Bassa Nera peatland in the Spanish Pyrenees Mountains. Photo: Hans Joosten.

IMCG Bulletin 2019-05:
August – October 2019

INTERNATIONAL MIRE CONSERVATION GROUP

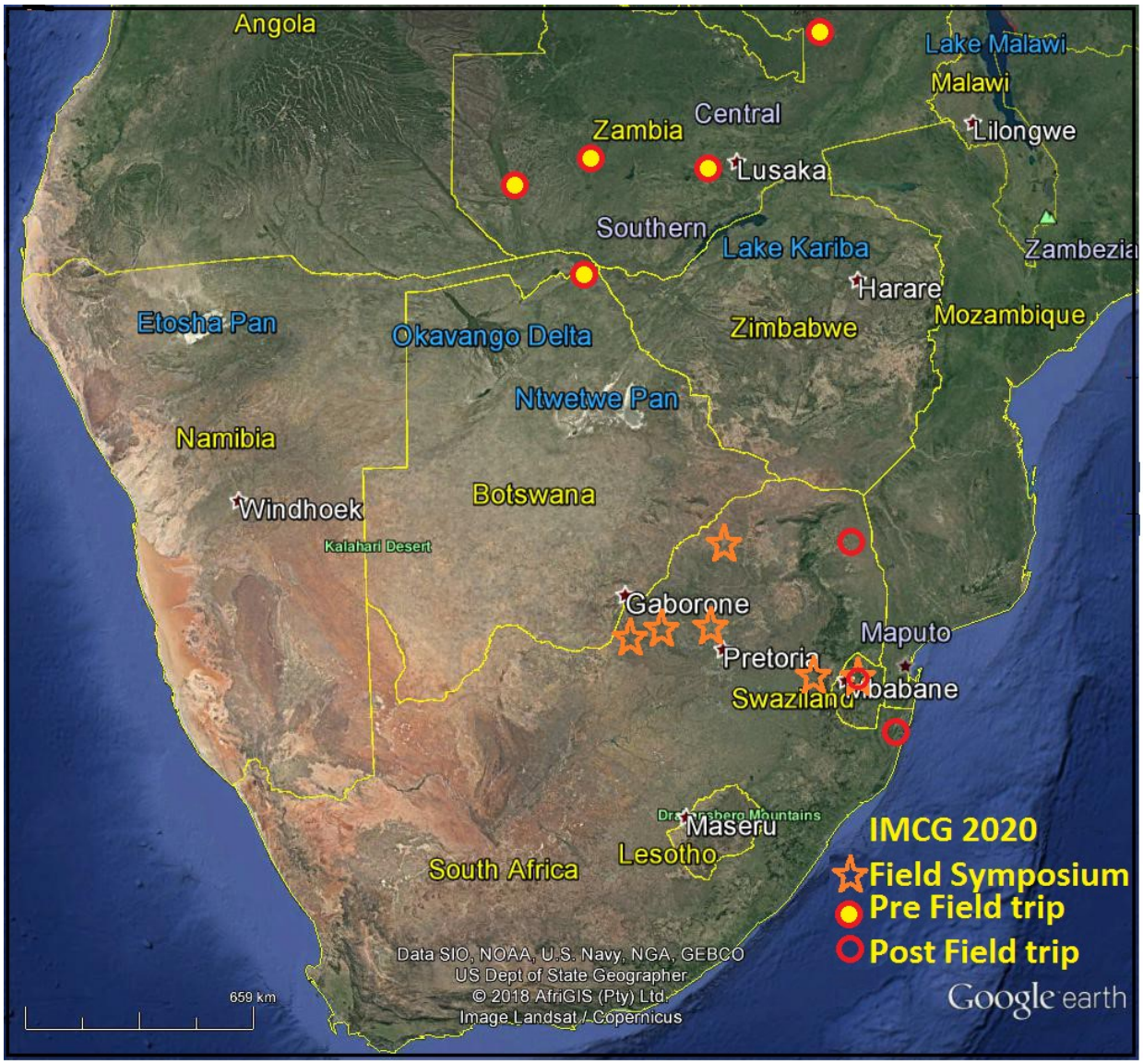
www.imcg.net

Contents of this Bulletin

IMCG issues

Word from the Secretary-General

You are all too active… Here is the new IMCG Bulletin covering August – October 2019. News is getting faster in than we can elaborate it, so be patient with us, when things are somewhat delayed. Not only the number of high-level publications on peatlands is increasing, also the activities all over the world. This time some special attention to Africa, because also there much peatland activity – in both negative and positive sense – is going on. Our 2020 General Assembly will be held in the Kingdom of Eswaniti (Swaziland), whereas the IMCG Field Symposium wil next to that country also visit South Africa, whereas the associated pre- and post-symposium field trips will cover additionally Zambia (with a peatland reconnaissance trip) and Botswana. Attention also to the Nile Basin Initiative and its efforts to map the peatlands of the Nile catchment. As it is currently difficult to get information from what is possibly the largest peat stock of thee Nile catchment, this Bulletin also contains a contribution on what in classical antiquity was known and/or reported about the Sudd in South-Sudan.
This Bulletin arrives from you from the Climate Convention in Madrid. 33 hours by train from Greifswald, but next to the benefits for the climate, it also provided time to work on this Bulletin ;-).
Keep sending news, photographs, papers and other contributions to be included in the next Bulletin, which I promise to be shorter…, **by December 31, 2019** to Hans Joosten at joosten@uni-greifswald.de.



IMCG Field Symposium & General Assembly 2020 in the Kingdom of Eswatini

The IMCG Field Symposium and General Asembly 2020 will take place in South Africa and the Kingdom of Eswatini (Swaziland), with pre- and post symposium tours in Zambia, Botswana, South Africa, and the Kingdom of Eswatini. The Field Symposium and General Assembly will have the following schedule and indicative costs:

IMCG FIELD SYMOSIUM AND GENERAL ASSEMBLY 2020 Cost: €950 (from O.R. Tambo Airport in South Africa)

Day		Date	Activity, Venue	Distance (km)
1	Sunday	22-11-2020	12H00 Depart from O.R. Tambo Airport by bus to Marico Biosphere	330
2	Monday	23-11-2020	Molopo and Molomane Mires	50
3	Tuesday	24-11-2020	Bokraal Tuffa Mire	150
4	Wednesday	25-11-2020	Watervalvlei Mire, Kgaswane Nature Reserve; Depart to Marakele National Park, Thabazimbi	302
5	Thursday	26-11-2020	Matlbas Mire	30
6	Friday	27-11-2020	Mire restoration workshop; Tlope wetland restoration site	30
7	Saturday	28-11-2020	Travel to Chrissiesmeer	476
8	Sunday	29-11-2020	Tevreden Pan Mire	40
9	Monday	30-11-2020	Mpumalanga Wetland and Minining workshop; travel to Malalotja Nature Reserve, Kingdom of Eswatini (Swaziland)	125
10	Tuesday	01-12-2020	Malalotja Mire	5
11	Wednesday	02-12-2020	Sebibe Mire and Hawane Ramsar site	60
12	Thursday	03-12-2020	University of Eswatini, Manzini: Symposium	120
13	Friday	04-12-2020	University of Eswatini, Manzini: IMCG General Assembly and departure to O.R. Tambo (start of optional field visits)	434
				2152

Matlabas spring mire, South Africa. Photo: Piet-Louis Grundling.

Malalotja mire, Kingdom of Eswatini (Swaziland). Photo: Piet-Louis Grundling.

OPTIONAL POST SYMPOSIUM FIELD VISITS Cost: €400 - 600 To be confirmed based on interest

BULEMBU GEOTRAIL (oldest rocks in the world) AND GRANITE CAVES OF GOBHOLO. Kingdom of Eswatini

13	Friday	04-12-2020	Depart at 13H00 for Malalotja Nature Reserve - do canopy trial	240
14	Saturday	05-12-2020	Bulembu geotrial (take passports	180
15	Sunday	06-12-2020	Gobholo caves	70
16	Monday	07-12-2020	Travel to Hlane National Park, via Ngwenya Iron Mine	151
17	Tuesday	08-12-2020	Hlane National Park: Hlane lead wood riparian forest	70
18	Wednesday	09-12-2020	Depart to O.R. Tambo, South Africa	450
				1161

HOT SPRING MIRES: Kruger National Park South Africa (Limited to 12)

13	Friday	04-12-2020	Depart at 13H00 for Pretoriuskop Camp via Malelane Gate, SA	240
14	Saturday	05-12-2020	Granitic mires of Pretoriuskop	80
15	Sunday	06-12-2020	Satara Camp	141
16	Monday	07-12-2020	Shireni Bush Camp	210
17	Tuesday	08-12-2020	Malahlapanga Hot Spring Mire	70
18	Wednesday	09-12-2020	Mfayeni Hot Spring Mire	20
19	Thursday	10-12-2020	Baleni-Soutini: Ivory trail Camp (Spring mire, traditional salt works)	140
20	Friday	11-12-2020	Return to O.R. Tambo	505
				1406

SWAMP FOREST AND COASTAL MIRES: Kosi Bay, Maputaland South Africa (Limited to 16)

13	Friday	04-12-2020	Depart at 13H00 for Tembe Elephant Park, South Africa	270
14	Saturday	05-12-2020	Muzi Chalk Peat Mire	40
15	Sunday	06-12-2020	Depart for Kosi Bay; visit Vazi Mire Fire en route	95
16	Monday	07-12-2020	Kosi Bay Estuary and peat gardens	50
17	Tuesday	08-12-2020	Kosi Bay and Raffia Swamp Forest	60
18	Wednesday	09-12-2020	Lake Sibayi and related mires and Sodwana Bay	20
19	Thursday	10-12-2020	Travel to O.R Tambo via Chrissiesmeer	450
20	Friday	11-12-2020	Return to O.R. Tambo	250
				1235

PRE-FIELD SYMPOSIUM FIELD VISIT Cost: €1350 - 1550 dependent on interest and flight options into Zambia

ZAMBIA : DISCOVER NEW MIRES (Limited to 12)

1	Monday	09-11-2020	Depart at 13H00 for Lusaka, Zambia via Botswana: 1st overnight stop, Mokopane, South Africa	442
2	Tuesday	10-11-2020	Kasane, Botswana	947

3	Wednesday	11-11-2020	Mongu, Zambia	461
4	Thursday	12-11-2020	Mongu: Visit Luena Flats	200
5	Friday	13-11-2020	Blue lagoon National Park via Kafue National park	530
6	Saturday	14-11-2020	Blue lagoon National Park: Visit Kafue Wetlands	516
7	Sunday	15-11-2020	Ngungwa	670
8	Monday	16-11-2020	Bangweulu Wetlands, Zambia	50
9	Tuesday	17-11-2020	Bangweulu Wetlands, Zambia	50
10	Wednesday	18-11-2020	Lusaka: Depart by air or	623
11	Thursday	19-11-2020	Return to O.R. Tambo via Kasane (via road): Kasane	561
12	Friday	20-11-2020	Nata, Makgadigadi Pans, Botswana	300
13	Saturday	21-11-2020	O.R Tambo, South Africa	870
				6220

Makgadigadi Pans, Botswana. Photo: Hans Joosten.

If you are interested to join one or more of the trips, please contact Piet-Louis Grundling for a preliminary registration or for more information: PGrundling@environment.gov.za. More information will also follow in the coming IMCG Bulletins.

