yrs), Tapio Lindholm (Finland, male, 65 yrs), Tatiana Minayeva (World, female, 55 yrs), Francis Muller (France, male, 60 yrs), Faizal Parish (UK/Malaysia, male, 57 yrs), Line Rochefort (Canada, female, 57 yrs), Rob Stoneman (United Kingdom, male, 51 yrs) and Franziska Tanneberger (Germany, female, 40 yrs).
The new IMCG Main Board will now start the procedure to elect the Executive Committee, incl. the chair, from among its members.

6. Nomination of Honorary Life Members
Proposals will be discussed at the General Assembly.

7. Conference resolutions
Proposals will be discussed at the General Assembly.

8. Next venues
Proposals will be discussed at the General Assembly.

9. Any Other Business
Proposals will be discussed at the General Assembly.

Mires and Peat

The new 2017 Impact Factor for our scientific journal Mires and Peat has just been published by Thomson Reuters Web of Science. The IF has again increased and stands now on 1.326. See more detailed information below. Congratulations to all people who have made this possible!

Year	Total cites	Journal Impact factor (IF)	increase	IF without journal self cites	5 year impact	Immediacy index	Citable items	Cited half-life
2017	347	1.326	0.197	1.046	1.638	0.700	20	6.1
2016	261	1.129	0.034	0.870	1.956	0.438	32	5.6
2015	227	1.095	0.189	1.000	Not appl.	0.182	11	5.2
2014	190	0.806	-	0.806	Not appl.	0.286	7	4.4

In June and July 2018 the following papers were published in Mires and Peat:

- Sphagnum decay patterns and bog microtopography in south-eastern Finland. [M. Mäkilä, H. Säävuori, A. Grundström and T. Suomi] Volume 21: Article 13 http://mires-and-peat.net/modules/download_gallery/dlc.php?file=266
- The water balance of a Sphagnum farming site in north-west Germany. [K. Brust, M. Krebs, A. Wahren, G. Gaudig and H. Joosten] Volume 20: Article 10 http://mires-and-peat.net/modules/download_gallery/dlc.php?file=265
- Substrate quality and spontaneous revegetation of extracted peatland: case study of an abandoned Polish mountain bog. [E. Zając, J. Zarzycki and M. Ryczek] Volume 21: Article 12 http://mires-and-peat.net/modules/download_gallery/dlc.php?file=264
- Effectiveness of restoration of a degraded shallow mountain fen after five years. [B. Glina, A. Bogacz, Ł. Mendyk, O. Bojko and M. Nowak] Volume 21: Article 11 http://mires-and-peat.net/modules/download_gallery/dlc.php?file=263
- The effect of drainage on CO_2, CH_4 and N_2O emissions in the Zoige peatland: a 40-month in situ study. [R. Cao, Y. Chen, X. Wu, Q. Zhou and S. Sun] Volume 21: Article 10 http://mires-and-peat.net/modules/download_gallery/dlc.php?file=262

Find the journal online at http://mires-and-peat.net/ . Send your new manuscripts to Editor-in-Chief Olivia Bragg: o.m.bragg@dundee.ac.uk

Request to IMCG colleagues and friends

I'm addressing all of you regarding the following issue. Regrettably, I could not attend the IMCG Feld Symposium in August 2016 in Malaysia and Borneo but being very interested in this region, I decided to organise my own travel still to Kalimantan in 2016. I was extremely impressed by (and 'fell in love' with) the landscape, nature and culture of Borneo island. Thus I am planning to return to Kalimantan this year around October or November (but a postponement to December would be possible if needed) for a two to three weeks. Since it is not easy to get around to placers of my interests and even harder to get detailed information (especially in English), I'm asking the IMCG network community for advice and support. I'm searching for:

- General recommendations and information for the island, both parts (national parks, regions, hikes ...)
- Fellow travellers who would like to join
- People who would be willing to show projects they are involved in (restoration and nature protection projects)
- People who can use or would like to have help or exchange for their projects (whatever is possible in two to three weeks)
- Any other interesting restoration or conservation projects in Borneo or elsewhere I could participate in during October/November

A few words about my person:

I'm a 28 years old ecologist from Switzerland who did several mire ecology projects during my studies. I'm now working in an office in Zurich for different projects containing nature and landscape concerns. I'm an enthusiastic traveller with a passion for hiking who would love to learn more about ecological and socio-cultural issues of different regions. I have some friends from my last visit in Kalimantan in Bengkayang (West Kalimantan) who would be happy about a visit and can explain quite a lot about Dayak culture but not really about scientific ecological processes.

Best wishes from Switzerland. Philipp Schmid: phil.schmid@gmx.ch

Bargerveen at the IMCG Field Symposium 2018. Photo: Hans Joosten

Papers

Some facts on submerged drains in Dutch peat pastures

John Couwenberg, Greifswald Mire Centre (couw@gmx.net)

The peat soils in the western and northern parts of the Netherlands have been drained for many centuries and used as pastures (Figure 1). As we all know, drainage causes peat oxidation and leads to subsidence of the land. Some centuries ago, after already several centuries of subsidence, drainage of the Dutch peat soils became challenging and the assiduous Dutch came up with a technical solution to their problem: They invented the polder system. Dikes were built and the subsided areas were pumped dry using windmills, resulting in the typical Dutch 'polder' landscape. In this ostensibly idyllic landscape cows graze (or at least the grass grows that feeds them) that produce the milk that is used to produce the cheese that is then exported all over the World. The Dutch are famous for their cheese.

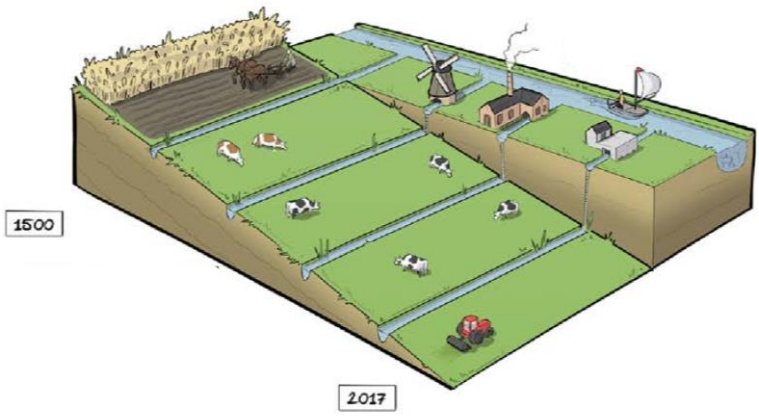

Figure 1: Subsidence through the centuries; the time axis runs from 1500 CE to 2017 CE. Peat soil that was initially situated above the regional groundwater table was drained for agriculture. Drainage led to subsidence and soon there was a shift to grazing lands and drainage had to involve windmills and later steam- and diesel-operated pumps. Deeper pumping means more subsidence and Dutch peat soils are now up to 8 m below sea level (from Bos et al. 2017).

The windmills enabled continued drainage of the poldered peat soils, leading to continued subsidence and creating the 'nether'-lands in which the coastal peatlands are now located on average 1.3 metres below sea level (Erkens et al. 2016, cf. Figure 1). The famous Dutch cheese is thus directly linked to another thing the Netherlands are famous for: large parts of the country lie below sea level. For a country close to the sea, projected sea level rise poses a problem. Even more so as the rate of peatland subsidence is much higher than the rate of sea level rise. Land subsidence presents a series of additional problems, like damage to infrastructure and buildings or salt water intrusion, affecting many sectors and many parts of society. Centuries of battling the water (and winning for the most part) have given the Dutch confidence that they can win this battle too. All it needs is wit and an invention to provide the technical solution also this time.
The solution is called 'submerged drainage'. How can drainage of any sort be the solution to ongoing subsidence, you may ask. The answer is that it cannot. But I am running ahead of myself.

Submerged drainage

First things first, what is submerged drainage? To drain Dutch peat soils, ditches have been dug at distances of (only) 30 metres up to several hundred metres. Now, the water table in the field is not the same as in the ditch. The farther away from the ditch, the larger the (potential) difference. In summer the water table between ditches is usually lower than in the ditches because infiltration of ditch water cannot replace water that is lost through evapotranspiration quick enough (Figure 2a). In winter the water table between the ditches is usually higher than in the ditches because the water surplus from rainfall and reduced evapotranspiration needs much time to reach the ditches (Figure 2b).

The idea now is to install drainage tubes that run perpendicular to the ditches and to install many of them. Tests have been carried out with tubes every 4, 6, 8, or 12 metres. These tubes are installed below the ditch water level and could thus bring water from the ditch to the field in summer when the water level in the ditch is higher than in the field (Figure 2a); and remove water from the field in winter when the water table in the field is higher than in the ditch (Figure 2b). The claim was and has remained that submerged drains, because

they induce higher water tables in summer, would at least halve the subsidence rate of Dutch peat pastures (Bokma 2005, vd Akker & Hendriks 2017, and many reports in between). Before we get into the effect on the rate of subsidence, let us first look at the actual effect of the submerged drains on the water table in the field between the ditches.

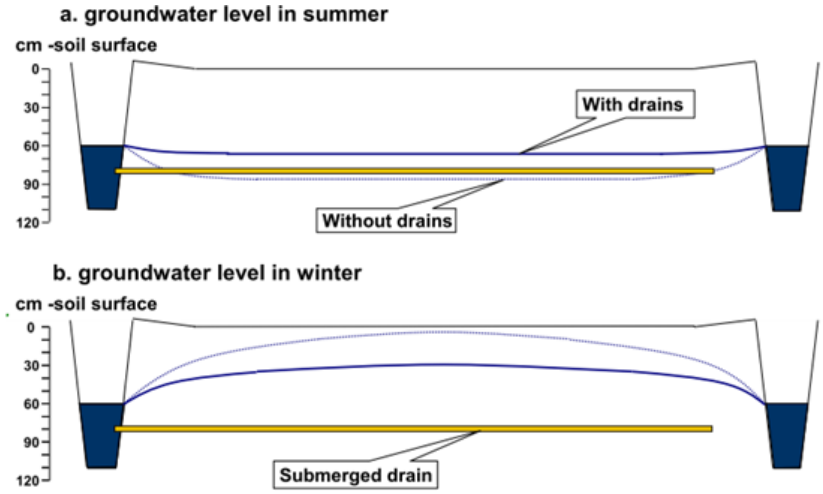

Figure 2: Idealized performance of submerged drains (from vd Akker & Hendriks 2017).

The effect of submerged drains on ground water table

First pilots with submerged drains were carried out in different parcels of Polder Zegveld[1]. The ditches connected to the drains were held at fixed high or fixed low water levels (Hoving et al. 2008). These first field tests yielded inconclusive results at best (cf. Figure 3)[2]. The authors do claim that water table fluctuations in the field are attenuated over the year, adding that submerged drains therefore perform as promised. Yet, the effect is mostly in reducing water tables during autumn, winter and spring, and not in raising water tables in summer. If water tables were clearly higher (> 10 cm) in summer, they were so only during the first year after the drains were installed, or water tables were higher in winter as well. If the water table is higher both in winter and summer, this rather indicates that the control plots were not ideally chosen, but were apparently lying (some centimetres) higher than the experimental plots.