Mires and Peat

In August – October 2019 the following papers were published:

- Combined palaeolimnological and ecological approach provides added value for understanding the character and drivers of recent environmental change in Flow Country lakes [H.J. Robson, V.J. Jones, G.M. Hilton, S. Brooks, C.D. Sayer & A. Douse] Volume 23: Article 09 http://mires-and-peat.net/pages/volumes/map23/map2309.php
- Growing season CO_2 fluxes from a drained peatland dominated by *Molinia caerulea* [N. Gatis, E. Grand-Clement, D.J. Luscombe, I.P. Hartley, K. Anderson & R.E. BrazierVolume 24: Article 31 http://mires-and-peat.net/pages/volumes/map24/map2431.php
- A new preparation method for testate amoebae in minerogenic sediments [X. Zheng, J.B. Harper, G. Hope & S.D. Mooney] Volume 24: Article 30 http://mires-and-peat.net/pages/volumes/map24/map2430.php

- Strong long-term interactive effects of warming and enhanced nitrogen and sulphur deposition on the abundance of active methanogens in a boreal oligotrophic mire [M. Martí, M.B. Nilsson, Å. Danielsson, P-E. Lindgren & B.H. Svensson] Volume 24: Article 29 http://mires-and-peat.net/pages/volumes/map24/map2429.php
- *Sphagnum* moss as a functional reinforcement agent in castor oil-based biopolyurethane composites [A. Ämmälä & P. Piltonen] Volume 24: Article 28) http://mires-and-peat.net/pages/volumes/map24/map2428.php
- The dependence of net soil CO_2 emissions on water table depth in boreal peatlands drained for forestry [P. Ojanen & K. Minkkinen] Volume 24: Article 27 http://mires-and-peat.net/pages/volumes/map24/map2427.php
- Dynamics of organic matter and mineral components in *Sphagnum*- and *Carex*-dominated organic soils [L.W. Szajdak, T. Meysner, L.I. Inisheva, E. Lapshina, M. Szczepański & W. Gaca] Volume 24: Article 26 http://mires-and-peat.net/pages/volumes/map24/map2426.php
- The effects of alkalinity and cations on the vitality of *Sphagnum palustre* L.. [A.H.W. Koks, G. van Dijk, A.J.P. Smolders, L.P.M. Lamers & C. Fritz] Volume 24: Article 25 http://mires-and-peat.net/pages/volumes/map24/map2425.php
- Genetic diversity and implications for conservation strategies of *Drosera rotundifolia* L. (Droseraceae) in northern Germany (Schleswig-Holstein) [S. Eschenbrenner, C.M. Müller, B. Gemeinholzer & V. Wissemann] Volume 24: Article 24 http://mires-and-peat.net/pages/volumes/map24/map2424.php
- Mire margin to expanse gradient in part relates to nutrients gradient: evidence from successional mire basins, north Finland [S. Rehell, J. Laitinen, J. Oksanen & O.-P. Siira] Volume 24: Article 23 http://mires-and-peat.net/pages/volumes/map24/map2423.php
- An overview of the patterned fens of Great Sandy Region, far eastern Australia [R. Fairfax & R. Lindsay] Volume 24: Article 22 http://mires-and-peat.net/pages/volumes/map24/map2422.php

Find the journal online at http://mires-and-peat.net/ Electronic submission is required using our dedicated electronic submission system. If you experience any problems please contact the Editor-in-Chief Olivia Bragg (o.m.bragg@dundee.ac.uk) who can offer alternative routes for electronic submission.

John Ater Maker (r), Director of Wetlands, National Ministry of Environment – Juba, Republic of South Sudan, with assistants on peat reconnaissance in the Sudd swamps

Papers

Peatland prose from the past: the Sudd in the south

Pim de Klerk (Greifswald Mire Centre/State Museum of Natural History Karlsruhe; pimdeklerk@email.de, www.pimdeklerk-palynology.eu)

Introduction

The Nile River is the longest river in the world, and according to Seneca the Younger the most famous ('Natural questions' IV:2). One branch originates in the Rwandan mountains and flows through Lake Victoria northward (the White Nile), whereas another branch comes from Lake Tana in the Ethiopian Mountains (Blue Nile). Both branches meet at the present-day city of Khartoum (Republic of the Sudan).
The White Nile passes the Sudd region (South Sudan), a large inland delta and one of the most important wetlands of Africa and the world (Mohammed 2005; Rebelo & Moghraby 2018). The Sudd contains opulent vegetation that grows mainly in floating mats and floating islands. These developed in a landscape with channels, lagoons and inundated areas that are constantly interacting and changing in time and space (Petersen et al. 2007; Rebelo & Moghraby 2018). This makes the area hardly accessible (Petersen et al. 2007) and the name Sudd actually derives from the Arabic word for obstruction (Rebelo & Moghraby 2018).
The Nile River triggered fascination and curiosity already in Antiquity, and automatically the question arises how far upstream the knowledge of ancient cultures reached, and if they were aware of the Sudd.

The Nile floods

There were mainly two reasons for the interest in the Nile. The first was the annual inundation in summer when the river deposited a layer of fertile silt that was crucial for ancient Egyptian agriculture. The Greek historian Herodotus (c. 484-425 BCE) described this silt as: "*…reclaimed land by the Egyptians as gift from the river*" ("*… ἐστὶ Αἰγυπτίοισι ἐπίκτητός τε γῆ καὶ δῶρον τοῦ ποταμοῦ*") ('Histories' II:5).
Especially the fact that the Nile transported the highest amount of water in summer instead of spring - when European rivers had an increased discharge because of snowmelt - triggered curiosity. Many authors provided various explanations that were summarised by e.g. Herodotus ('Histories' II:20-27), Pomponius Mela ('Description of the world' I:53), Seneca the Younger ('Natural questions' IV:1-30), Lucan ('On the civil war' X:194-267), Pliny the Elder ('Natural history' V:10) and John Lydus ('The months' IV:107). The Egyptian view was rather simple: it was all the work of the gods. This was still propagated in the text of the 'Famine stela' that was written in Ptolemaic times (305-30 BCE) but tells a story placed around the 27th century BCE. Egyptian science – that was mixed greatly with religion and magic - had reached a rather high level in ancient Egypt: architecture, hydrological engineering, anatomy and medicine, metallurgy and mineralogy, astronomy, and various other disciplines flourished greatly (Ead 2014; Warburton 2016). Egyptians, however, were seemingly not interested in the functioning of the natural landscape, even in the last centuries BCE when Greek natural science had already developed. Herodotus wrote in his 'Histories' (II:19/28) with an apparent undertone of wondering that he could not find anybody in Egypt who could explain the causes of the annual summer inundation, apart from one official of whom Herodotus suspected that he made fun of him. The 3rd century BCE work 'The flooding of the Nile' - that is not unambiguously attributed to the Greek philosopher Aristotle (384–322 BCE) - provided the correct answer: heavy summer rainfall in Ethiopia caused the (Blue) Nile to transport excessive amounts of water. Aristotle's grandnephew Callisthenes (c. 360-327 BCE) had accompanied Alexander the Great during his expeditions in Egypt and Asia and may have participated in an expedition along the Nile into Ethiopia. His work has not been preserved apart of some quotes by other authors: the 6th century CE Byzantine author John Lydus stated that Callisthenes had visited Ethiopia and had written - similar to Aristotle - about excessive rain that made the Nile swell ('The months' IV:107). Lucan (39-65 CE), however, wrote that this alleged Nile/Ethiopia expedition had been terminated because of the great heat ('On the civil war' X:268-285) and, thus, had not reached Ethiopia. The discussions of Pomponius Mela (died c. 45 CE) in the 'Description of the world', Seneca the Younger (c. 4 BCE-65 CE) in the 'Natural questions', Lucan in 'On the civil war', and Plutarch (c. 46-120 CE) in 'On the Opinions of the Philosophers' show that the thoughts of Aristotle and Callisthenes had already sunk considerably into oblivion in the first century CE. Their theories were, however, mentioned among various other theories by Pliny the Elder

(23-79 CE) ('Natural history' V:10) and John Lydus ('The months' IV:107) and, thus, were not completely forgotten.

The sources of the Nile

Also the unknown sources of the River Nile triggered curiosity and speculation in Antiquity. Various ancient authors wrote that the Nile sprung in western Africa. They named Mauritania or the Atlas Mountains as its origin (Pliny the Elder, 'Natural history' V:10; Vitruvius, 'On architecture' VIII:2:6/7; Strabo, 'Geography' XVII:3:4 quoting other unspecified authors with whom he obviously disagreed personally; Cassius Dio, 'Roman history' 76:13; Ammianus Marcellinus, 'History of Rome' XXII): they thought that major west African rivers such as the Congo or the Niger - that they probably knew of from predominantly oral reports - were upstream reaches of the Nile. They claimed that in the west African stream(s) and in the Nile the same plants and animals occurred and that, thus, these rivers had to be connected. There were theories that the Nile run underground for a long trajectory from west to east that connected the different branches (Pliny the Elder, 'Natural history' V:10). Other authors placed the sources in the south, at a subterranean sea, or just left the question unanswered. Diodorus Siculus ('Historical library' I:32) - like Aristotle (see above and below) - placed the sources of the Nile in the Ethiopian Mountains, i.e. the actual source area of the Blue Nile.

The search for the sources of the Nile and the Sudd

Herodotus wrote in the 4th century BCE about the sources of the Nile: "*I heard from some men of Cyrene, who told me that they had gone to the oracle of Ammon* [the region of present-day Amman in Jordan] *and had spoken with Etearchus, the king of the Ammonites. Deriving from other subjects the conversation turned to the Nile and that no-one knew its sources. Etearchus told them that once he had been visited by some Nasamones. These are a Libyan people that inhabit the land of the Syrtis and the region slightly east of the Syrtis* [i.e. the present-day Libyan coast]. *When these Nasamones were asked if they brought any news concerning the uninhabited Libyan desert, they told Etearchus that when some sons of their leaders - proud and violent youths - came to adulthood, they planned various wild adventures and had chosen five of them by lot to visit the deserts of Libya and to see if they could progress further than those who previously had transgressed the farthest*. […] *When the young men left their companions, well supplied with water and food, they journeyed first through the inhabited country and came to the region of wild beasts. They travelled over the desert, towards the west, and crossed a wide sandy region, until after many days they saw trees growing in a plain. When they came to these and picked their fruits, they were met by small men of less than common stature, who captured them and led them away. The Nasamones did not know the language of these men, who in turn did not know the language of the Nasamones. The men led them though vast marshes, after which they came to a city where all the people were of a stature like that of the guides, and had a black skin. A great river ran past this city, from the west towards the rising sun, in which they saw crocodiles*." ("*ἀλλὰ τάδε μὲν ἤκουσα ἀνδρῶν Κυρηναίων φαμένων ἐλθεῖν τε ἐπὶ τὸ Ἄμμωνος χρηστήριον καὶ ἀπικέσθαι ἐς λόγους Ἐτεάρχῳ τῷ Ἀμμωνίων βασιλέι, καί κως ἐκ λόγων ἄλλων ἀπικέσθαι ἐς λέσχην περὶ τοῦ Νείλου, ὡς οὐδεὶς αὐτοῦ οἶδε τὰς πηγάς, καὶ τὸν Ἐτέαρχον φάναι ἐλθεῖν κοτε παρ᾽ αὐτὸν Νασαμῶνας ἄνδρας. τὸ δὲ ἔθνος τοῦτο ἐστὶ μὲν Λιβυκόν, νέμεται δὲ τὴν Σύρτιν τε καὶ τὴν πρὸς ἡῶ χώρην τῆς Σύρτιος οὐκ ἐπὶ πολλόν. ἀπικομένους δὲ τοὺς Νασαμῶνας καὶ εἰρωτωμένους εἴ τι ἔχουσι πλέον λέγειν περὶ τῶν ἐρήμων τῆς Λιβύης, φάναι παρὰ σφίσι γενέσθαι ἀνδρῶν δυναστέων παῖδας ὑβριστάς, τοὺς ἄλλα τε μηχανᾶσθαι ἀνδρωθέντας περισσὰ καὶ δὴ καὶ ἀποκληρῶσαι πέντε ἑωυτῶν ὀψομένους τὰ ἔρημα τῆς Λιβύης, καὶ εἴ τι πλέον ἴδοιεν τῶν τὰ μακρότατα ἰδομένων*. […] *εἶπαι ὧν τοὺς νεηνίας ἀποπεμπομένους ὑπὸ τῶν ἡλίκων, ὕδασί τε καὶ σιτίοισι εὖ ἐξηρτυμένους, ἰέναι τὰ πρῶτα μὲν διὰ τῆς οἰκεομένης, ταύτην δὲ διεξελθόντας ἐς τὴν θηριώδεα ἀπικέσθαι, ἐκ δὲ ταύτης τὴν ἔρημον διεξιέναι, τὴν ὁδὸν ποιευμένους πρὸς ζέφυρον ἄνεμον, διεξελθόντας δὲ χῶρον πολλὸν ψαμμώδεα καὶ ἐν πολλῇσι ἡμέρῃσι ἰδεῖν δή κοτε δένδρεα ἐν πεδίῳ πεφυκότα, καὶ σφεας προσελθόντας ἅπτεσθαι τοῦ ἐπεόντος ἐπὶ τῶν δενδρέων καρποῦ, ἁπτομένοισι δέ σφι ἐπελθεῖν ἄνδρας μικρούς, μετρίων ἐλάσσονας ἀνδρῶν, λαβόντας δὲ ἄγειν σφέας· φωνῆς δὲ οὔτε τι τῆς ἐκείνων τοὺς Νασαμῶνας γινώσκειν οὔτε τοὺς ἄγοντας τῶν Νασαμώνων ἄγειν τε δὴ αὐτοὺς δι᾽ ἑλέων μεγίστων, καὶ διεξελθόντας ταῦτα ἀπικέσθαι ἐς πόλιν ἐν τῇ πάντας εἶναι τοῖσι ἄγουσι τὸ μέγαθος ἴσους, χρῶμα δὲ μέλανας. παρὰ δὲ τὴν πόλιν ῥέειν ποταμὸν μέγαν, ῥέειν δὲ ἀπὸ ἑσπέρης αὐτὸν πρὸς ἥλιον ἀνατέλλοντα, φαίνεσθαι δὲ ἐν αὐτῷ κροκοδείλους*"). ('Histories' II:32).

This kind of hear-say story rises suspicion about its accuracy. The only reach where the Nile actually flows from the west to the east, however, is immediately north of the Sudd. Thus, the tale could very well refer to this wetland.

Diodorus Siculus mentioned in the first century BCE immense marshes and gigantic lakes upstream along the Nile ('Library of history' I:32) which will have been the Sudd, although the lakes may have been the Lakes Victoria and Albert, or the shallow Lake Kyoga that has numerous marshy settings that may have been included in oral reports from the southern regions.

Aristotle – around a century after Herodotus – wrote about marshes through which the Nile streamed after it left the mountains. Although his report dealt actually with the Blue Nile that comes from the Ethiopian mountains and does not cross the Sudd, he may have heard about vast marshes along the river that he wrote about without knowing that there were actually two different branches. In another work – within the context of migratory birds - Aristotle referred to: "*…marshes above* [i.e. upstream of] *Egypt from where the Nile flows. Here it is said that they* [i.e. the birds] *attack pygmies. That is not entirely a fairy tale, since in reality small people live here, so they say, and their horses are small too, and they live their lives dwelling in holes.*" ("*… εἰς τὰ ἕλη τὰ ἄνω τῆς Αἰγύπτου, ὅθεν ὁ Νεῖλος ῥεῖ. οὗ καὶ λέγονται τοῖς Πυγμαίοις ἐπιχειρεῖν. οὐ γάρ ἐστι τοῦτο μῦθος, ἀλλ' ἔστι κατὰ τὴν ἀλήθειαν γένος μικρὸν μέν, ὥσπερ λέγεται, καὶ αὐτοὶ καὶ οἱ ἵπποι, τρωγλοδύται δ' εἰσὶ τὸν βίον.*") ('History of animals' VIII:12).

The Greek word "Πυγμαῖος" (pygmaios) relates to "πυγμή" (pygme) which, among others, is a length measure "from the elbow to the knuckles" (Liddell & Scott 1961). "Τρωγλοδύται" (troglodytai) literary means "cave-dwellers", but in many modern translations of ancient texts the designation "troglodytes" is retained. The word was in ancient times used for actual cave-dwellers north of the Caucasus and other regions, but caves did (and do) not occur in the northeastern African regions. According to Hornblower & Spawforth (2003) the name of the people in the northeast African realm was actually "Τρωγοδύται" (trogodytae), i.e. without λ and was in that form without any reference to caves. This form was also used in various ancient Greek/Roman sources and on Egyptian papyri, and was later read as or falsely "corrected" to "Τρωγλοδύται". Possibly the designation "trogodytes" was to northeastern African people along the Red Sea coast in general without denoting a specific ethnic group, but the etymology of the word is unknown. Liddell & Scott (1961) translated "Τρωγλοδύται" with "cave-dwellers" in general, i.e. geographically unspecific, and noted that "Τρωγοδύται" were a people in northeastern Africa (for which they remarked that also the designation "Τρωγλοδύται" was used). Ziegler et al. (1975) included the entry "Trog(l)odytai" and, thus, implied that both words were synonyms. The mix-up already occurred in Antiquity by authors quoting others, and by the copyists of the ancient texts. For example, word forms with "Τρωγλο-" are included in the consulted original text editions of Herodotus ('Histories' IV:183), Aristotle ('History of animals' VIII:12), Strabo (who thought that the people west of the Red Sea were Arabs) ('Geography' I:1,3; I:2,34; II:5,33/36), and Josephus ('Antiquities of the Jews' I:15, II:11). Strabo added that the name "Erembi" of a group of Arabian people originally derived from "ἔραν ἐμβαίνειν" (eran embainein; meaning "going into the ground") and was - according to Strabo - later replaced by the more sophisticated "Τρωγλοδύται" ('Geography I:2,34). In the consulted original text editions of Pliny the Elder derived Latin forms with "trogo-" are used, but the Loeb edition provides an English translation with cave-dwellers anyway, whereas the Delphi and the Marix editions used anglicised/germanised terms with "troglo-" in the translations ('Natural history' VI:34; XII:35; XIII:52; XXXVII:32). Law (1967) addressed the designation "trogo-" in the work of Pliny and interpreted these as "troglodytes" and "cave-dwellers" too. Diodorus Siculus ('Historical library' III:31/32) also wrote about "trogodytes" which was retained in the consulted English translation in which a footnote was added that this spelling is remarkable. Trogodytes, thus, probably were a specific or unspecific population group that did not dwell in caves, although many people thought they did. Diodorus Siculus wrote that the Trogodytes were a nomadic people who during the hot season sheltered in marshes, possibly the Sudd ('Historical library' III:32).

A more specific report on the Nile marshes comes from Seneca the Younger. He told that before the Nile River had reached Philae in southern Egypt, it had already passed large deserts and had spread widely in marshes ('Natural questions IV:2,3). In Book VI Seneca quotes some members of an expedition sent-out by Emperor Nero to seek the sources of the Nile: "*I have heard of the long journey of those two centurions who were sent to investigate the sources of the Nile by Emperor Nero, who among other virtues primarily loved the truth* [i.e. the actual specifics of the world]*. They were helped by the king of Ethiopia, who had written recommendations for*

the neighbouring kings, and thus they penetrated into the farthest regions. "There", they told, "we came to immense marshes of which the local population could not point-out a way through, nor could anybody hope to find someone who could. The waters are entangled with plants and cannot be penetrated by foot or by boat, because the muddy and completely overgrown marsh does not carry anything apart for a small one-person vessel. There", they told, "we saw two rocks from which with huge force the river arises"." ("*Ego quidem centuriones duos, quos Nero Caesar, ut aliarum uirtutum ita ueritatis in primis amantissimus, ad inuestigandum caput Nili miserat, audiui narrantes longum illos iter peregisse, cum a rege Aethiopiae instructi auxilio commendatique proximis regibus penetrassent ad ulteriorem. Inde, ut quidam aiebant, peruenimus ad immensas paludes, quarum exitum nec incolae nouerant nec sperare quisquam potest: ita implicatae aquis herbae sunt et aquae nec pediti eluctabiles nec nauigio, quod nisi paruum et unius capax limosa et obsita palus non fert. Ibi, inquit, uidimus duas petras, ex quibus ingens uis fluminis excidebat*"). ('Natural questions' VI:8,2-4).

The depiction of these huge marshes greatly resembles the present-day situation of the Sudd, and it seems unambiguous that the expedition had actually reached this area. The account seems reliable: Seneca had heard it directly from members of the expedition and not along a sequence of hearsays. Yet, the concluding sentence is odd, since a setting with rocks and a cascade does not occur in the Sudd region. According to a note in the consulted German translation these rocks were those located between Elephantine and Aswan, i.e. in the southern Egyptian realm. Thus, it is likely that Seneca did not quote the centurions completely accurately after all. Noteworthy is that Seneca's nephew and ward Lucan did not mention marshes at all in his description of the course of the River Nile ('On the civil war' X:285-331).

Pliny the Elder gave another account of the expedition ordered by Nero: "*Certainly the praetorian soldiers and their tribune who were recently sent-out by Emperor Nero on an exploration mission, because - among other wars - he also thought about one against Ethiopia, reported only of deserts.*" ("*certe solitudines nuper renuntiavere principi Neroni missi ab eo milites praetoriani cum tribuno ad explorandum, inter reliqua bella et Aethiopicum cogitanti*"). ('Natural history' VI:35).

With this quote Pliny contradicted Seneca directly, not only on the purpose of the expedition but also on its results. The first inconsistency can be easily explained. Seneca lived and wrote during the emperorship of Nero and needed to be friendly and flattering (although in the end he was condemned to death anyway). Pliny wrote his 'Natural history' during the later reign of Emperor Vespasian and could write more freely about Nero. The second inconsistency has a less apparent origin: it must derive from an erroneous transmission of information. Indeed, although Pliny claimed that the expedition had only found deserts, he referred several sentences later to marshes anyway. Unfortunately, he did not specify his sources, but Aristotle (as quoted above) may have been one of these, as Pliny in fact wrote: "*There are some who report a pygmy people living among the marshes from which the River Nile rises*." ("*quidam et pygmaeorum gentem prodiderunt inter paludes ex quibus Nilus oriretur*") ('Natural history' VI:35).

Conclusions

The Sudd was certainly known - or at least known of – by scientists from ancient Greek and Roman cultures, yet their knowledge on the area was restricted. First of all, it was known that vast marshes related to the River Nile existed far south of Egypt. However, there are no reports that anybody from the ancient Mediterranean cultures had actually seen these, except the members of the expedition sent by Nero. The other information available to authors from Antiquity must have come from African sources that will have reached the Mediterranean realm along (a sequence of) oral reports, e.g. the Nasamones mentioned by Herodotus.

Furthermore, a short-statured people was reported to live in the regions of the Sudd - but contrary to persistent views probably not in caves - which is currently not the case (Gowdy & Lang undated). The possibility thus exists that the actual oral sources were not fully reliable.

Finally, the description of Seneca suggests that the landscape of the Sudd has not changed considerably over the last two millennia.

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Peat extraction in Gishoma, Rwanda. Photo: Hans Joosten.

Peatland news

Global

Peatlands, a growing net source of greenhouse gasses since 1960

Ever since the last ice age, natural peatlands have been important carbon sinks, and intact peatlands still are today. However, drainage of peatlands for agriculture and forestry has transformed large areas from former sinks into net sources of greenhouse gasses. Especially in temperate and boreal regions, but increasingly also in the tropics. On a global scale, peatlands turned from a net sink into a net source of greenhouse gasses in 1960. Rehabilitation of these peatlands may greatly reduce additional emissions in the future.