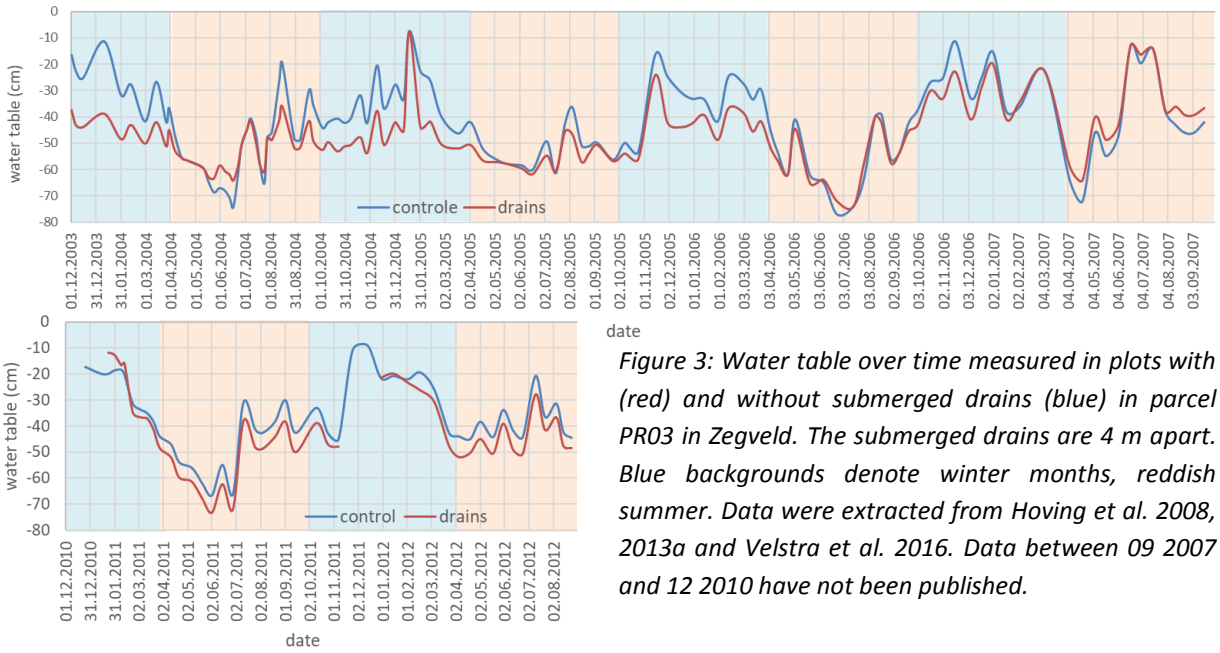

Figure 3: Water table over time measured in plots with (red) and without submerged drains (blue) in parcel PR03 in Zegveld. The submerged drains are 4 m apart. Blue backgrounds denote winter months, reddish summer. Data were extracted from Hoving et al. 2008, 2013a and Velstra et al. 2016. Data between 09 2007 and 12 2010 have not been published.

[1] Additional pilots (Pleijter & vd Akker 2007) were started in Linschoten where the peat was covered by a clay layer and where the effect of the drains was disappointing (Jansen et al. 2008) and subsequent research was abandoned, and in Polder Zeevang, see below.

[2] Water tables were averaged over a multitude of measurements relative to the respective surface heights (Pleijter & vd Akker 2007). These surface heights may differ by some decimetres within parcels. Whether, and in how far, this approach affects the results is unclear, but let's assume it doesn't.

A next test was carried out at two farms in Polder Zeevang north of Amsterdam. In these pilots the water table was lower in all cases with submerged drains compared with the control (Hoving et al. 2011). Interestingly, the pilots are explicitly mentioned in a policy paper on a future strategy for the Krimpenerwaard area near Rotterdam ('Strategische visie Krimpenerwaard') published in 2017. Although the data show that submerged drains do not work, the policy paper still cites them as a visionary way to combat subsidence.

It is a bit disturbing that the mini-abstract on the first page of the report reads: "By a more even course of the groundwater table, this way of drainage [i.e. using submerged drains] can limit waterlogging and land subsidence." It is not made clear that limiting land subsidence is a hypothetical claim that is not supported in any way by the findings of this pilot. But then again, the pilot itself is rather disturbing in its own right.

One of the studied farms in the polder "has to deal with very high ditch water levels of less than 20 cm below the surface, as have many surrounding farms in the Zeevang polder. Here the [ditch water] level was reduced to 60 cm below the surface, where submerged drains had to compensate for the resulting extra land subsidence." So, the cynical idea really is to lower the water table in the ditch and then compensate for the expected increase in subsidence by attaining a higher water table in summer through subsurface drains.
In the end, the reference sites are deemed inappropriate and the conclusion is that summer water tables were unaffected, but winter water tables were clearly lower and thus that agricultural use is less impaired. So, the report actually finds evidence of the opposite of what the original vision aimed for: that water tables should become higher in summer (and lower in winter) so that peat and height losses would be curbed while still providing farmers with the possibility to use the land. Now the focus is on the land use only and the fact that water tables are lower overall is not mentioned as a problem at all; on the contrary: "An investment in drainage will only be appealing to farmers if the drainage improves considerably", write Hoving et al. (2011)

The reason why farmers would like a lower water table is not because grass yields would increase. Several reports compare yields between fields with and without submerged drains and find no difference (e.g. Hoving et al. 2008, 2011, 2013a, 2015). In summer and early autumn, the water table is usually deep enough to enter the field for harvesting. One reason why farmers strive for improved drainage, with more level groundwater tables across the field, is simply because they can then enter their fields earlier, easier and more often, and bring out more animal manure[3].

At additional sites in Zegveld and sites in Krimpenerwaard, Demmeriksekade, Keulevaart and in the Wormer- and Jisperveld similar results were obtained as in Zeevang with submerged drains and fixed ditch water levels (vd Akker et al. 2013, Hendriks et al. 2014, Hoving et al. 2013a, vd Akker et al. 2016a): reference sites turned out (or were rather deemed) inappropriate or summer water tables were not much higher or even lower with submerged drains, particularly in the second year after installation of the drains. Note that the first pilot ran over 5 years and specifically set out to look at how the performance of the drains held up over time ("The experiment will continue for another 4 years, in which we will also study whether the performance of the submerged drains diminishes over time" Hoving & vd Akker 2005). The first pilot study was not very critical in this respect and later studies were restricted to two years of measurements only.

Dynamic ditch water levels

Overall, the performance of the submerged drains could hardly be called satisfactory in the above pilots, although the reports often did claim success. In 2012, in order to improve the effectiveness of the drains, pilot sites with dynamic ditch water levels were introduced (the idea was presented by Hoving et al. already in 2008); the rationale being that "[h]igh intensity use of grassland is restricted to only a number of days during the growing season; accessibility of the grass sward is important only during fertilizer application, grazing and grass harvest in form of pasturing or mowing" (Hoving et al. 2013a). Essentially, ditch water levels are kept high in summer to raise water tables in the field and low in winter to lower them (dynamic water level), or ditch water levels are kept high at all times unless the farmer or the cows need access (dynamic high water level).

[3] http://www.mestportaal.nl/2012/vroeg-mest-uitrijden-op-veen-mogelijk-met-onderwaterdrainage/, which translates to: www.manureportal.nl/2012/early-spreading-of-manure-on-peat-soils-possible-with-submerged-drains/

Dynamic ditch water levels were no favourite among farmers as they led to instability and erosion of the ditch banks. Also the Dutch water boards did not like the approach as it would entail many small areas of regulation, whereas the water boards are currently actually striving to increase the size of the regulation areas (v Woerkom 2016). So, exit dynamic ditch water levels. The newest invention is called 'pressurized drains' in which a hydraulic head can be built up inside a small 'water tower' that feeds the submerged drains in summer. Thus far, no reports have been published on this newest approach (but see below). The meta-analysis that follows will focus on the results of the pilots with dynamic ditch water levels. It is the closest we can get to the currently hyped set-up with dynamic, pressurized drains.

The Greifswald Mire Centre performed a meta-analysis that looked at the available water table data from parcels with submerged drains where dynamic or dynamic high water ditch water levels were applied (Hoving et al. 2013a, b, 2015). Data are available from 7 parcels, each partly installed with submerged drains and partly run as control plot. In 6 parcels there are sub-parcels with drains at 4 m distance and in all but 2 of these parcels there are also sub-parcels with drains at 8 m distance. In all the analysed reports field water tables are presented over time for both the experimental and the control plot (cf. Figure 4).

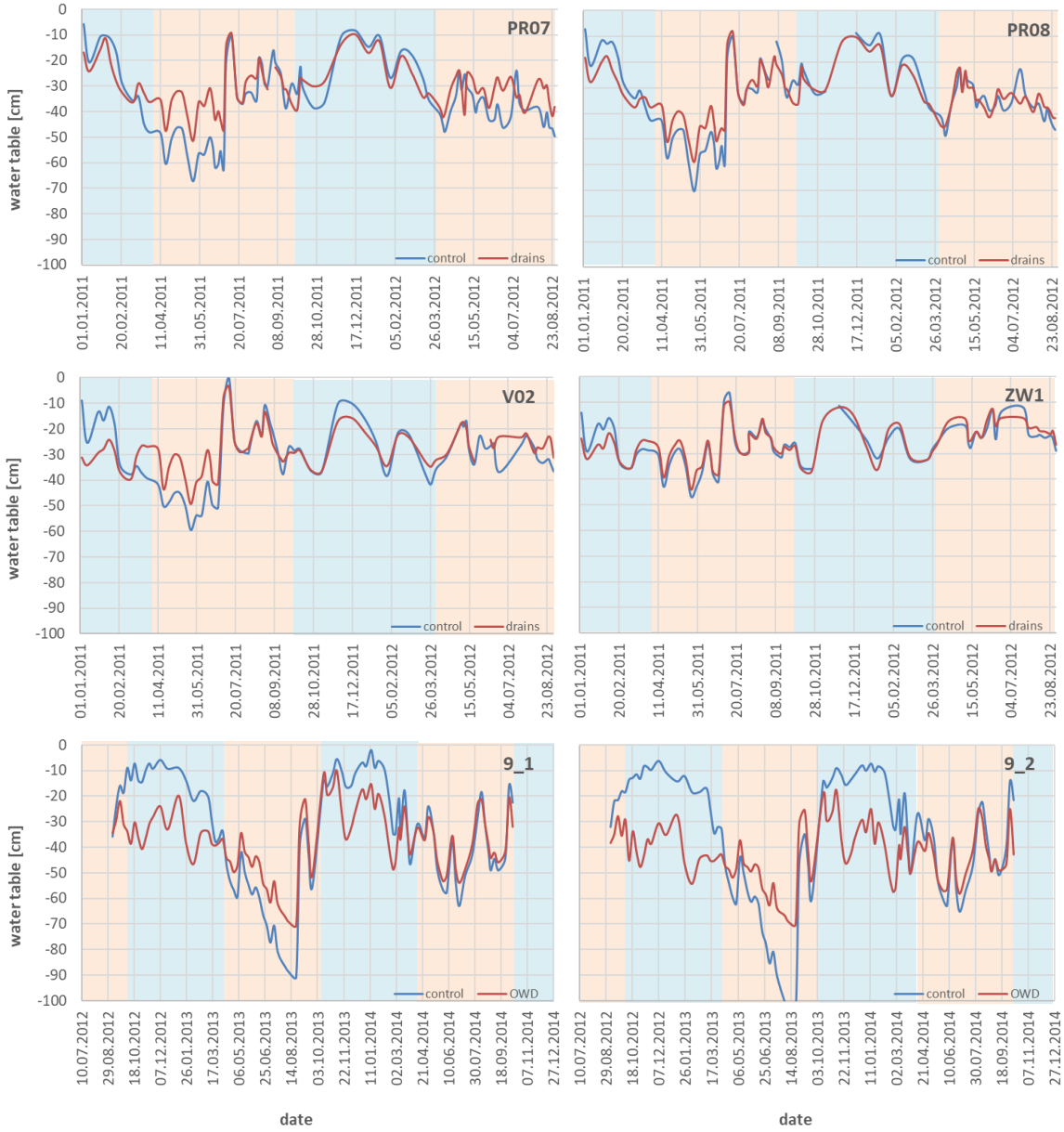

Figure 4: Water table over time measured in plots with (red) and without submerged drains (blue) in parcels in Zegveld (PR07, PR08, VO2, ZW1) and Zeevang (9_1, 9_2). Only the measurements of the sub-parcels with submerged drains at 4 m distance and their control are shown. Blue backgrounds denote winter months, reddish summer. Note the different measurement periods. Data were extracted from Hoving et al. (2013a, b, 2015).