The distinction between boreal and temperate peatlands, and peatlands in tropical regions is important. Where the first group of peatlands experienced widespread land conversions by the nineteenth century, drainage onset in the tropics commenced only from 1960. Between 1850 and 2015, temperate and boreal regions lost 26.7 million ha, and tropical regions 24.7 million ha, of natural peatland. By 2100, the loss of natural peatlands in

tropical regions may have increased to 36.3 million ha, corresponding to 62% of the initial peatland area in the tropics in 1850. The additional loss of peatlands in temperate and boreal regions will be small; total loss by 2100 is projected to be 7% of the initial peatland area in these regions in 1850.

Drained peatlands not only emit CO_2 but NH_4 and N_2O as well. These are all greenhouse gasses. The emission volumes of the latter two are also expressed in terms of CO_2 by translating their volumes into volumes of CO_2 that have the same global warming impact. These volumes are expressed in volumes CO_2e, where 'e' means carbon dioxide 'equivalent'.

A reconstruction of the past and projections for the future were combined to estimate changes in the global balance of peatland greenhouse gasses for the period 1850 - 2100. For boreal and temperate peatlands annual uptake rate of greenhouse gasses by intact peatlands is projected to decrease from 0.31 (in 1850) to 0.29 Pg COe (in 2100), along with an increase in the drained area. For tropical peatlands a decrease from 0.10 to 0.04 Pg COe is projected. (1Pg = 10^{12}kg.)

In the context of the global budget of greenhouse gasses this change in uptake (sink) is relatively small. The change in emissions (source) is much more pronounced, however. Estimates for the period 1850 - 2100 show a steady increase of emissions from peat decomposition. For 2015, a release of greenhouse gasses from drained peatlands of 1.53 ± 0.80 Pg CO_2e is estimated, with 1.26 ± 0.77 of that total emitted in the tropics.

Emissions from temperate and boreal systems dominated the overall picture until around 1980. Since then, annual emissions from the tropics exceed those from temperate and boreal regions. By 2100, tropical regions are projected to completely dominate greenhouse emission from peatlands. Without counteracting measures having been taken, the annual emissions rate will then reach 2.23 ± 0.69 Pg COe in the tropics, compared with 'only' 0.07± 0.16 Pg COe in boreal and temperate regions. In the latter regions, most of the carbon will have disappeared by oxidation by then. In drained tropical peatlands this exhaustion will start after 2100 because of the later drainage onset.

Between 1850 and 2100, drained peatlands will have released 249 ± 38 Pg Ce by biological peat oxidation. From 2015 onwards, the release will total 169 ± 44 Pg CO_2e, dominated by tropical emissions.

These results illustrate the strong dominance of sources over sinks. What would it take for global peatland sources to equal peatland sinks, and thus for peatlands to become neutral in terms of emissions of greenhouse gasses by 2050 and thereafter? Almost all drained peatlands need to be rehabilitated. Full rehabilitation of all degraded peatlands in boreal and temperate regions, and of 98% of degraded peatlands in the tropics is needed for this.

The IPCC has estimated in 2014 that a net emission of about 2,550 - 3,150 Pg COe since 1870 would allow global mean air temperatures to remain below +2 °C. Without counteracting measures, the emissions from drained peatlands will consume 7.9 to 9.8 % of this amount. Most of this 'allowed' budget has already been used, however, due to the already high anthropogenic emissions accumulated since 1870. The available budget left for 2020 - 2100 is only about 400 - 1,600 Pg CO.

Without rehabilitation of peatlands, the emissions from peatlands may comprise 12-41% of the total budget of greenhouse gasses that would keep global warming below +2 °C. Widespread rehabilitation of formerly drained peatlands would substantially reduce these values to 3-12% of the budget. If we include extant peatlands in the overall calculation, the contribution of peatlands to this total 'allowed' budget would reduce to 'only' 1-5%.

Source: Leifeld et al., 2019. Nature Climate Change 9(12): 945-947. https://www.nature.com/articles/s41558-019-0615-5

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Northern peatlands may contain twice as much carbon as previously thought

Northern peatlands may hold twice as much carbon as previously suspected, according to a study published in *Nature Geoscience*. The findings suggest that these boggy areas play a more important role in climate change and the carbon cycle than they're typically given credit for. Global climate models rarely account for the carbon that peat and other soils absorb, store and release.

"The carbon that's underground is the least well understood pool of carbon," said lead author Jonathan Nichols, an associate research professor at Columbia University's Lamont-Doherty Earth Observatory. "It's a huge question mark in a lot of global climate models." Refining those measurements could make climate models—and thus climate predictions—more accurate. That is what Nichols and his coauthor Dorothy Peteet, a paleoclimatologist at the NASA Goddard Institute for Space Studies and adjunct at Lamont-Doherty, set out to do. Their new study incorporates 4,139 radiocarbon measurements from 645 peatland sites in northern Europe, Asia, and North America. But the main innovation is in how the researchers calculated the carbon storage in

peatlands. "Before, it was just assumed that all peatlands have accumulated carbon at the same rate at the same time throughout the last few thousand years, which is a terrible assumption," said Nichols. "The carbon accumulation rate can be wildly different from one place to another during the same point in time. Our own previous work has shown this, as well as the work of many others."

The problem was that there just wasn't a good statistical way to account for those differences. So Nichols and Peteet came up with a new algorithm to estimate the total amount of carbon stored in northern peatlands. "It allows us not to have to make this assumption that we all know is wrong," said Nichols.

Previously, scientists simply averaged the carbon accumulation rate measured in as many peat samples as they could find, and multiplied that average by the total area of peatland in the Northern Hemisphere. This strategy was biased, Nichols and Peteet point out, because there are many fewer samples from less-studied areas such as Asia or Eastern and Southern Europe; the data from these undersampled areas was effectively washed out by the sheer volume of measurements from North America and Europe.

Northern peatlands (here in Alaska) may contain more carbon than previously thought. Photo: Hans Joosten.

By assuming peatlands in different parts of the world accumulate peat at different rates, and by weighing those rates by the size of the region, the new algorithm allowed the researchers to calculate that northern peatlands hold 1.1 trillion tons of carbon. That's a colossal amount of carbon and quite a jump from the previous estimate of roughly 545 billion tons. Nichols and Peteet found that after the last glacial period, when the peatlands were absorbing this huge amount of carbon, the level of carbon in the atmosphere remained stable. How could that be, if the peatland plants were pulling carbon out of the air during photosynthesis and then never releasing it? The researchers suspect the ocean released more carbon during that time, which compensated for the carbon removed by the growing peatlands. "An important next step is to add peat to simulations of global climate," said Nichols. "The more we understand the climate system, the better our models of that system are going to be."

The study's findings also have implications for predicting future carbon emissions from peatlands. "The parts of the world with peat are also the parts that are warming faster than the rest of the world. What happens when you warm them up? Do they grow faster and sequester more carbon, or do they decay faster and release more?" Nichols asks.

In general, he's finding that peatlands are decaying faster and releasing more carbon as the planet's thermostat climbs; climate change is disrupting natural rainfall patterns in peatlands, which can push out mosses in favor of plants such as sedges. Sedges grow and decay faster, and their roots bring oxygen deep into the layers of peat, allowing organic material to break down and release carbon that may have been stored there for millennia. In

addition, humans often mine peatlands and burn the peat for fuel or use it in agriculture or horticulture. All these processes convert peatlands from absorbers of carbon to emitters, said Nichols. "And because of the work we've done for this paper, we now know that there's a lot more carbon that can be released to the atmosphere than we thought," he said.

- https://phys.org/news/2019-10-northern-peatlands-carbon-previously-thought.html
- https://www.ldeo.columbia.edu/news-events/northern-peatlands-contain-twice-much-carbon-previously-thought
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More information: Rapid expansion of northern peatlands and doubled estimate of carbon storage, *Nature Geoscience* (2019). https://nature.com/articles/s41561-019-0454-z

Transforming land use can make world carbon neutral by 2040

Transforming use of forests, farms and food systems can help countries to make the land sector carbon neutral by 2040, and also restrain global temperatures from rising beyond 1.5 degrees Celsius, according to a study. Currently, the land sector contributes about 25 % of global emissions (11 gigatonne GtCO2e per year). Taking precedence to act on land use can help cut down a third of the emissions needed to keeping temperatures below 1.5°C, according to the study published in the journal *Nature*. This is additional to the 30 per cent of carbon emissions that land already sequesters naturally. A team of researchers from the Austria-based Institute for Applied Systems Analysis (IIASA), assessed 24 land management practices that offer the most mitigation potential along with other social and environmental benefits and developed a new roadmap on tranforming the land sector. They identified six priority actions areas:

- Reducing deforestation, peatland drainage and burning, and mangrove conversion by 70 % by 2030
- Restoring forests, drained peatlands, and coastal mangroves
- Improving forest management and agroforestry
- Enhancing soil carbon sequestration in agriculture across all agricultural countries
- Reducing consumer food waste in developed and emerging countries
- Shifting one in five people to primarily plant-based diets by 2030

"The roadmap foresees a phased approach where first actions to avoid emissions are prioritised. This means concentrating on avoiding deforestation in hotspot geographies such as Brazil and Indonesia. More high-tech options on carbon removal from the atmosphere need to be tested and piloted today," said Michael Obersteiner, programme researcher at the IIASA Ecosystems Services and Management (ESM) and one of the study authors.

Implementing the roadmap can make the land sector carbon neutral by 2040 and a net carbon sink of about three $GtCO_2$ per year by 2050. "Together, these actions will mitigate 15 $GtCO_2e$ per year — about 50 % from reducing emissions and 50 % from additional carbon uptake by land," the researchers said.

Besides, "there is also a need to develop additional negative emissions technologies — like direct air capture and low-impact bioenergy with carbon capture and storage (BECCS) — to sustainably remove more carbon from the atmosphere in the future," according to lead author Stephanie Roe, environmental scientist at the University of Virginia. Limiting the planet under 2°C will require us to halve emissions every decade, and also remove a huge amount of CO_2 that is already in the atmosphere, Roe said.

- https://www.downtoearth.org.in/news/climate-change/transforming-land-use-can-make-world-carbon-neutral-by-2040-study-67406
- https://news.mongabay.com/2019/10/research-outlines-roadmap-for-land-uses-to-slow-climate-change/

UNCCD New Delhi Declaration refrains from explicitly mentioning peatlands…

The parties to the UN Convention to Combat Desertification (UNCCD) met 2-13 September 2019 for COP14 in the Indian capital of New Delhi, adopting a series of measures in the Delhi Declaration. Besides the 'land degradation neutrality' (LDN) agreement - whereby countries have pledged to halt the degradation of land to the point where ecosystems and land use can no longer be supported - there was a landmark decision to boost global efforts to mitigate and manage the risks of crippling drought. Countries will also now be expected to address insecurity of land tenure, including gender inequality; promote land restoration to reduce land-related carbon emissions; and mobilize innovative sources of finance from public and private sources to support the implementation of these decisions at a national level.

Regretfully the importance of peatland and forest ecosystems in creating multiple benefits from undertaking land restoration practices was no longer mentioned in the accepted version. In a draft we could still read: "Acknowledging those practices, which conserve and restore land and soil affected by desertification, land degradation, drought and floods, *including in peatland and forest ecosystems*, contribute towards achieving land

degradation neutrality…", but the italized text was skipped from the final declaration. A pity, because without care for peatlands no land degradation neutrality can be achieved…

- https://news.un.org/en/story/2019/09/1046332
- https://www.unccd.int/sites/default/files/sessions/documents/2019-09/ICCD_COP%2814%29_L.9-1915606E.pdf
- https://www.downtoearth.org.in/news/climate-change/delhi-declaration-might-downplay-international-finance-institutions-role-in-mitigating-desertification-66634
- https://www.cseindia.org/cop14-unccd-s-new-delhi-declaration-dilutes-role-of-international-funding-bodies-and-tenurial-issues-9687

Peatland desertification in Mongolia. Photo: Hans Joosten.