If we look at these measurements, we see that *when* there is a difference between water tables with and without submerged drains, the drains apparently perform as they should (Figures 4, 5, 6): when water tables are low in the control plot (below −40 cm), they are often higher in the accompanying plot with drains and when water tables are high in the control plot (above −20 cm), they are often lower with drains. Yet, the differences are only apparent in the first year after the drains were installed and much less so in the second year (data for additional years have not been published[4]).
The submerged drains thus seem to be much less effective in the second year after they are installed. In the reports this failure is assigned to water tables (in the control) not being as low as during the first year, which is indeed so (Figure 4, 6). However, for parcels 9_1 and 9_2 this would mean that the second year water tables around −50 to −60 cm would not be deep enough to trigger an effect of the drains. Yet, similar water tables of −50 or −60 cm are seen in the first year of other parcels (PR07, PR08, VO2, and also 9_1 and 9_2) where the drains do show the envisaged effect (Figure 4). In this respect the argument that water tables are not low enough for the drains to be effective during the second year seems moot.

For water tables below −40 cm in the control plots, associated water tables in the plots with drains are rarely 20 cm (or more) higher, even during the first year. If water tables are high in the control (above −20 cm), they are clearly lower in the plots with submerged drains, also during the second year (Figure 5, 6). Although submerged drains are promoted for raising water tables in summer, the dominant effect is rather in lowering water tables during winter and early spring (see above on why farmers like it that way). The average effect of the drains is limited to maximum 6 cm higher water tables during summer and 9 cm deeper water tables during winter (Figure 6).

Now, remember the cynical trial above in which the ditch water level was lowered just to test whether submerged drains could compensate. They could not and ground water tables were about 10 cm lower, which Hoving et al. (2011) deemed 'relatively limited'. So we have to conclude that the effect of submerged drains with dynamic water tables – particularly during the second year after their installation – is less than 'relatively limited'.

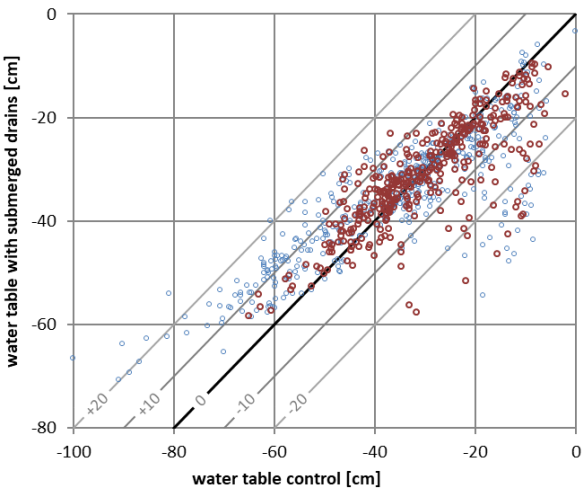

Figure 5. Plot of the water table with submerged drains in relation to the water table in the associated control plot. Blue dots denote measurements made during the first year after installation of the drains, red dots during the second year. Diagonal lines indicate the difference between the situation with and without submerged drains, denoting where in the situation with submerged drains the water table is 20 cm higher (+20), 10 cm higher (+10), equal (0), 10 cm lower (−10) or 20 cm lower (−20) than in the control plot. Water tables in the situation with drains tend to be somewhat higher for low water tables and lower for high water tables in the control. Data were extracted from Hoving et al. (2013a, b, 2015).

[4] Velstra et al. 2016 provide measurement data for PR07 during the period May 2014 and November 2015. There is no control plot, but the water tables are compared with those in PR03 and PR13 (fixed and low and fixed high ditch water level, respectively, see Figures 3 and 13). There is no obvious effect of the drains in PR07 although water tables drop to −70 cm. Water tables in PR03 and PR13 for the subparcels with drains do not differ from their controls during this time (see Figures 3 and 13).

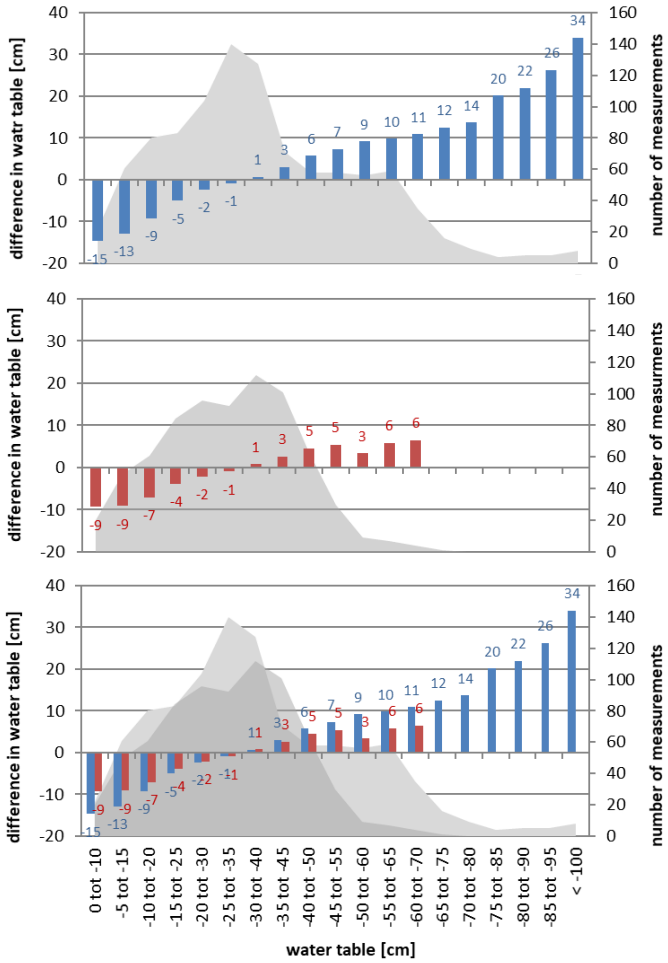

Figure 6: Difference between the water table with and without submerged drains expressed as mean difference over all data in 10 cm bins defined for the water table of the control plots without drains. Top: for the year in which the submerged drains were installed. Blue upward bars indicate that the groundwater table with submerged drains was higher than without; blue downward bars indicate that it was lower (left-hand axis). The mean difference in water table is written above or below the bar. The grey graph in the background indicates how many measurements there are for the respective water table classes (right-hand axis). There were, for example, 140 measurements for water tables between −25 and −35 cm during the first year. The total number of measurements is 1001 for the first year. Centre: same but with red bars for the second year. There are a total of 729 measurements for the second year. Below: combination of the two graphs. Data were extracted from Hoving et al. (2013a, b, 2015).

Effect on emissions and subsidence

Seeing that the effect of submerged drains on the groundwater table is only limited, this raises the question what the effect is on CO_2 emissions and subsidence. Direct measurements of greenhouse gas emissions on sub-parcels with and without submerged drains have thus far only been carried out on one occasion in a peat meadow in Frisia. The results actually show that CO_2 emissions are higher with submerged drains than without. However, these results are under embargo and cannot be presented here.

The Greifswald Mire Centre has systematically collected CO_2 emission data from temperate European peatlands. From those data, we know that the mean annual water table shows a rather strong correlation with CO_2 emissions: for every 10 cm of additional drainage, CO_2 emissions increase with 5 tonnes per hectare and year (Figure 7). The mean annual water table hardly differs between the plots with submerged drains and their respective control plots. Going by mean annual water table alone, CO_2 emission would not be much different either.

The mean annual water table obviously does not tell the entire story, however. The trend line in Figure 7 is only a correlation and not a causal relationship. There is a rather large variance around the trend: at the same mean annual water table, emissions may vary by about 20 t CO_2 per ha and year. Whereas mean annual water table is a good proxy, emissions are eventually determined by a whole series of variables, like soil structure, nutrient status, land use, vegetation, fertilization, productivity or water table fluctuations. So, it is not unlikely that higher water tables in summer (and in summer only) could reduce emissions and therewith subsidence, but this has thus far never been shown.

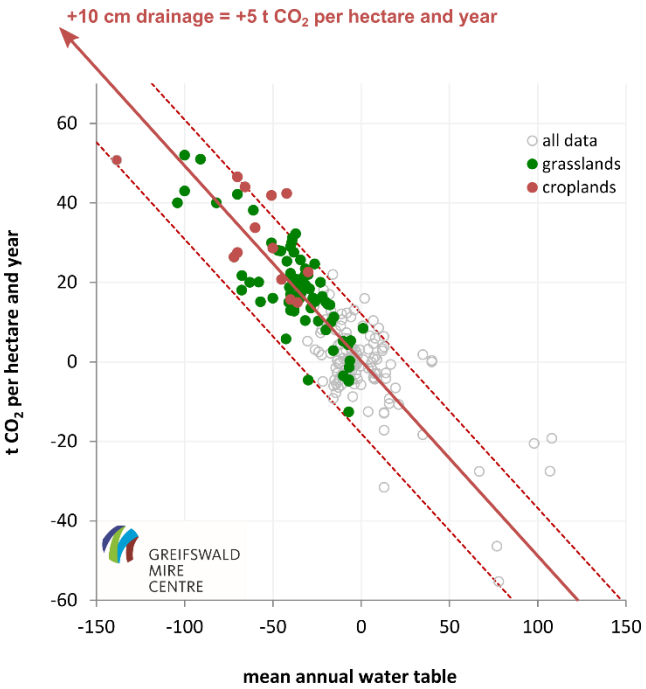

Figure 7: Measured full-year CO_2 fluxes from European peat soils in relation to the mean annual water table. The solid red line shows the regression (r^2 = 0.86, n = 84 croplands + grasslands) that suggests that CO_2 emissions increase by 5 tonnes per hectare and year for every additional 10 cm deeper drainage. The dashed lines denote the 95% CI. Source: emission database Greifswald Mire Centre.

In the reports on submerged drains another approach is used to assess CO_2 emissions. This approach is based on subsidence measurements over multiple decennia in association with ditch water levels in Zegveld. These long term data on subsidence have been translated into CO_2 emissions using the carbon content of a peat profile in Zegveld (as a rule of thumb there are 2.3 t CO_2 ha^{-1} y^{-1} for every mm of subsidence; vd Akker et al. 2008). A correlation is found between the rate of subsidence and the ditch water level (Figure 8a) as well as with the 'mean lowest ground water table' in the field (MLGWT, Figure 8b)[5]. Both these correlations are derived from the same original dataset.

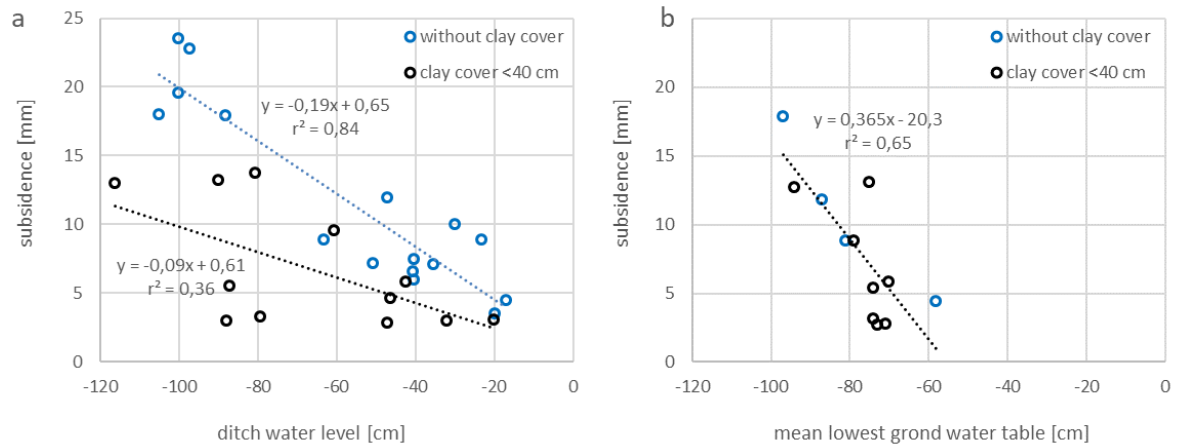

Figure 8: Mean rate of subsidence in relation to the ditch water level (a) and to the mean lowest ground water table (b). Source: vd Akker et al. 2012.

Translation of the measured subsidence rates into CO_2 fluxes means that 20 mm of subsidence equals 46 t CO_2 ha^{-1} y^{-1} at a ditch water level of −100 cm, which is close to 50 t CO_2 ha^{-1} y^{-1}. So the subsidence data seem to fit the general correlation presented in Figure 7 rather well (cf. vd Akker et al. 2018). If the mean annual ditch water level is zero, subsidence would be zero and CO_2 emissions would be zero too. The reports on submerged drainage focus on Figure 8b, however, because the (original) idea is to raise summer water tables. Whereas the correlation with the MLGWT is rather strong, it would be presumptuous to conclude from the

[5] To establish the 'mean lowest groundwater table', the lowest 3 water tables measured between April and March (hydrologic year) are averaged over a period of at least 8 years during which no changes in hydrological management may occur, like lowering ditch water levels (or installing submerged drains…).

suggested correlation in Figure 8b that changing summer water tables, and summer water tables alone, could reduce emissions and subsidence.

It would similarly be presumptuous to suggest that if the MLGWT is about −50 cm, the rate of subsidence would be zero. This can apparently only apply if the ditch water level is at 0 cm (Figure 8a; remember that Figure 8a and 8b are different presentations of the same dataset; just that 8b has only 4 instead of 15 datapoints for peat soils not covered with a layer of clay). The correlations presented in Figure 8 apply to situations in which the water table follows a natural course. It is yet unclear how a targeted change in the water table through subsurface drains would change rates of subsidence and CO_2 emissions. Water table may be a good proxy for emissions across years and between sites, but within a single year temperature seems to be much more important, for example (Lafleur et al. 2005).

Reports and popular articles on submerged drainage commonly claim that CO_2 emissions can at least be halved. This claim has never been supported by direct flux measurements. There is one example of a parcel where submerged drains were tested against a control and where subsidence was measured over a longer period. Indeed, the subsidence measured over 10 years in the plot with submerged drains is about half of the subsidence in the control plot (Figure 9).

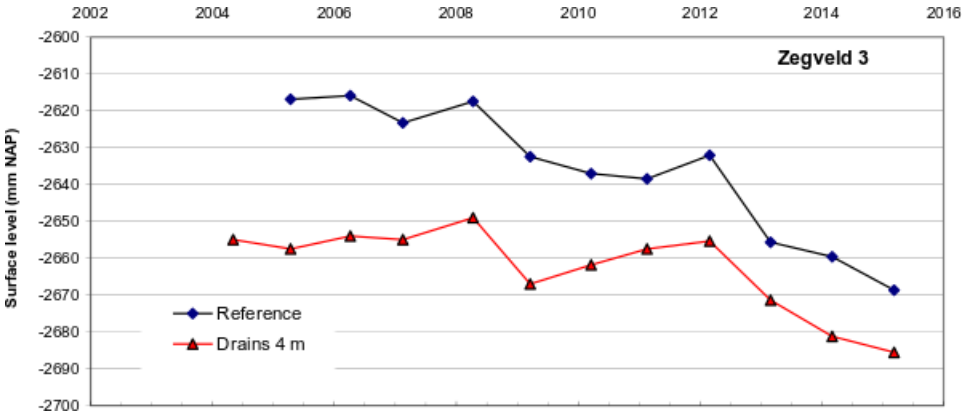

Figure 9: Subsidence measured in Zegveld parcel PR03 with (red) and without (blue) submerged drains. Surface height is presented in relation to standard Dutch datum NAP. Note the initial difference in height (c. 4 cm) and the difference in swelling between the two sub-plots; changed from vd Akker et al. 2017.

So, that looks good, right? Exactly as promised and even supported by measurements[6]. Yet, the height measurements were carried out on the Zegveld parcel PR03, of which we know that the submerged drains do not raise summer water tables to much effect (Figures 3 and 10). In their report, Hoving et al. (2013a) write: "The effect of the drains at fixed ditch water level (installed in 2003) in general turned out rather small; particularly so in case of parcel PR03. Whereas the effect of the drains was still good during the first years (2004-2007) [… t]he fixed low ditch water level caused the drains to be primarily draining."

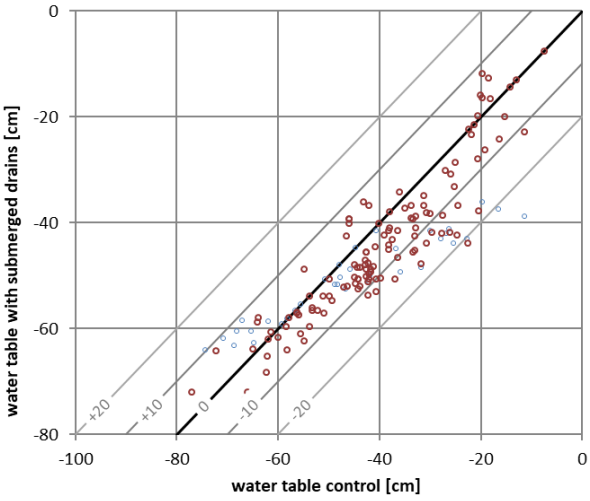

Figure 10: Water table in parcel Zegveld PR03 in the plot with submerged drains compared with the control plot. Blue dots refer to the first year after drains were installed, red dots to later years (cf. Figure 3). Explanation on how to read the graph, see Figure 5. Data were extracted from Hoving et al. 2008 and Hoving et al. 2013.

[6] Surface height is measured every year along transects between the ditches and perpendicular to that. No fixed points are marked, but measurements are made every 2 metres along a tape measure. The average value of these measurements is presented with no information on variance, outliers or uncertainties.

In parcel PR03 water tables were only sporadically higher in the plot with submerged drains (in 2004, 2006, 2007) and then only by a few centimetres (Figures 3 and 10). So, although total subsidence over a period of 10 years clearly differs, this difference cannot be explained by differences in water table and therefore not by the presence or absence of submerged drains. Hoving et al. (2013a) clearly state that the submerged drains in parcel PR03 Zegveld are ineffective in raising summer water tables. Nonetheless, Figure 9 is presented by vd Akker et al. (2017[7]) to illustrate the success of submerged drains, suggesting that subsidence is lower because summer water tables *are* higher with submerged drains.

What really causes the difference in subsidence between the two plots is unknown. The surface rises strikingly during some years (Figure 9) and the difference in eventual surface height is less related to differences in subsidence than to differences in swelling. Between 2005 and 2008, for example, the surface of the control plot dropped by about 1 mm whereas the plot with submerged drains rose by more than 8 mm. Between 2009 and 1012, the control plot dipped and swelled back to show hardly any difference in height. During this same time the plot with drains rose by 11.5 mm. A raise in surface height because of swelling does not entail a net sequestration of CO_2. It is inappropriate to suggest that submerged drains help combat climate change on the basis of these data.

With respect to greenhouse gas emissions, nitrous oxide needs to be taken into account. N_2O emissions are very erratic and good proxies for emissions on parcel scale are thus far lacking.
However, the highest N_2O emissions have been measured at a mean annual water table of −40 cm (Figure 11). It is this water table that is strived for in the pilots with submerged drains (cf. Figure 6), which may pose a risk to the climate, particularly if the land is fertilized (which it is in the Netherlands, see above). Because the highest N_2O emissions occur at a water table of around −40 cm, raising the mean annual water table from −70 to −40 cm does not necessarily result in reduced climate impact. Although CO_2 emissions will be lower, an increase in N_2O emissions may nullify this effect (Jurasinski et al. 2016).

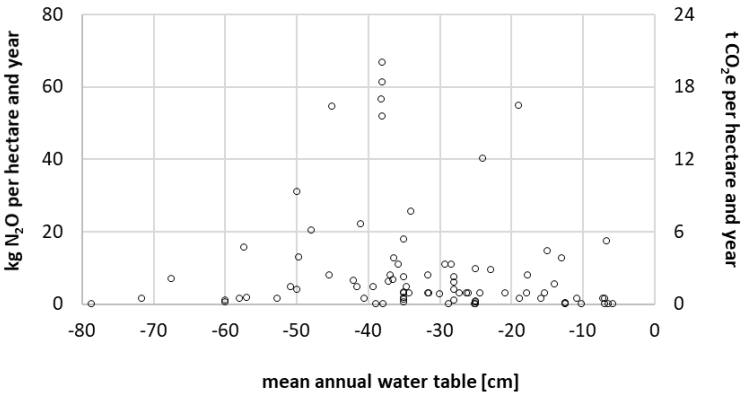

Figure 11: Annual N_2O flux from European grasslands on peat in relation to the mean annual water table. The axis on the right-hand side shows approximate emissions calculated in CO_2-equivalents (1 kg N_2O = 298 kg CO_2e). Source: emission database Greifswald Mire Centre.

But what about pressurised drains?

As mentioned above, dynamic ditch water levels were not popular among farmers and water boards. Because dynamic water tables did seem to improve the effects of submerged drains, a system with mini-water towers was developed. By pumping water into or out of the towers, a hydraulic head difference can be built up with submerged drains attached to the tower. This system of pressurised drains has been tested since 2016. It promises to be more effective than submerged drains with dynamic ditch water levels. First results have been presented in a popular journal (Jansen et al. 2017) and have been shown in presentations (Figure 12) and on webpages[8]. The set-up seems to work. Water tables with pressurized drains are higher in summer and lower in winter than in the control during both measurement years and largely remain between −20 and −60 cm.