Excerpts of the UNCCD New Delhi Declaration

Recalling … that striving to achieve land degradation neutrality has the potential to act as an accelerator for achieving a number of the Sustainable Development Goals and as a catalyst for attracting sustainable development financing to implement the Convention,

Acknowledging those practices which conserve and restore land and soil affected by desertification/land degradation, drought and floods, contribute towards achieving land degradation neutrality and can also have long-term multiple benefits for the health, well-being and socioeconomic development of the entire society, especially for the livelihoods of the rural poor,

Noting the link between the restoration and sustainable management of land and the creation of decent jobs, including green jobs initiatives and other employment-generating opportunities, for vulnerable communities in degraded areas, …

Recognizing the contribution of effective and responsible governance and stewardship of natural resources, especially land and water, for combating desertification/land degradation and drought and for the sustainable development of current and future generations,…

United Nations

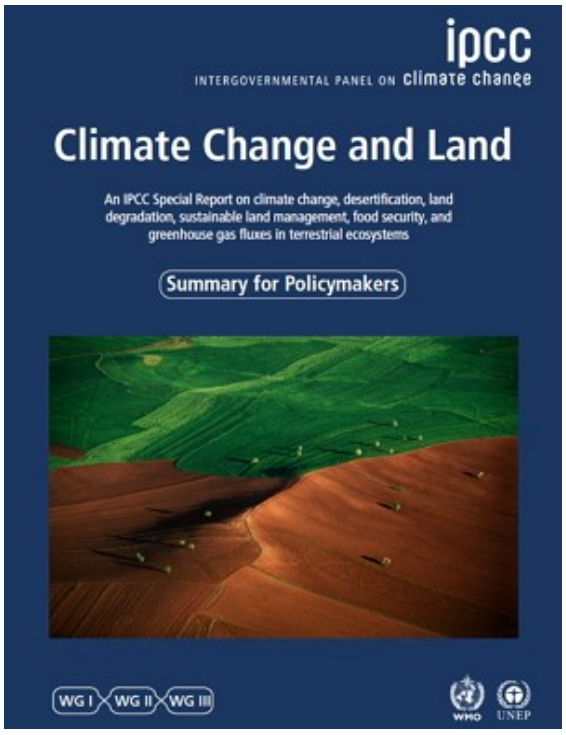
Convention to Combat Desertification

4. Invite development partners, international financial mechanisms, the private sector and other stakeholders to boost investments and technical support for the implementation of the Convention and the achievement of land degradation neutrality, create green jobs and establish sustainable value chains for products sourced from the land;

5. Promote opportunities that support, as appropriate and applicable, the long-term goals of the Paris Agreement and the development of an ambitious post-2020 global biodiversity framework, taking into consideration land-based solutions for climate action and biodiversity conservation and the mutually supportive implementation of the three Rio conventions;

6. Welcome the United Nations Decade on Ecosystem Restoration (2021–2030), commit to adopting an integrated, best-practice approach to land restoration based on scientific evidence and traditional knowledge that offers hope to vulnerable communities and invite Parties, observers and other relevant UNCCD stakeholders, including the private sector, to accelerate and scale up relevant initiatives at all levels;

- https://www.unccd.int/sites/default/files/sessions/documents/2019-09/ICCD_COP%2814%29_L.9-1915606E.pdf



IPCC Special report Climate change and Land

On 14 August 2019, IPCC released its *Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*. Selected peatland related statements from the 1542 pages long report include:

B1.2. While some response options have immediate impact, others take decades to deliver measurable results. Examples of response options with immediate impacts include the conservation of high-carbon ecosystems such as peatlands, wetlands, rangelands, mangroves and forests. Examples that provide multiple ecosystem services and functions, but take more time to deliver, include afforestation and reforestation as well as the restoration of high-carbon ecosystems, agroforestry, and the reclamation of degraded soils (*high confidence*).

B1.3. The successful implementation of response options depends on consideration of local environmental and socio-economic conditions. Some options such as soil carbon management are potentially applicable across a broad range of land use types, whereas the efficacy of land management practices relating to organic soils, peatlands and wetlands, and those linked to freshwater resources, depends on specific agro-ecological conditions (*high confidence*).

B1.4. Land based options that deliver carbon sequestration in soil or vegetation, such as afforestation, reforestation, agroforestry, soil carbon management on mineral soils, or carbon storage in harvested wood products do not continue to sequester carbon indefinitely (*high confidence*). Peatlands, however, can continue to sequester carbon for centuries (*high confidence*). When vegetation matures or when vegetation and soil carbon reservoirs reach saturation, the annual removal of CO_2 from the atmosphere declines towards zero, while carbon stocks can be maintained (*high confidence*). However, accumulated carbon in vegetation and soils is at risk from future loss (or sink reversal) triggered by disturbances such as flood, drought, fire, or pest outbreaks, or future poor management (*high confidence*).

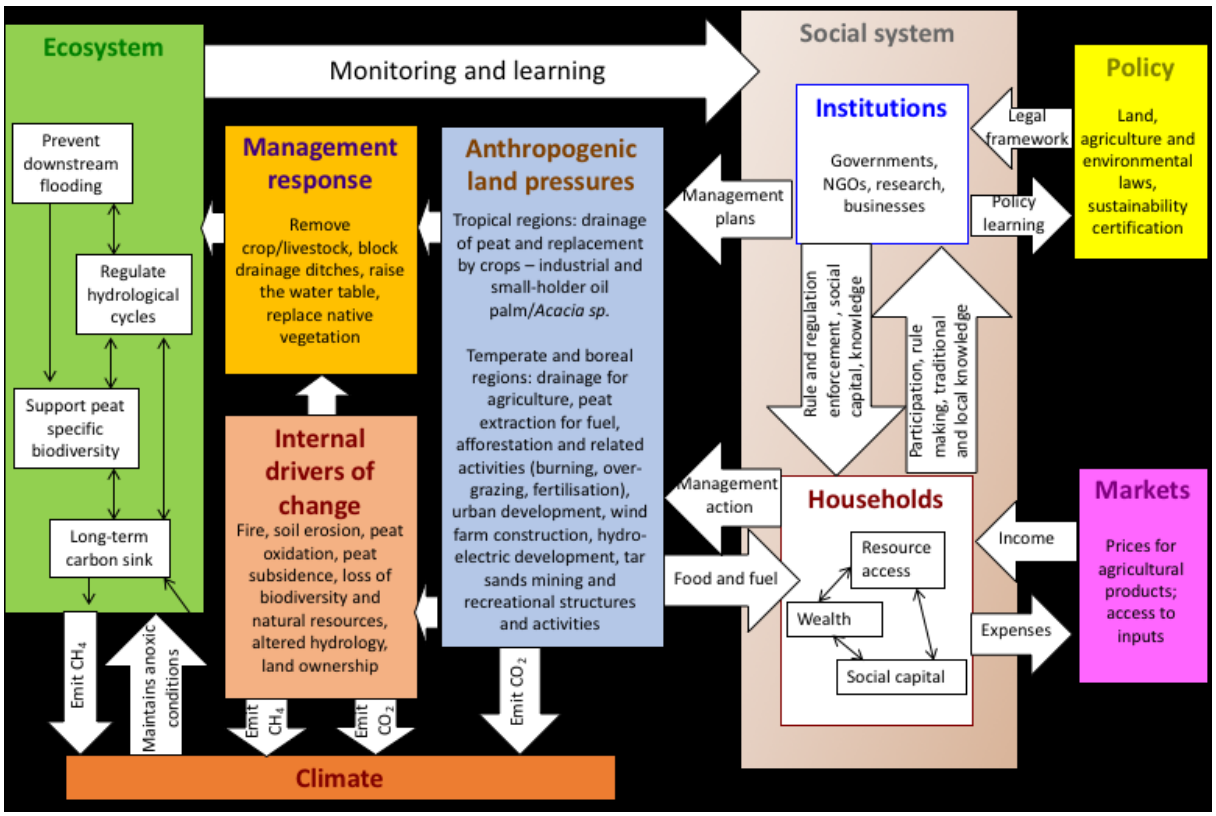
B2.2. A wide range of adaptation and mitigation responses, e.g. preserving and restoring natural ecosystems such as peatland, coastal lands and forests, biodiversity conservation, reducing competition for land, fire management, soil management, and most risk management options (e.g. use of local seeds, disaster risk management, risk sharing instruments) have the potential to make positive contributions to sustainable development, enhancement of ecosystem functions and services and other societal goals (*medium confidence*).
B3.1. If applied at scales necessary to remove CO_2 from the atmosphere at the level of several $GtCO_2yr^{-1}$, afforestation, reforestation and the use of land to provide feedstock for bioenergy with or without carbon capture and storage, or for biochar, could greatly increase demand for land conversion (*high confidence*). Integration into sustainably managed landscapes at appropriate scale can ameliorate adverse impacts (*medium confidence*). Reduced grassland conversion to croplands, restoration and reduced conversion of peatlands, and restoration and reduced conversion of coastal wetlands affect smaller land areas globally, and the impacts on land use change of these options are smaller or more variable (*high confidence*).

- Among the most vulnerable ecosystems to degradation are high carbon stock wetlands (including peatlands). Drainage of natural wetlands for use in agriculture leads to high CO_2 emissions and degradation (*high confidence*)
- In high carbon lands such as forests and peatlands, the carbon benefits of land protection are greater in the short-term than converting land to bioenergy crops for BECCS, which can take several harvest cycles to 'pay-back' the carbon emitted during conversion (carbon-debt), from decades to over a century *(medium confidence)*.
- Fires from deforestation (for land use change) and on peatlands (which store more carbon than terrestrial vegetation) obviously are a net source of carbon from the land to the atmosphere (Turetsky et al. 2014); these types of fires were estimated to emit 0.4 GtC yr^{-1} in recent decades (van der Werf et al. 2017). Peatland fires dominated by smouldering combustion under low temperatures and high moisture conditions can burn for long periods (Turetsky et al. 2014).
- Northern peatlands (40°-70°N) are a significant source of atmospheric CH_4, emitting about 48 Tg CH_4, or about 10% of the total emissions to the atmosphere (Zhuang et al. 1 2006; Wuebbles and Hayhoe 2002). CH_4 emissions from natural northern peatlands are highly variable with the highest rate from fens (*medium evidence, high agreement*). Peatland management and restoration, alters the exchange of CH_4 with the atmosphere (*medium evidence, high agreement*). Management of peat soils typically converts them from CH4 sources to sinks (Augustin et al. 2011; Strack and Waddington 2008; Abdalla et al. 2016) (*robust evidence, high agreement*). While restoration decreases CO_2 emissions, CH_4 emissions often increase relative to the drained conditions (*robust evidence, high agreement*) (Osterloh et al. 2018; Christen et al. 2016; Koskinen et al. 2016; Tuittila et al. 2000; Vanselow-Algan et al. 2015; Abdalla et al. 2016). Drained peatlands are usually considered to be negligible methane sources, but they emit CH_4 under wet weather conditions and from drainage ditches (Drösler et al. 2013; Sirin et al. 2012). While ditches cover only a small percentage of the drained area, emissions can be sufficiently high that drained peatlands emit comparable CH_4 as undrained ones (*medium evidence, medium agreement*) (Sirin et al. 2012; Wilson et al. 2016).
- Because of the large uncertainty in the tropical peatland area, estimates of the global flux are highly uncertain. A meta-analysis of the effect of conversion of primary forest to rice production showed that emissions increased by a factor of 4 (*limited evidence, high agreement*) (Hergoualc'h and Verchot, 2012). For land uses that required drainage, emissions decreased by a factor of 3 (*limited evidence, high agreement*). There are no representative measurements of emissions from drainage ditches in tropical peatlands.
- Protection and restoration of wetlands, peatlands and coastal habitats reduces net carbon loss (primarily from sediment/soils) and provides continued or enhanced natural CO_2 removal (Chapter 4, section 4.9.4). Reducing annual emissions from peatland conversion, draining and burning could mitigate 0.45-1.22 $GtCO_2$-eq yr^{-1} up to 2050 *(medium confidence)* (Hooijer et al. 2010; Griscom et al. 2017; Hawken 2017) and peatland restoration 0.15 to 0.81 *(low confidence)* (Couwenberg et al. 2010; Griscom et al. 2017b). …Wetland drainage and rewetting was included as a flux category under the second commitment Period of the Kyoto protocol, with significant management knowledge gained over the last decade (IPCC 2013c). However, there are high uncertainties as to the carbon storage and flux rates, in particular the balance between CH_4 sources and CO_2 sinks (Spencer et al. 2016). Peatlands are sensitive to climate change which may increase carbon uptake by vegetation and carbon emissions due to respiration, with the balance being regionally dependent (*high confidence*). There is *low confidence* about the future peatland sink globally. Some peatlands have been

found to be resilient to climate change (Minayeva and Sirin 2012), but the combination of land use change and climate change may make them vulnerable to fire (Sirin et al. 2011). While models show mixed results for the future sink (Spahni et al. 2013; Chaudhary et al. 2017; Ise et al. 2008), a study that used extensive historical data sets to project change under future warming scenarios found that the currently global peatland sink could increase slightly until 2100 and decline thereafter (Gallego-Sala et al. 2018).