[7] and repeatedly in popular reports and presentations, e.g. vd Akker et al. 2009, 2010, 2016b
[8] https://www.verantwoordeveehouderij.nl/nl/Verantwoorde-Veehouderij-2/show-5/Onderwaterdrains-met-putbemaling-lijken-meerwaarde-te-hebben.htm and
https://www.verantwoordeveehouderij.nl/nl/zuivelnl-projecten/Show/Grondwaterpeil-onder-controle.htm

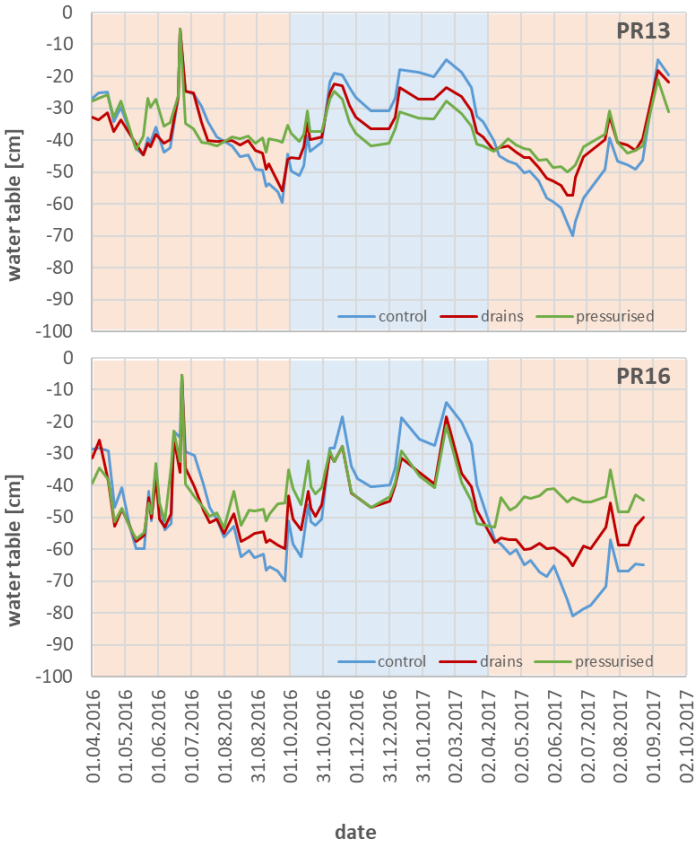

Figure 12: Groundwater table in Zegveld parcel 13 (top) and parcel 16 (bottom) without submerged drains (control, blue line), with 'normal' submerged drains (red) and with pressurized drains (green) with fixed high (PR13) and fixed low ditch water level (PR16). Blue shading denotes winter months, reddish summer. Changed after Hoving et al. 2018.

Interestingly, the non-pressurized submerged drains show higher summer and lower winter water tables in both parcels and for both years as well (Figure 12). Note that ditch water levels for parcel 13 are kept at a fixed high level (c. −15 cm[9]) and that this pilot was originally conceived to increase water tables during summer only (Hoving et al. 2008). During the initial measurement period (2003-2007), the drains showed a rather haphazard effect in parcel 13 with a modestly higher water table during the first summer, hardly any effect during the

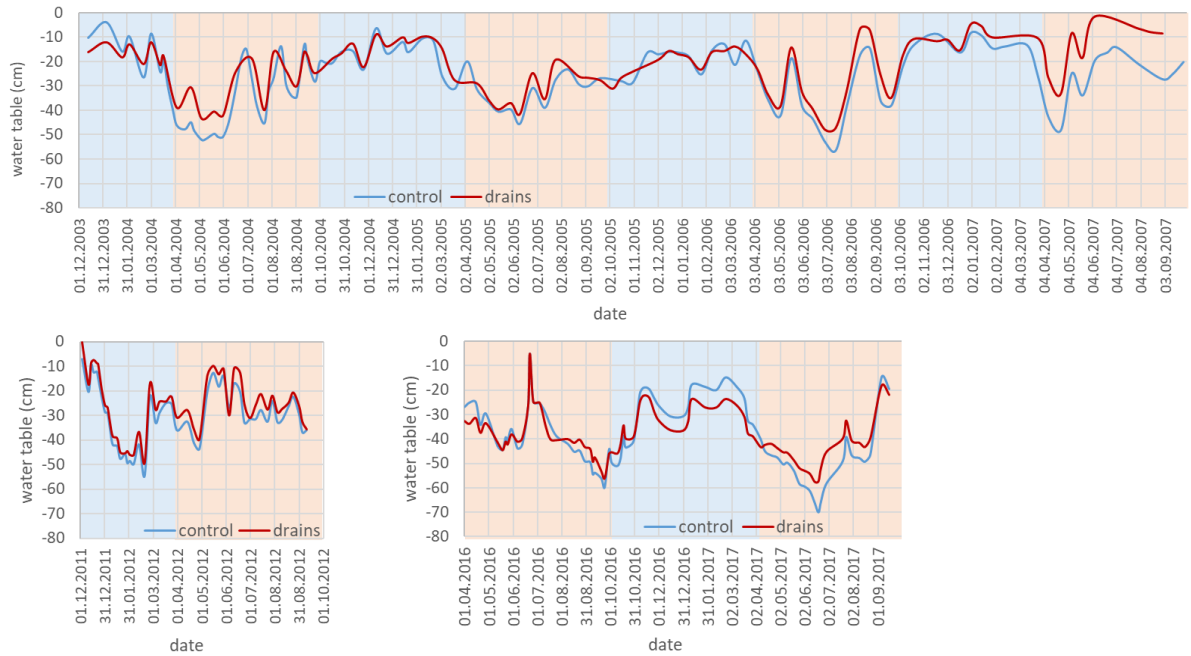

Figure 13: Water table over time measured in plots with (red) and without submerged drains (blue) in parcel PR13 in Zegveld. The submerged drains are 4 m apart. Blue backgrounds denote winter months, reddish summer. Data between 09 2007 and 12 2011, 09 2012 and 02 2014 have not been published. The parcel was restructured in 2016. Data from Hoving et al. 2008, 2013a, 2018 and Velstra et al. 2016.

[9] remember that such a high ditch water level was considered impractically high in the cynical Zeevang study.

subsequent three winters and two summers, followed by water tables above −10 cm during the fourth summer, which was more than 15 cm higher than in the control (Figure 13, Hoving et al. 2008[10]). In 2011/2012 the PR13 plot with drains showed slightly higher water tables than the control at all times (Figure 13, Hoving et al. 2013). Now, during the winter of 2016/17 the drains in parcel 13 for the first time seem to result in lower water tables, even below the water level in the ditch, which seems odd (Figure 13, Hoving et al. 2018). Also the higher summer water table in 2017 exemplifies the erratic performance of the drains over longer time periods. The drainage set-up of the parcel was changed for the final study, basically resetting things, but such erratic behaviour will need to be clarified. What are the uncertainties involved and how high is the risk that the drains do not perform?

With pressurized drains of course the question arises where to pump the large amounts of water to and from. Hoving et al. (2018) show amounts upwards of 5 (and up to 50!) cubic metres per ha and day during most days of the year. In 2017, over a period of 4 months about 2000 cubic metres of water were pumped into test plot PR16 (expressed per hectare, Hoving et al. 2018[11]). There are ideas to create water basins in the polders that can be used to store water that is pumped out of or back into the parcels. Yet, if the demand is so high everywhere at the same time during the same dry period, then these basins need to be very many and/or very large and pumping infrastructure needs to be powerful and intricate.

The articles and presentations on pressurized drains are understandably enthusiastic. A claim that is commonly made is that the rate of subsidence and CO_2 emissions can be reduced not by 50, but by 75% (v Woerkom 2016, Bos et al. 2017, Jansen et al. 2017, Hoving et al. 2018). This claim seems overly optimistic and is not grounded in any direct measurements, but – again – based on the contentious relationship between MLGWT and subsidence rates from Figure 8b. So, direct flux measurements are needed – like they are being carried out on parcels with and without pressurized drains in Frisia, the results of which are under embargo…

Conclusion

The idea of submerged drains is compelling. Drainage/infiltration tubes are placed below the ditch water level so that the ditch would not only function to drain the field but could also irrigate it from below. In this way summer water tables could be raised and subsidence and CO_2 emissions could be reduced. Yet, it is only an idea and hypothesis, and hypotheses need to be tested.
The meta-analysis presented here condenses looking at 60 or more reports and dozens of popular articles and presentations. It focusses on the effect of submerged drains on field water tables and possible outcomes in terms of CO_2 emissions and subsidence. It does not address grass yields, nutrient dynamics or economic analyses. All of these things need to be looked at and have been looked at in the reports. I went by a first-things-first approach, however, which is to test the hypothesis whether submerged drains could raise summer water tables by such an extent that CO_2 emissions and subsidence would decrease markedly.

Based on the available data, I think they cannot. At least not on the longer term if fixed ditch water tables are used. Data on submerged drains with dynamic water tables have not been published beyond the second year after the drains were installed, and my assessment may be proven wrong. Still, in my opinion, the many reports presenting the data have not been very critical of these data. The strange behaviour of the water table in the PR13 plot with submerged drains (and a fixed high ditch water level) is nowhere scrutinised, for example.

More unsettling is the presentation of the subsidence measurements at parcel PR03 Zegveld. The suggestion that the lower rate of subsidence at the plot with submerged drains is because the drains raise the water table in summer is not supported by the data. No decisive evidence exists that CO_2 emissions and the rate of subsidence would halve if submerged drains were present. Direct flux measurements using chambers or eddy covariance should be carried out. Eddy covariance measurements may have a too large footprint and it would

[10] note the same much higher summer water table in the fourth summer also in the sub-parcels with submerged drains at 8 and 12 m distance (p. 62 and 63 in Hoving et al. 2008). Such large distances between the drains were generally concluded to be ineffective. The summer of 2007 was very wet, by the way.
[11] Hoving et al. 2018 suggest that demand could be diminished if the ditch water level is held at the same as the desired water table in the field and not so low as in PR16 (−55 cm)

probably be best to measure fluxes using closed chambers. With closed chambers measurements could moreover be carried out directly above and in between the submerged drains. The preliminary results of pressurized drains may look more promising, but again, direct flux measurements are lacking to support the claim that emissions (and the rate of subsidence) could be reduced, this time by 75%.

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Addendum: A personal view on societal implications

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Reducing subsidence and CO_2 emissions by 50 or 75% does not really solve the problem: the land will still subside and emissions will still continue. We know that emissions will need to be zero by the year 2050 (Figueres et al. 2017). This zero-emissions goal implies that everyone needs to take her or his responsibility. Every person, every city, every municipality and every country. Every sector will have to meet this goal as well, including the land-use sector, including Dutch peat meadows.
Subsidence and emissions can become zero, or peat can even start to accumulate again, *only* if peatlands are wet. Paludicultures even offer a varied potential to continue productive use of the land (Wichtmann et al. 2016). Surely, rewetting the vast Dutch peatland areas and introducing alternative forms of utilization will meet with a lot of resistance and big economic barriers. If (pressurized) submerged drains can throttle down subsidence and emissions, they are welcome to do so while *everyone* prepares to go full-on into wet land use of Dutch peat soils. Submerged drains can only be an intermediate step towards completely wet peatlands.

During the Middle Ages, the Dutch peatlands had subsided so much, that cropland utilization was no longer possible. The Dutch showed inventiveness, but above all flexibility and switched to grassland utilization (Figure 1). Now, the land has subsided so much that not even grassland utilization remains a viable option for the future. Flexibility is called for again now in this age of climate change. The Dutch have enough inventiveness to find new solutions and approaches. There are new types of land use that are climate neutral or can even constitute a net sink, like the use of short-rotation biomass (e.g. *Typha*, *Phragmites*) as long-lasting building material – a form of 'carbon capture and storage', but without the negative connotations of geo-engineering.

In a World where everyone and every sector will need to arrive at net zero emissions the creation of such net sinks will likely be worth much more than milk and cheese. Politicians should remove every possible barrier in achieving land use sinks and encourage other forms of climate friendly land use. Farmers should be stimulated to implement such land use. Society should be taught to appreciate it. Milk and cheese from peat meadows are detrimental to the climate and no pressurised drain can change that fact. Dutch wit cannot save drainage-based land use on peat soils. Dutch wit and flexibility are needed to create a new landscape to fill our children's children and their children and generations after them with pride.

Peatland news

Global

High carbon stock ecosystems at the Oslo Tropical Forest Forum

The Global Peatlands Initiative participated in the Oslo Tropical Forest Forum on June 27th and 28th, with several partner members among the speakers for various panel discussions. Of special interest was Session 3B on June 28th at 9am on High carbon stock ecosystems: Incorporating mangroves and peatlands into REDD+ strategies. The session highlighted the importance of the climate and other ecosystem services provided by wetland forests. Participants shared ideas and discussed strategies on how to increase attention to these relatively small and underappreciated areas – in particular in national and jurisdictional REDD+ strategies.

Livestream of the event: https://norad.no/en/front/thematic-areas/climate-change-and-environment/oslo-redd-exchange/oslo-redd-exchange-2018/livestream-from-2018-oslo-tropical-forest-forum/

RSPO should sharpen its rules, say big investors

More than 90 institutional investors managing more than $6.7 trillion in assets have called on the Roundtable on Sustainable Palm Oil to strengthen its standards. The investors outlined their demands in a letter to the RSPO. The RSPO certifies palm oil produced by its members as "sustainable" if it meets certain criteria. At present, members are allowed to clear certain kinds of forest to make way for their plantations. The investors want the RSPO to ban clearance of all "high carbon stock" forest. Further, the investors want the RSPO to change its policy on peatlands, whose clearance and drainage is a major source of greenhouse emissions.

At present, the RSPO allows member companies to use peat soil where the peat is less than 3 meters deep. The investors are asking for a "revised definition of peat soil and guidance on phasing out development or replanting on peat soils."

- https://news.mongabay.com/2018/08/rspo-must-ban-deforestation-say-investors-representing-6-7t-in-assets/
- https://www.thestar.com.my/business/business-news/2018/08/23/palm-oil-watchdog-urged-to-take-giant-leap-to-save-forests

Africa

Democratic Republic of Congo

DRC set to reclassify national parks for oil, open rainforest to logging

Since February, DRC's environment minister Amy Ambatobe has handed over control of three logging concessions in Congo Basin rainforest to Chinese-owned logging companies. Two of these concessions are located in a massive peatland – the largest in the tropics – that was discovered last year. Fourteen more concessions are expected to be awarded to companies in the coming months, according to Unearthed, Greenpeace's investigative unit. The DRC government is also reportedly planning to declassify large portions of Salonga and Virunga national parks to allow oil exploration. Virunga is one of the last bastions of critically endangered mountain gorillas. These moves threaten a long-standing logging moratorium in the country, as well as forest protection agreements between the DRC and other countries. These logging concessions and licenses to explore for oil in protected areas are prepared ahead of presidential elections later this year and severely undermine the Central African Forest Initiative (CAFI), a multi-million dollar development and conservation project, established by the Norwegian government with international support in 2015. Norway's environment minister Ola Elvestuen told Greenpeace that he took the concerns "very seriously." "This forest is key to the future of humanity. Without protecting the Congo Basin forests, it is hard to see how we can meet the 1.5-2 degrees climate goals."

DRC's environment minister Amy Ambatobe addressing the GPI meeting in Brazzaville, March 2018. Photo: Hans Joosten.

The Congolese government has said that logging in the Cuvette peatlands would be impossible because of its wetland topography and has defended its right to authorize drilling anywhere in the country. Berta Pesti, lead official at CAFI, said she was very concerned. "No one thought working in DRC was going to be an easy ride. The moratorium is in place and until the conditions in DRC's own legal framework are met, no new contracts should be signed."

Unrest is growing in DRC ahead of the delayed presidential election in December that is due to choose a successor to Kabila, who has governed since 2001 and is not allowed to continue in the role. But Kabila has so far refused to commit to standing down, sparking protests. According to Ben Shepherd, Africa policy analyst at the Royal Institute of International Affairs in London, Kabila's government is likely to be using DRC's vast natural resources to build a "war chest" to fight the presidential election.

- https://news.mongabay.com/2018/07/drc-set-to-declassify-national-parks-for-oil-open-rainforest-to-logging/

Asia

Fires begin to flare in Southeast Asian peatlands

Noor Azura Ahmad: azura@gec.org.my

The world has recorded extremely high temperatures and a record number of fires in 2018. With catastrophic typhoons, storms and floods, it seems that the earth is out to demonstrate what havoc a full scale climate change would bring. In Southeast Asia, the hot and dry season has come on full force and brought on many incidents of wildfires in the region. Large peatland areas in Indonesia, Malaysia and even Brunei have burned despite various measures taken to prevent fires and haze.

Indonesia is particularly affected as the fires in Sumatra may affect the Asian Games which is being held in Jakarta and Palembang City. Some of the resulting haze has moved across the Straits of Malacca to neighbouring Malaysia and Singapore. In Malaysia, peatland fires have been recorded in the states of Sarawak, Selangor, Pahang, Kelantan and Terengganu. Most of them started from land clearing or burning of farm waste. In Selangor state, some cloud seeding was done to help douse the fires on farm lands in Johan Setia area, near Klang. Thanks to various fire prevention and preparation strategies, the fires are being speedily dealt with, although some loss of home and commercial crops could not be avoided. With the dry season estimated to last

until the end of September, it is hoped that the fires can be prevented and controlled to avoid another disaster like the 2015 haze. Related news:

- Schools close as haze worsens in Pontianak
- Nation experiencing haze
- Miri fire department using excavators to snuff out peat fires
- Ketika Api Ludeskan Kebun, Rumah dan Harta Benda Warga Rokan Hilir (in Indonesian)
- 200ha bushes in Sarawak destroyed in fire
- A burning problem in Pahang
- Palembang ruffled by fire, LRT malfunction ahead of Asian Games
- Forest fires threaten Asian Games as hotspots flare up in Sumatra

China

China launches peatland study on Qinghai-Tibet Plateau

On Wednesday July 25, Northwest China's Qinghai Province has launched a study into peatlands in the province the first study of its kind on the Qinghai-Tibet Plateau. The study aims to collect peatland materials, to protect and manage peatlands and to ensure such resources are exploited properly. The study aims to include every peatland larger than one hectare and to collect information on natural environment, categories, biomass, carbon stores and soil. Peatland drainage, exploitation and restoration since 1990 will also be included. "We have a lack of data on peat resources, the most valuable resource in wetlands, resulting in no targeted measures to protect peatlands," said Wang Enguang, deputy director of the provincial forestry department. The investigation is scheduled for completion in December 2019.

Qinghai has 8.14 million hectares of wetland, the most of any province-level region and accounting for 15.19 percent of the entire wetland in China. China has invested 10.2 billion yuan (1.5 billion U.S. dollars) in the protection of wetland since 2013, implementing more than 1,600 wetland conservation projects across the country. China plans to investigate peatlands in 11 provinces and regions. Since the program was launched in 2014, investigation has been undertaken in six provinces and regions, namely the northeastern provinces of Liaoning, Jilin and Heilongjiang, Inner Mongolia Autonomous Region in the north and southwestern provinces of Yunnan and Guizhou.

- http://www.xinhuanet.com/english/2018-07/25/c_137347967.htm

Indonesia

Tropical Peatlands Exchange

A Tropical Peatlands Exchange event was held on 8th August 2018 in Bogor, Indonesia; organised by the Center for International Forestry Research (CIFOR) with support from the Government of Indonesia and private sector partners. The Exchange opened with remarks from representatives of CIFOR, the Peatlands Restoration Agency (BRG) and the Research, Development and Innovation Agency of the Indonesian Ministry of Environment and Forestry (FOERDIA). The Exchange included two panels: national and subnational exchanges; and four parallel sessions: peatlands and climate change, peatlands hydrology and subsidence, peatlands and ecosystem services, and community engagement for peatlands conservation and restoration. The sessions involved 29 resource persons and were attended by over 120 participants. Recordings and materials can be obtained from the links below.

- Researchers, government, civil society and the private sector come together for peatlands management in Indonesia
- Tropical Peatlands Exchange 2018
- Alue Dohong - Opening remarks Tropical Peatlands Exchange 2018
- Livestream and recording of the opening, panels and selected parallel sessions

Forest fires threaten Asian Games as hotspots flare up in Sumatra

The threat of haze from another season of forest fires on Indonesia's Sumatra Island hangs over Asia's biggest sporting event, scheduled to kick off later this month. Authorities in South Sumatra province detected 198 fire hotspots across the province in July, most of them in districts with a long history forest fires. These include the

districts of Ogan Komering Ilir and Ogan Ilir, both close to the provincial capital, Palembang, which is co-hosting this year's Asian Games. Tens of thousands of athletes, officials and visitors from 45 countries are expected to attend the Games, which Jakarta is also co-hosting.

The devastating fire season of 2015 was followed by two years of longer rainy seasons, which helped keep the number of hotspots down and fires from spreading extensively. This year, however, is expected to witness a normal dry season, with no rain at hand. Experts have predicted forest fires to return in full force, particularly in areas including South Sumatra, which has a long history of fire episodes.

Dasrul Chaniago, the director of air pollution control at the Ministry of Environment and Forestry, said the government would be pushed hard this year to keep air quality healthy enough for locals, athletes and visitors to breathe. "This year, one of the toughest challenges is to keep peatland and forests from burning," he said at a recent discussion on air pollution in Jakarta. "We will experience the hottest weather in August and September." Palembang has so far remained free of haze, but the threat is ever-present, as the dry season intensifies through September. The prospect of a repeat of the 2015 disaster has spurred the government to enlist the military in firefighting efforts; hundreds of soldiers have been deployed to monitor 55 villages in Ogan Komering Ilir and Ogan Ilir districts alone.

The National Police chief, Tito Karnavian, has also called for greater vigilance against forest burning. Fires and the haze they generate will not just harm locals and the environment, he said, but also reflect badly on Indonesia, "especially now that South Sumatra is hosting the Asian Games."

- https://news.mongabay.com/2018/08/forest-fires-threaten-asian-games-as-hotspots-flare-up-in-sumatra/
- https://www.straitstimes.com/asia/se-asia/hot-spots-detected-as-dry-season-peaks-in-indonesia

Paludiculture Platform

In preparation of the launch of the International Tropical Peatland Center, the Forest Research and Development Center together with Wetlands International Indonesia convened in early August a Focus Group Discussion 'Initiation for a Paludiculture Platform', in which 42 participants from 20 institutions participated. The discussion was directed by the Director General for Research, Development, and Innovation of the Ministry of Environment and Forestry. He stressed five items: 1) peatlands as a national asset, controlling fire, restoration, and community wellbeing; 2) landscape and peatland; 3) Indonesia as a centre of peatland knowledge: 4) the International Tropical Peatland Center and networking; and 5) paludiculture and peatland.