- Stablising bioenergy crops in previous high carbon forestland or peatland results in high emissions of carbon that may take from decades to more than a century to be re-paid in terms of net CO_2 emission savings from replacing fossil fuels, depending on previous forest carbon stock, bioenergy yields, and displacement efficiency (Elshout et al. 2015; Harper et al. 2018; Daioglou et al. 2017).
- It has long been recognised that dynamics of soil organic carbon (SOC) represent a large source of uncertainties on biogeochemical interactions of land with atmosphere and climate as detailed below. Since AR5, there have been new understanding on SOC size, as well as microbial processes that influence SOM dynamics under climate change and LULCC. Three existing data bases (SoilGrids, the Harmonized World Soil Data Base, Northern Circumpolar Soil Database) substantially differ in estimated size of global soil organic carbon (SOC) stock down to 1 m depth, varying between 2500 Pg to 3400 Pg with differences among databases largely attributable to C stored in permafrost (Joosten 2015; Köchy et al. 2015; Tifafi et al. 2018). These values are four to eight times larger than the carbon stock associated with the terrestrial vegetation (Bond-Lamberty et al. 2018). New estimates since AR5 show that much larger areas in Amazon and Congo basins are peatlands (Gumbricht et al. 2017; Dargie et al. 2019).
- Of the land degradation processes, deforestation, increasing wildfires, degradation of peat soils, and permafrost thawing contribute most to climate change through the release of greenhouse gases and the reduction in land carbon sinks following deforestation (*high confidence*).
- In the context of climate change, the degradation of peatland ecosystems is particularly relevant given their very high carbon storage and their sensitivity to changes in soils, hydrology and/or vegetation (Leifeld and Menichetti 2018). Drainage for land-use conversion together with peat mining are major drivers of peatland degradation, yet other factors such as the extractive use of their natural vegetation and the interactive effects of water table levels and fires (both sensitive to climate change) are important (Hergoualc'h et al. 2017a; Lilleskov et al. 2019).
- Some response options will not be possible if action is delayed too long; for example, peatland restoration might not be possible after certain thresholds of degradation have been exceeded, meaning that peatlands could not be restored in certain locations (*medium confidence*)
- Avoided peat impacts and peatland restoration can provide significant mitigation, though restoration can lead to an increase in methane emissions, particularly in nutrient rich fens. There may also be benefits for climate adaptation by regulating water flow and preventing downstream flooding. Considering that large areas of global peatlands are degraded, peatland restoration is a key tool in addressing land degradation. Since large areas of tropical peatlands and some northern peatlands have been drained and cleared for food production, their restoration could displace food production and damage local food supply, potentially leading to adverse impacts on food security locally, though the global impact would be limited due to the relatively small areas affected.
- Peatland restoration could provide moderate levels of climate mitigation, with avoided peat impacts and peat restoration estimated to deliver 0.6-2 $GtCO_2e\ yr^{-1}$ from all global estimates published in Griscom et al. (2017a), Hawken (2017), Hooijer et al. (2010), Couwenberg et al. (2010) and Joosten and Couwenberg (2008), though there could be an increase in methane emissions after restoration (Jauhiainen et al. 2008; Table 6.16).
- Avoided peat impacts and peatland restoration can help to regulate water flow and prevent downstream flooding (Munang et al. 2014), but the global potential (in terms of number of people who could avoid flooding through peatland restoration) has not been quantified.
- There are no impacts of peatland restoration for prevention of desertification, as peatlands occur in wet areas and deserts in arid areas, so they are not connected.
- Considering that large areas (0.46 Mkm^2) of global peatlands are degraded and considered suitable for restoration (Griscom et al. 2017), peatland restoration could deliver moderate benefits for addressing land degradation (Table 6.40).

- Around 14-20% (0.56–0.80 Mkm^2) of the global 4 Mkm^2 of peatlands are used for agriculture, mostly for meadows and pasture, meaning that if all of these peatlands were removed from production, 0.56–0.80 Mkm^2 of agricultural land would be lost. Assuming livestock production on this land (since it is mostly meadow and pasture) with a mean productivity of 9.8 kg protein ha^{-1} yr^{-1} (calculated from land footprint of beef/mutton in (Clark and Tilman 2017)), and average protein consumption in developing countries of 25.5 kg protein yr^{-1} (equivalent to 70g person^{-1} day^{-1}; FAO, 2018), this would be equivalent to 21–31 million people no longer fed from this land (Table 6.46).
- While subarctic peatlands are at risk due to warming, these are not the main peatlands that are at risk from agricultural conversion (Tarnocai 2006); these peatlands, such as those in the tropics, may be more vulnerable in hotter scenarios to water table alterations and fire risk (Gorham 1991).



Model of a social-ecological system related to restoration and reduced impact of peatlands. The boxes show systems (ecosystem, social system), external and internal drivers of change and the management response – here enacting the response option. Unless included in the internal drivers of change box, all other drivers of change are external (e.g. climate, policy, markets, anthropogenic land pressures). The arrows represent how the systems can influence each other, with key drivers of impact written in the arrow in the direction of effect.

IPCC Special report Climate change and Land Chapter 4.9.4 Degradation and management of peat soils

Globally, peatlands cover 3-4 % of the Earth's land area (~430 Mha) (Xu et al. 2018a; Wu et al. 2017b) and store 26-44% of estimated global soil organic carbon (Moore 2002). They are most abundant in high northern latitudes, covering large areas in North America, Russia and Europe. At lower latitudes, the largest areas of tropical peatlands are located in Indonesia, the Congo Basin and the Amazon Basin in the form of peat swamp forests (Gumbricht et al. 2017; Xu et al. 2018a). It is estimated that while 80-85% of the global peatland areas is still largely in a natural state, they are such carbon-dense ecosystems that degraded peatlands (0.3% of the terrestrial land) are responsible for a disproportional 5% of global anthropogenic carbon dioxide (CO_2) emissions, that is an annual addition of 0.9-3 Gt of CO_2 to the atmosphere (Dommain et al. 2012; IPCC 2014c).

Peatland degradation is not well quantified globally, but regionally peatland degradation can involve a large percentage of the areas. Land-use change and degradation in tropical peatlands have primarily been quantified in Southeast Asia, where drainage and conversion to plantation crops is the dominant transition (Miettinen et al. 2016). Degradation of peat swamps in Peru is also a growing concern and one pilot survey showed that over 70% of the peat swamps were degraded in one region that was surveyed (Hergoualc'h et al. 2017a). Around 65,000km^2 or 10% of the European peatland area has been lost and 44% of the remaining European peatlands are degraded (Joosten, H., Tanneberger 2017). Large areas of fens have been entirely 'lost' or greatly reduced in thickness due to peat wastage (Lamers et al. 2015).

The main drivers of the acceleration of peatland degradation in the twentieth century were associated with drainage for agriculture, peat extraction and afforestation related activities (burning, overgrazing, fertilisation) with a variable scale and severity of impact depending on existing resources in the various countries (O'Driscoll et al. 2018; Abu et al. 2017; Dommain et al. 2018; Lamers et al. 2015). New drivers include urban development, wind farm construction (Smith et al. 2012), hydroelectric development, tar sands mining and recreational (Joosten, H., Tanneberger 2017).

Anthropogenic pressures are now affecting peatlands in previously geographically isolated areas with consequences for global environmental concerns and impacts on local livelihoods (Dargie et al. 2017; Lawson et al. 2015; Butler et al. 2009).

Drained and managed peatlands are GHG emissions hotspots (Swails et al. 2018; Hergoualc'h et al. 2017b; Roman-Cuesta et al. 2016; Hergoualc'h et al. 2017a). In most cases, lowering of the water table leads to direct and indirect CO_2 and N_2O emissions to the atmosphere with rates dependent on a range of factors, including the groundwater level and the water content of surface peat layers, nutrient content, temperature, and vegetation communities. The exception is nutrient limited boreal peatlands (Minkkinen et al. 2018; Ojanen et al. 2014). Drainage also increases erosion and dissolved organic C loss, removing stored carbon into streams as dissolved and particulate organic carbon, which ultimately returns to the atmosphere (Moore et al. 2013; Evans et al. 2016).

In tropical peatlands, oil palm is the most widespread plantation crop and on average it emits around 40 t CO_2 ha^{-1} yr^{-1}; Acacia plantations for pulpwood are the second most widespread plantation crop and emit around 73 t CO_2 ha^{-1} yr^{-1} (Drösler et al. 2013). Other land uses typically emit less than 37 t CO_2 ha^{-1} yr^{-1}. Total emissions from peatland drainage in the region are estimated to be between 0.07 and 1.1 Gt CO_2 yr^{-1} (Houghton and Nassikas 2017; Frolking et al. 2011). Land-use change also affects the fluxes of N_2O and CH_4. Undisturbed tropical peatlands emit about 0.8 Mt CH_4 yr^{-1} and 0.002 Mt N_2O yr^{-1}, while disturbed peatlands emit 0.1 Mt CH_4 $yr^{-1}$and 0.2 Mt N_2O–N yr^{-1} (Frolking et al. 2011). These N_2O emissions are probably low as new findings show that emissions from fertilised oil palm can exceed 20 kg N_2O–N ha^{-1} $yr^{-}1$ (Oktarita et al. 2017).

In the temperate and boreal zones, peatland drainage often leads to emissions on the order of 0.9 to 9.5 t CO_2 ha^{-1} y^{-1} in forestry plantations and 21 to 29 t CO_2 ha^{-1} y^{-1} in grasslands and croplands. Nutrient poor sites often continue to be CO_2 sinks for long periods (e.g. 50 y) following drainage and in some cases sinks for atmospheric CH_4, even when drainage ditch emissions are considered (Minkkinen et al. 2018; Ojanen et al. 2014). Undisturbed boreal and temperate peatlands emit about 030 Mt CH_4 yr^{-1} and 0.02 Mt N_2O-N yr^{-1}, while disturbed peatlands emit 0.1 Mt CH_4 $yr^{-1}$and 0.2 Mt yr^{-1} N_2O (Frolking et al. 2011).

Fire emissions from tropical peatlands are only a serious issue in Southeast Asia, where they are responsible for 634 (66–4070) Mt CO_2 yr^{-1} (van der Werf et al. 2017). Much of the variability is linked with the El Niño Southern Oscillation, which produces drought conditions in this region. Anomalously active fire seasons have also been observed in non-drought years and this has been attributed to the increasing effect of high temperatures that dry vegetation out during short dry spells in otherwise normal rainfall years (Fernandes et al. 2017; Gaveau et al. 2014). Fires have significant societal impacts; for example, the 2015 fires caused over 100,000 additional deaths across Indonesia, Malaysia and Singapore and this event was more than twice as deadly as the 2006 El Niño event (Koplitz et al. 2016).