He said, that in Indonesia there are 8 provinces vulnerable to fire, including Riau, South Sumatera, Jambi, West Kalimantan, East Kalimantan, Central Kalimantan, South Kalimantan, and Papua, which divide into 66 districts/cities and 731 villages. Indonesia has 865 Peatland Hydrological Units, including 465 PHUs in Papua, 207 PHUs in Sumatra, 190 PHUs in Kalimantan, and three in Sulawesi. He explained that in the period 2015-2017, Indonesia has succeeded to reduce forest fires and emissions significantly. He noticed a paradigm shift from fire suppression (for which the biggest budget was allocated) to prevention, community involvement, early warning and detection, and early response.

The Indonesian success attracts international attention. The Republic Congo and The Democratic Republic Congo are interested to come to Indonesia and learn about tropical peatland management, both the benefits and the challenges. He reminded, that with respect to due sustainable peatland management, paludiculture is as proven technology to avoid draining of land, based on wetland adapted peatland species. The Director General stressed the necessity of collective action of all stakeholders.

- https://www.tprc-global.org/paludiculture-platform-interconnecting-activists-to-meet-sustainable-tropical-peatlands-in-indonesia/

Smallholder agriculture in central Kalimantan. Photo: Hans Joosten.

Indonesia forest assessment casts an optimistic light on a complex issue

Indonesia has released its inaugural "The State of Indonesia's Forests 2018" report published with support from the U.N. Food and Agriculture Organization (FAO) and Norway's International Climate and Forest Initiative. It was first presented by Indonesia's environment minister in Jakarta on July 11 and at an FAO forestry committee meeting in Rome on July 16. Indonesia's total forest area spans 1.2 million km^2 — an area the size of South Africa — and accounts for 63 percent of the country's total land area. But not all of that area is "forest" in the generally understood sense of the word; only about 70 percent of it has tree cover. This stems from the Indonesian government's definition of what constitutes a forest. Of the total forest area, more than half, or about 688,000 km^2, is designated as production forest, which includes vast swaths of pulpwood plantations. Global demand for timber, paper and especially palm oil has put relentless pressure on Indonesia's tropical forests, making it into the world's top deforester, eclipsing Brazil in 2014.

To determine the amount of forest cover left in the country, the government analyzed deforestation data going back to 1990 and published since 2006. The report showed fluctuations in Indonesia's deforestation rate over the years, with highs from 1996 to 2000, when an average 35,100 km^2— greater than the size of Belgium —per year. This period was also marked by massive forest fires. Severe fires were also recorded in 2007, 2012 and 2015. The record-breaking fires of 2015 alone contributed to 10,900 km^2 of deforestation. Since then, the Ministry of Environment and Forestry has recorded a declining deforestation rate, with a 42 % reduction in

2016 followed by a 24 % drop in 2017. The total amount of new deforestation last year, at 4,790 km^2, was the third-lowest on record. The 2015 fires spurred President Joko "Jokowi" Widodo to roll out a series of policies overhauling the country's forestry management, including a moratorium on clearing new peatland and an ambitious plan to restore 20,000 km^2 of degraded peatland across the country.

"The ministry of forestry in Indonesia historically has been a deforestation ministry, [but] *Ibu* Siti [Nurbaya] has turned it into a forest conservation ministry," Erik Solheim, executive director the U.N. Environment Programme (UNEP), said at the Oslo Tropical Forest Forum in Norway at the end of July. **"**Deforestation in peatland has been reduced [by] 88 percent. Why? Because [the] moratorium from the government is [being] implemented with strength and vigor."

The government's figures for the drop in deforestation track with new tree-cover loss data published on Global Forest Watch, a monitoring site run by the U.S.-based think tank World Resources Institute (WRI). The WRI data show that Indonesia managed to reduce its tree-cover loss last year even as tree-cover loss rate in other tropical countries increased. Globally, tropical tree-cover loss in 2017 was the second-highest since 2001, and only slightly lower than the high in 2016. WRI researchers said the decline in the rate in Indonesia was likely due in part to the peat moratorium, given that primary forest loss in protected peat areas went down by 88 percent between 2016 and 2017 to the lowest level ever recorded. But they also noted that 2017 was a non-El Niño year, which resulted in wetter conditions and fewer fires than in past years. Measuring the deforestation rate under drier conditions would give a better indication of just how sustainable the decline is, they said.

"One year doesn't make a trend," Frances Seymour, a senior fellow at the WRI, said during recent a global press call. "I'll be cautious in interpreting the data. We need to look at the various factors, including weather like El Niño," she said, adding that the weather phenomenon contributed to the relatively higher deforestation rates of 2015 and 2016.

The probability of an El Nino this year, and the dry weather it brings, remains low, but already there's been an uptick in one of the signal causes of deforestation: fires. The area of burned peatland in the first half of this year, at 180 km^2 as of early July, already exceeds the 2017 total of 136 km^2, Minister Siti said. "It means that we still have to be cautious," the minister said. "If we manage to reach mid-October [without major fire episodes], then we can breathe easy."

Between 2015 and 2017, the government recorded significant declines in both the incidences of fires, known as hotspots, and the area of land burned. There were 2,581 hotspots recorded in 2017, down from 21,929 in 2015. The total area of burned land, including peatland, was 1,654 km^2 in 2017, from 26,114 km^2 two years earlier. These efforts, Siti said, have led to the "relative absence of transboundary haze in 2017."

Key to Indonesia's touted success in reducing deforestation is the peat conservation and restoration effort, underscored by the recognition that the degradation of peatlands has historically made Indonesia among the biggest greenhouse-gas emitters in the world. According to the government's report, the average annual levels of emissions from the forestry sector and peatlands stood at 709.4 million tons of carbon dioxide for the period from 2000 to 2016. Much of those emissions, some 304.3 million tons of CO_2 a year, came from peatland degradation. The average over that period was skewed by the 2015 fires, when emissions from peatlands spiked to 712.6 million tons of CO_2, before declining to 90.2 million tons in 2016 and 12.5 million tons in 2017.

In the wake of that disaster, President Jokowi launched his policies aimed at preventing future fires on peatland, which included establishing a Peatland Restoration Agency, or BRG. The agency has identified 239,600 km^2 of degraded peatland across the country, and plans to restore 20,000 km^2 by 2020. But it has only achieved 5 % of that target to date, and some researchers have said its efforts are severely underfunded.

Some of the targeted areas fall within existing timber and oil palm concessions. The affected companies are obliged to retire those parts of their concessions for conservation purposes. To date, more than 100 oil palm and pulpwood companies have pledged to restore a combined 14,000 km^2 of degraded peatland that fall within their leases. Eighty of the companies are oil palm planters and 45 are pulp and paper firms. Of these, 49 palm oil companies and 31 pulpwood companies have had their plans approved by the Ministry of Environment and Forestry. Environment and Forestry Minister Siti said Indonesia had long been criticized by other countries for not doing enough to protect its forests. "I think nothing could solve this unless we have good data. So for the very first time, we're explaining what's happening in our forestry sector," she said at the presentation of the report. Now that the Indonesian government has finally published a definitive reckoning of the state of its forests, environmentalists and activists are urging a follow-up to ensure the progress made so far can be sustained, even if Jokowi is no longer in office after next year's elections.

- https://news.mongabay.com/2018/07/indonesia-forest-assessment-casts-an-optimistic-light-on-a-complex-issue/

Report says Indonesia 'land swap' plan puts forests at risk

Researchers say an Indonesian government plan to give plantation companies new lands in exchange for restoring areas they destroyed could result in more tropical forests being cut down.

Spatial analysis released on Tuesday July 24 by civil society groups shows 40 % of the 921,000 hectares designated for land swaps is natural forest. The Ministry of Forestry and Environment plan is part of Indonesia's attempts to avoid a repeat of disastrous 2015 fires that swept through vast acreages of swampland that were cleared and drained by pulp and paper companies for industrial plantations. In exchange for "re-wetting" the peatlands, making them unsuitable for conventional plantations, conglomerates such as Sinarmas and April would be given lands elsewhere. The land swap plan has raised concerns among conservation groups because of the potential for new conflicts with communities and fears companies might be given new land even before they've completed restoration of the degraded swampland forests. The plan is also unpopular with plantation operators because new areas they're allocated could be distant from their factories and mills.

The Anti-Forestry Mafia Coalition, which overlaid government maps of the land swap areas with Indonesia's forest cover map to arrive at the 40 % figure, said any new land handed out should only come from areas previously approved for industrial forestry plantations. It also criticized lack of a legally binding requirement to ensure companies restore degraded lands at their own expense before getting new allocations. "Without this provision, the companies can simply walk away from the disaster they've created," the coalition of 14 groups said in a statement. "Restoration may never take place and abandoned areas may be vulnerable to catastrophic fires for years to come."

- https://www.tampabay.com/report-says-indonesia-land-swap-plan-puts-forests-at-risk-ap_world97033b8695d24467949aed3bdcfe1a5e

Maludan. Photo: Hans Joosten.

Malaysia

Maludam National Park — pride of Sarawak's conservation efforts

June 28, 2018, Thursday

Sarawak's Maludam National Park, a globally significant peat swamp is a key part of the US$9.4 million project to protect the park and its surrounding. The project called 'Sustainable Management of Peatland Ecosystems in Malaysia' was approved in January 2018 by the Global Environment Facility (GEF) in Washington DC. This project is the culmination of three years of field trips, discussions with stakeholders, and approvals from

government officials to include Maludam National Park as a globally important site. The project showcases the Sarawak government's priority in protecting peat swamps in line with peat lands conservation worldwide.

"The Sarawak government's vision in protecting the Maludam Peninsula is laudable, given both the unique and endangered wildlife, and critically important environmental protection functions", said Dr Elizabeth Bennett, vice president of Wildlife Conservation Society. Her view was echoed by United Nations Development Programme (UNDP) in Malaysia. Maludam National Park was officially gazetted as a Totally Protected Area in 2000. The park covered an initial area of 43,147 hectares. Due to its importance as a 'single dome or independent peat basin' peat swamp, and recognizing the environmental importance and sensitivity of such an extremely large and deep peat dome, the Sarawak government increased protection for the site by gazetting an extension of 10,421 hectares on 15th January 2015. The park's current size is 53,568 hectares, making it the largest patch of protected peat swamp in southern Borneo.

The environmental sensitivity of peat swamps and the Maludam peninsula has been recognised since the mid-1990s. In 1999, Sarawak's State Planning Unit approved the "Integrated Development Plan Study for Coastal Peat Land in Sarawak" whereby the Maludam Peninsula was considered off limits to development as the independent peat basin was deemed 'non-developable' (SPU Technical Report, Volume 3, pages 151 -171). This was substantiated by researchers in a subsequent study which reiterated 'the Sg Maludam peat land can be regarded as a single ecohydrological unit in which the hydrology of one part has an influence on adjacent areas' (Maludam Technical Report, page 35). Drainage of even one part of the dome is a threat as 'the original ecosystem of the peat swamp will change radically and permanently because drainage bleeds the peat swamp, the very medium that is its basis of existence' (Maludam Technical Report, page 37).

Numerous rare and endangered flora and fauna are found in Maludam National Park. The rarest is the red banded angur, one of Asia's most endangered primates, with Maludam containing the only viable population in the world. Another notable primate is the proboscis monkey (a Sarawakian and Malaysian tourism icon).

The peat swamps and adjoining mangroves are also important nurseries to an endangered fish, the 'terubok'.

About 13,000 villagers live in the Maludam peninsula. These villagers depend on water from the park as the forest is a natural water catchment. The peat swamp also serves as a crucial, natural flood mitigation tool and regulates the seasonal floods that affect the area.

- http://www.theborneopost.com/2018/06/28/maludam-national-park-pride-of-sarawaks-conservation-efforts/

Australasia

New Zealand

Forest & Bird concerned for future of rare peatland

Forest & Bird have raised concerns over a rare peatland's inclusion in a council document. The Mangaroa Peatland, otherwise known as the Waipango Swamp, was shown in the development contributions in the Upper Hutt City Council's 2018-2028 Long-Term Plan. The Upper Hutt branch of Forest & Bird said the inclusion of the peatland was worrying because it could indicate an intent to develop the area, which had possible ecological significance. "Our concern is that it's the only remaining significant area of peat bog left in the lower half of the North Island," said chairman Graham Bellamy.

With 2 per cent of original wetlands remaining in the Wellington region and 10 per cent remaining nationally, it was critical that examples be preserved. Forest & Bird had no access to the peatland because it was in private ownership. Parts of the peatland had been farmed for many years and it was unclear whether it still held any ecological value. "We don't know if there is anything left to save. What we want to do is have a full evaluation done of the wetland to see if there is any ecological value in it and to find out if it's possible to restore it. [If it is found to be ecologically valuable] we feel it would deserve to be preserved and restored back to its original condition."

- https://www.stuff.co.nz/environment/105797208/forest--bird-concerned-for-future-of-rare-peatland

Europe

European Union

Infomation material on paludiculture in Estonian, Latvian and Lithuanian

Infomaterial on paludiculture is now available in the Baltic languages. A flyer on paludiculture can be downloaded in Estonian and Lithuanian whereas in Latvian separate material is available on paludiculture on bogs and paludiculture on fens. The infomaterial of the Succow Foundation and the Greifswald Mire Centre was translated by the Baltic partners within the EUKI project Paludikultur in den baltischen Staaten.

Germany

Conference: Understanding the ecology of restored fen peatlands for protection and sustainable use

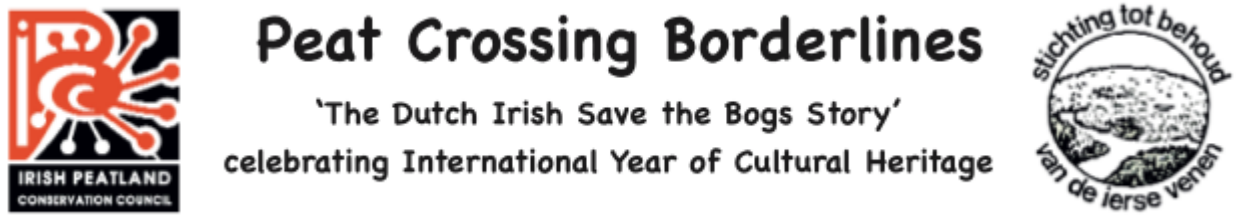
Peatlands cover 3% of the world's land surface but contain twice as much carbon as all the biomass of the world's forests. Many peatlands have been drained for agriculture, forestry, or peat extraction, leading to disproportionally high greenhouse gas emissions and subsidence. Rewetting can solve many of the drainage-related problems but is rarely implemented, because the loss of agricultural land is seen as inevitable. New management approaches in which peatland rewetting is combined with agriculture or forestry, so called 'paludiculture', can be an alternative. The biogeochemistry and ecology of these novel ecosystems are, however, still hardly known. A better understanding of ecosystem functioning und the underlying processes is the basis for a sustainable use of wet landscapes.

The **international WETSCAPES Conference** to be held September 10-13, 2019 in Rostock, Germany, will bring together researchers and practitioners working on fen peatlands and coastal wetlands - pristine, drained and rewetted. Experience of scientists and practitioners from agriculture, forestry, nature conservation, landscape planning, water engineering and other fields related to peatland management will be exchanged.

For more information: www.wetscapes.de/conference.

Ireland

Peat Crossing Borderlines – Sharing the Dutch-Irish Save the Bogs Story



The Irish Peatland Conservation Council (IPCC) hosted on Saturday July 28 the 'Peat Crossing Borderlines' event at the Bog of Allen Nature Centre in Co. Kildare. The event celebrated this year's International Bog Day as part of the European Year of Cultural Heritage and highlighted the connection between Ireland and the Netherlands in the journey to save the bogs of Ireland.

Dutch people started to buy Irish Bogs in 1987. The inspiration came from Matthijs Schouten – a student from the Netherlands who was studying Irish Bogs as part of his Doctoral thesis. The Netherlands were the first country in Europe to cut away all of their bogs. Like Ireland peat was extracted for fuel. Matthijs was shocked when he started visiting Irish bogs to find that the machines were already removing the wildlife and cutting peat industrially. He was afraid that Ireland was heading in the same direction the Dutch had years before – the road to peatland extinction. To capture the imagination of the Irish people and to justify the Dutch people telling Irish people to conserve bogs he launched a campaign to purchase three bogs in three years in Ireland. These bogs were handed over to the Irish government so that they would be protected for the Irish People and were designated as National Nature Reserves. To learn more visit www.ipcc.ie .

- http://www.ipcc.ie/peat-crossing-borderlines-sharing-the-dutch-irish-save-the-bogs-story/

70% of BNM profit set be 'non-peat' based by 2021

A total of 70% of Bord na Mona's (BNM's) profits are projected to be "non-peat based" in just three years' time, according to the semi-state energy company's latest financial results. The company's annual report for the year ended March 28, 2018 – launched on July 23 – shows that the company recorded a turnover of €395.3 million, an operating profit (pre-exceptional items) of €33.2 million, and an operating loss (after exceptional items) of €6.1 million. Net debt fell by €94.4 million – from €170.5 million last year, to €76.1 million this year.

Major progress has been recorded on the company's decarbonisation agenda, with the carbon intensity of electricity generated consistently falling over the last decade. The company's move away from peat was also evidenced in the report as BNM reduced its operational peat extraction area to just 1% of Irish peatlands.

Commenting on the results, BNM chairman Geoff Meagher said the results point to the "fundamental change" underway in BNM as it prepares for the looming 2019 end of the Public Service Obligation (PSO) – relating to peat for power generation. The company is also on track to exit from peat extraction for energy production by 2030. The transition is extremely important as it will involve BNM further developing Ireland's renewable energy infrastructure – whilst remaining a profitable company.

- https://www.agriland.ie/farming-news/cpos-a-tourism-strategy-without-local-goodwill-cannot-succeed/

Latvia

Latvia suffers from unbearable drought and forest fires

Society » ENVIRONMENT | July 23, 2018, Monday // 14:16| Views: | Comments: 0

Fires raging for five days have destroyed more than 800ha of western Latvia, authorities said Sunday, July 22, with continuing extreme temperatures hampering firefighters' efforts. Satellite images showed the fires have wiped out 170ha of forest, 257ha of scrubland and nearly 400ha of peatland.

Latvia has experienced severe drought over the last few months, prompting authorities to declare a natural catastrophe in the agricultural sector.

- https://www.novinite.com/articles/191232/Latvia+Suffers+from+Unbearable+Drought+and+Forest+Fires
- https://punchng.com/forest-fires-destroy-2000-acres-of-land/
- http://www.intellinews.com/latvia-asks-for-international-help-to-contain-forest-fires-145673/
- http://www.xinhuanet.com/english/2018-07/24/c_137343721.htm

Norway

New report makes recommendations for improving forest protection

Over the past decade, Norway has spent $3 billion to support efforts to keep forests standing in all of the world's major rainforest (and peatland!) countries, helping to elevate forest protection as a globally important cause (and climate solution) in the process. But it's time to take stock of what's worked and what hasn't, in terms of both tropical forest protection in general and Norway's particular role in facilitating forest conservation, and chart a new course forward — that's the premise of a new report from Rainforest Foundation Norway titled "Saving the rainforest 2.0."

The report, released at the Oslo Tropical Forest Forum end of July, identifies key barriers to stopping the destruction of the world's forests and offers several recommendations for how the world can more successfully combat deforestation.

- https://mongabay.us14.list-manage.com/track/click?u=80161fe385606408293ae0e51&id=c6c31b636a&e=268d1757f8

United Kingdom

International Bog Day

International Bog Day is celebrated around the world on the fourth Sunday in July - this fell on 22nd July in 2018. This event has been designed to celebrate the beauty of bogs and to help make people more aware of peatlands, the services they provide for free and the threats they face. The IUCN UK Peatland Programme has relaunched Bog Day in the UK this year to raise its profile and the profile of peatlands as hole. We have created a new website with peatland facts and activities to help people learn about our amazing bogs. We commissioned film-maker Andy Clarke to produce a short film highlighting the beauty and value of bogs. Here is a link to the finished film.

Vertical launch spaceport planned for Scotland with first flights in early 2020s

The UK's first "spaceport" for the "vertical" launch of spacecraft will be built on the A'Mhoine peninsula in Sutherland on the north coast of Scotland. The Highlands and Islands Enterprise (HIE) of Scotland, an agency of the Scottish government aiming to create and grow business opportunities, will pay £9.8m towards the initial development of the facility, which could be operational in the early 2020s. A further £5m for the project is expected to come from industry and an additional £2.5m will be stumped-up by the UK Space Agency from an existing £50m fund. Money from that same fund will also be available to airports vying to become the country's first "horizontal" launch facility. Despite having a thriving satellite manufacturing industry, the UK currently has no launch facilities for spacecraft. UK Space Agency considers northern Scotland the best place in the UK for a Launchpad to reach popular satellite orbits using vertically launched rockets. "The decision to support the UK's first spaceport in Sutherland is tremendous news for our region and for Scotland as a whole," says HIE chief executive Charlotte Wright. "The international space sector is growing and we want to ensure the region is ready to reap the economic benefits that will be generated from this fantastic opportunity."

- https://physicsworld.com/a/vertical-launch-spaceport-planned-for-scotland-with-first-flights-in-early-2020s/

A'Mhoine peninsula in Sutherland. Photo: Hans Joosten.

Peatland conservation relevant papers June-July 2018

Collected by Hans Joosten: joosten@uni-greifswald.de

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6. Climatic, geomorphologic and hydrologic perturbations as drivers for mid- to late Holocene development of ice-wedge polygons in the western Canadian Arctic: https://onlinelibrary.wiley.com/doi/abs/10.1002/ppp.1977
7. Late-Holocene climate and vegetation dynamics in eastern Lesotho highlands: http://journals.sagepub.com/doi/abs/10.1177/0959683618777054
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9. Partitioning of the net CO_2 exchange using an automated chamber system reveals plant phenology as key control of production and respiration fluxes in a boreal peatland: https://onlinelibrary.wiley.com/doi/abs/10.1111/gcb.14292
10. Multi-proxy evidence for an arid shift in the climate and vegetation of the Banni grasslands of western India during the mid- to late-Holocene: http://journals.sagepub.com/doi/abs/10.1177/0959683618761540
11. Plantas comunes de los bofedales de Carampoma / Common plants of Carampoma bofedales - Lima, Peru: https://fieldguides.fieldmuseum.org/guides/guide/1041
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