Peatland degradation in other parts of the world differs from Asia. In Africa large peat deposits like those found in the Cuvette Centrale in the Congo Basin or in the Okavango inland delta, the principle threat is changing rainfall regimes due to climate variability and change (Weinzierl et al. 2016; Dargie et al. 2017). Expansion of agriculture is not yet a major factor in these regions. In the Western Amazon, extraction of non-timber forest products like the fruits of *Mauritia flexuosa* (moriche palm) and Suri worms are major sources of degradation that lead to losses of carbon stocks (Hergoualc'h et al. 2017a).

The effects of peatland degradation on livelihoods have not been systematically characterised. In places where plantation crops are driving the conversion of peat swamps, the financial benefits can be considerable. One study in Indonesia found that the net present value of an oil palm plantation is between USD 3,835 and 9,630 per ha to land owners (Butler et al. 2009). High financial returns are creating the incentives for the expansion of smallholder production in peatlands. Smallholder plantations extend over 22% of the peatlands in insular Southeast Asia compared to 27% for industrial plantations (Miettinen et al. 2016). In places where income is generated from extraction of marketable products, ecosystem degradation probably has a negative effect on livelihoods. For example, the sale of fruits of *M. flexuosa* in some parts of the western Amazon constitutes as much as 80% of the winter income of many rural households, but information on trade values and value chains of *M. flexuosa* is still sparse (Sousa et al. 2018; Virapongse et al. 2017).

There is little experience with peatland restoration in the tropics. Experience from northern latitudes suggests that extensive damage and changes in hydrological conditions mean that restoration in many cases is unachievable (Andersen et al. 2017). In the case of Southeast Asia, where peatlands form as raised bogs, drainage leads to collapse of the dome and this collapse cannot be reversed by rewetting.

Nevertheless, efforts are underway to develop solutions or at least partial solutions in Southeast Asia, for example, by the Indonesian Peatland Restoration Agency. The first step is to restore the hydrological regime in

drained peatlands and experiences with canal blocking and re-flooding of the peat. These efforts have been only partially successful (Ritzema et al. 2014). Market incentives with certification through the Roundtable on Sustainable Palm Oil have also not been particularly successful as many concessions seek certification only after significant environmental degradation has been accomplished (Carlson et al. 2017). Certification had no discernible effect on forest loss or fire detection in peatlands in Indonesia. To date there is no documentation of restoration methods or successes in many other parts of the tropics, but in situations where degradation does not involve drainage, ecological restoration may be possible. In South America, for example, there is growing interest in restoration of palm swamps, and as experiences are gained it will be important to document success factors to inform successive efforts (Virapongse et al. 2017).

In higher latitudes where degraded peatlands have been drained, the most effective option to reduce losses from these large organic carbon stocks is change hydrological conditions and increase soil moisture and surface wetness (Regina et al. 2015). Long-term GHG monitoring in boreal sites has demonstrated that rewetting and restoration noticeably reduce emissions compared to degraded drained sites and can restored the carbon sink function when vegetation is re-established (Wilson et al. 2016; IPCC 2014a; Nugent et al. 2018) although restored ecosystems may not yet be as resilient as their undisturbed counterparts (Wilson et al. 2016). Several studies have demonstrated the co-benefits of rewetting specific degraded peatlands for biodiversity, carbon sequestration, (Parry et al. 2014; Ramchunder et al. 2012; Renou-Wilson et al. 2018) and other ecosystem services such as improvement of water storage and quality (Martin-Ortega et al. 2014) with beneficial consequences for human well-being (Bonn et al. 2016; Parry et al. 2014).

Potential global contribution of response options to mitigation, adaptation, combating desertification and land degradation, and enhancing food security

	Response options based on land management	Mitigation	Adaptation	Desertification	Land Degradation	Food Security	Cost
Agriculture	Increased food productivity	L	M	L	M	H	—
	Agro-forestry	M	M	M	M	L	●
	Improved cropland management	M	L	L	L	L	●●
	Improved livestock management	M	L	L	L	L	●●●
	Agricultural diversification	L	L	L	M	L	●
	Improved grazing land management	M	L	L	L	L	—
	Integrated water management	L	L	L	L	L	●●
	Reduced grassland conversion to cropland	L	—	L	L	- L	●
Forests	Forest management	M	L	L	L	L	●●
	Reduced deforestation and forest degradation	H	L	L	L	L	●●
Soils	Increased soil organic carbon content	H	L	M	M	L	●●
	Reduced soil erosion	↔ L	L	M	M	L	●●
	Reduced soil salinization	—	L	L	L	L	●●
	Reduced soil compaction	—	L	—	L	L	●
Other ecosystems	Fire management	M	M	M	M	L	●
	Reduced landslides and natural hazards	L	L	L	L	L	—
	Reduced pollution including acidification	↔ M	M	L	L	L	—
	Restoration & reduced conversion of coastal wetlands	M	L	M	M	↔ L	—
	Restoration & reduced conversion of peatlands	M	—	na	M	- L	●

Key for criteria used to define magnitude of impact of each integrated response option

		Mitigation *Gt CO_2-eq yr^{-1}*	Adaptation *Million people*	Desertification *Million km^2*	Land Degradation *Million km^2*	Food Security *Million people*
Positive	Large	More than 3	Positive for more than 25	Positive for more than 3	Positive for more than 3	Positive for more than 100
	Moderate	0.3 to 3	1 to 25	0.5 to 3	0.5 to 3	1 to 100
	Small	Less than 0.3	Less than 1	Less than 0.5	Less than 0.5	Less than 1
	Negligible	No effect	No effect	No effect	No effect	No effect
Negative	Small	Less than -0.3	Less than 1	Less than 0.5	Less than 0.5	Less than 1
	Moderate	-0.3 to -3	1 to 25	0.5 to 3	0.5 to 3	1 to 100
	Large	More than -3	Negative for more than 25	Negative for more than 3	Negative for more than 3	Negative for more than 100

↔ **Variable**: Can be positive or negative — no data — na not applicable

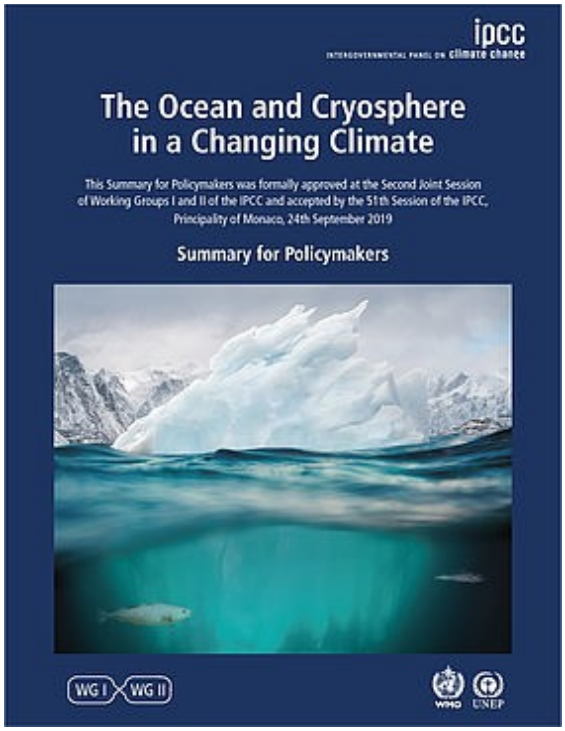
Confidence level
Indicates confidence in the estimate of magnitude category.
H High confidence
M Medium confidence
L Low confidence

Cost range
See technical caption for cost ranges in US$ tCO_2e^{-1} or US$ ha^{-1}.
●●● High cost
●● Medium cost
● Low cost
— no data

Regretfully the table above does not consider adequately that also other responses may include peatlands, that peatland rewetting may contribute substantially to adaptation, that peatlands may change directly into deserts (desertification, e.g. in Mongolia and China), and that paludiculture may solve the issue of loss of productive land and associated decreasing food security.

All further information and documents with respect to the SRCCL are to be found on the report page.

IPCC Special report 'Ocean and Cryosphere in a Changing Climate'



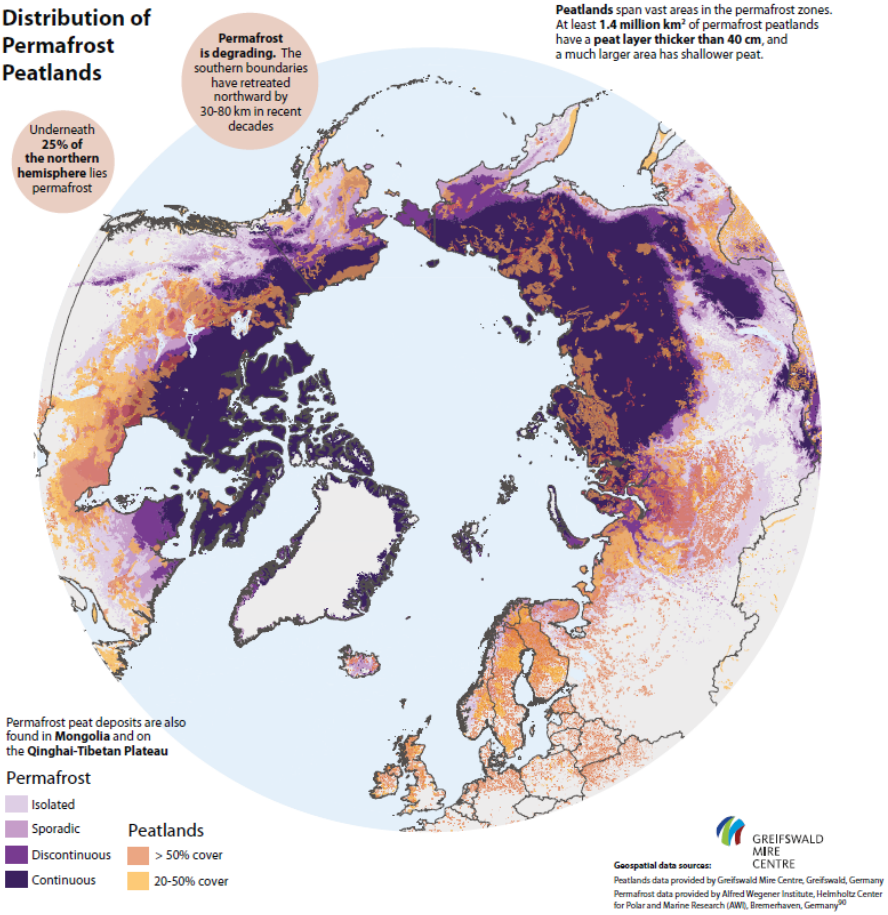
The latest IPCC report 'Ocean and Cryosphere in a Changing Climate' highlights the damaging consequences of endured changes to our oceans and frozen waters. The report, put together by more than 100 scientists from more than 30 countries, assessed the latest scientific knowledge about the impacts of climate change on ocean, coastal, polar and mountain ecosystems, and the human communities that depend on them. The report says that even if emissions came to a halt immediately, extreme events will occur every year by 2050 in many regions, increasing risks for many low-lying coastal regions and small islands.

The report highlights that the ocean and the cryosphere play a critical role for life on Earth and on the human population. A total of 670 million people in high mountain regions and 680 million people in low-lying coastal zones depend directly on these systems. "The open sea, the Arctic, the Antarctic and the high mountains may seem far away to many people," said Hoesung Lee, Chair of the IPCC. "But we depend on them and are influenced by them directly and indirectly in many ways – for weather and climate, for food and water, for energy, trade, transport, recreation and tourism, for health and wellbeing, for culture and identity."

Regretfully the report does not pay much attention to peatland, inspite of the spatial and functional importance of peatlands in the permaforst area (see https://www.unenvironment.org/news-and-stories/story/thawing-arctic-peatlands-risk-unlocking-huge-amounts-carbon

Read the IPCC report in full here.

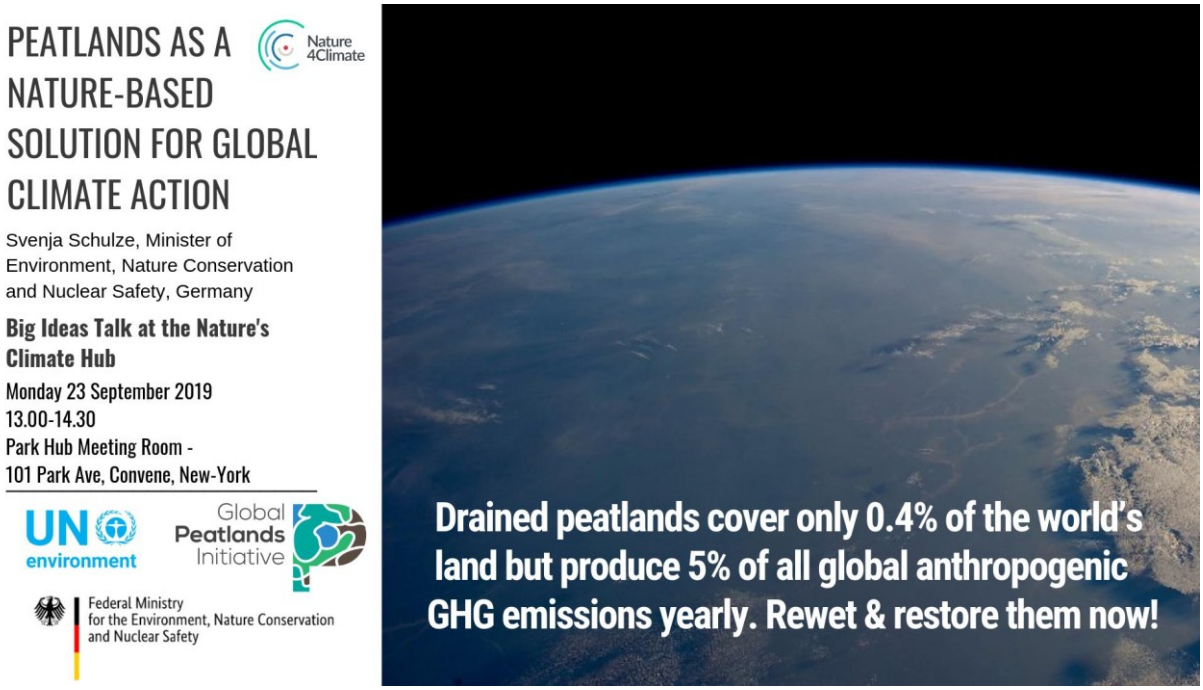
Peatlands and cryosphere in Alaska. Photo: Hans Joosten.



Distribution of permafrost peatlands. From: Permafrost peatlands: Losing ground in a warming world http://tinyurl.com/y26jmnop

Nature's Climate Hub New York

The September 2019 Nature's Climate Hub in New York, held in parallel with the UN Climate Action, featured various events on the importance of peatlands for climate. See the announcements below and consult https://news.globallandscapesforum.org/39034/fast-facts-peatlands/



Global Peatlands Initiative

UN Environment released a 1 min video highlighting peatlands as a Nature-Based Solution and emphasizing the need to act NOW: https://youtu.be/EXDKQwiLGPI.Please share in your circles, post it on you websites and tag #peatlandsmatter and @unenvironment and include www.globalpeatlands.org. GPI has been updating its website, adding new tabs on tropical peatlands and permafrost peatlands and changed the display of all partners logos on the main page. If you have any other suggestions on how to improve the GPI website, please contact Julie.vanoffelen@un.org and don't forget to also cross-link the GPI website as well as the UN Decade on Ecosystem Restoration to your websites (https://www.decadeonrestoration.org/).

A screenshot from the new UNenvironment peatland video: https://youtu.be/EXDKQwiLGPI.

Shell Aviation offsets fuel emissions with nature-based carbon credits

All Shell Aviation fuels sold through the VALCORA digital fuel purchasing platform will be carbon neutral, meaning that emissions will be offset via carbon credits automatically included with the purchase of the fuel. "We are pleased to offer the aviation industry access to independently certified nature-based carbon credits from Shell's portfolio. Following the successful launch of our own conservation programme, the addition of

the Shell offering perfectly complements our commitment to supporting the industry-wide aim of working towards a carbon neutral future," said Daniel Coetzer, VALCORA CEO. While sustainable aviation fuel and other low-carbon aviation technologies are in development, carbon credits from nature-based solutions have the potential to reduce emissions from aviation now. Shell buys carbon credits from a global portfolio of nature-based projects, including the Cordillera Azul National Park Project in Peru, the Katingan Peatland Restoration and Conservation Project in Indonesia and the GreenTrees Reforestation Project in the USA.
After in the Netherlands, Shell enables from October 17, 2019 also its customers to offset the CO_2 emissions from their car fuel purchases at its UK service stations at no extra cost.

- https://www.aviationpros.com/engines-components/aircraft-airframe-accessories/fuel-systems/press-release/21110300/valcora-valcora-bolsters-fuel-emission-offsetting-in-collaboration-with-shell-aviation
- https://www.shell.co.uk/media/2019-media-releases/drivers-set-to-go-carbon-neutral-with-shell.html

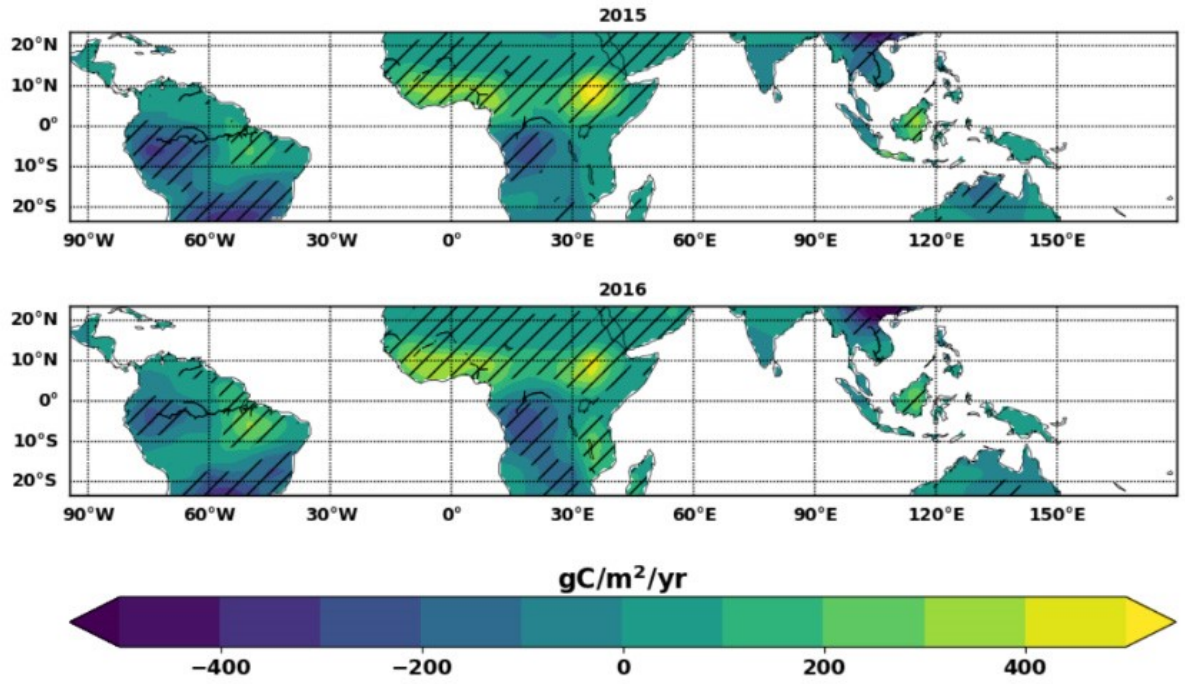
Africa

Satellite data show: Africa's tropical land emitted in 2016more CO_2 than the US

Africa's tropical land released close to 6billion tonnes of CO_2 in 2016, according to data taken by satellites. This means that, if Africa's tropical regions were a country, it would be the second largest emitter of CO_2 in the world – ahead of the US, which currently emits 5.3bn tonnes of CO_2 a year. The region's 2016 emissions were "unexpectedly large", the authors write in Nature Communications. This is because the land surface is covered by tropical forests and peatlands, environments which typically absorb and store large amounts of CO_2 from the atmosphere. The high rate of CO_2 loss in 2016 could be associated with a "strong" El Niño, scientists tell Carbon Brief. In the African tropics, it can cause unusually high temperatures and drought. Other causes of CO_2 emissions could include "substantial land-use change", including deforestation and fires associated with agriculture, the study says.
Africa is home to around 3% of the world's peatlands, including the world's most extensive tropical peatland. Though the African tropics are a globally important carbon store, there have been few studies looking into the extent of year-to-year CO_2 emissions from the land in this region. The new study analyses data taken by two satellites that recorded CO_2 emissions stemming from the Africa's tropical land from 2014-17. These satellites include Japan's greenhouse gases observing satellite (GOSAT) and NASA's orbiting carbon observatory (OCO-2). Data taken from both satellites show that some parts of tropical Africa's land are now releasing more CO_2 into the atmosphere than they absorb through their trees and soils, says study lead author Prof Paul Palmer, a researcher of geosciences from the University of Edinburgh: "This is a new perspective. Other satellites have

reported widespread land degradation over this region but our study is the first to link surface processes to changes in CO_2. What the data suggests is that the land is degrading in certain parts of tropical Africa to a point where it is beginning to release carbon."

The results show that net CO_2 emissions from Africa's tropical land totalled 5.4bn tonnes and 6bn tonnes in 2015 and 2016, respectively. Across the tropics as a whole, net CO_2 emissions reached 3.8bn tonnes and 5.9bn tonnes in 2015 and 2016, respectively. This is because the CO_2 emissions from tropical Africa were offset by other tropical regions, such as parts of South America, which acted as net removers of CO_2 ("carbon sinks") between 2015 and 2016. The maps below, taken from the paper's supplementary information, show the extent of CO_2 emissions from tropical land in 2015 and 2016. On the map, dark blue shows regions that acted as carbon sinks while yellow shows regions that were net emitters of CO_2.



CO_2 emissions from tropical land in 2015 and 2016 in gC/m^2/yr). Dark blue: carbon sinks, yellow: net emitters of CO_2. Hatched: regions with lower relative uncertainty. Source: Supplementary Information, Palmer et al. (2019)

The map indicates that the Congo basin acted as a large carbon sink from 2015-16. This region is home to the world's most extensive tropical peatland, which covers an area larger than the size of England. The maps also show that CO_2 losses from Africa were concentrated in western tropical Africa and over parts of Ethiopia. These regions are home to "large soil carbon stores", Palmer says. Land degradation and deforestation in these areas could have caused soils to erode and release some of the carbon they hold. CO_2 in the African tropics was likely influenced by the 2015/16 El Niño, says Prof Oliver Phillips, chair in tropical ecology at the University of Leeds, who was not involved in the study: "The 2015/16 was one of the strongest El Niño events on record. We already know that atmospheric concentrations of CO_2 increased faster than ever before in 2016 and that tropical temperatures reached record levels. And other studies have shown that this was boosted in part by emissions from the tropical land. "The current paper attributes remarkably large emissions to parts of northern tropical Africa which retain very little intact forest. A feature of the 2015-16 El Nino in Africa was sustained warming – and the paper's suggestion that the large emissions are partly be due to soil carbon stores being [lost] is troubling. It implies a risk of global heating aggravating CO_2 emissions within large areas of mostly agricultural land."

The research "has brought focus to a region of the world we know so little about", says Dr Pep Canadell, a research scientist and director of the Global Carbon Project, an independent project tracking worldwide emissions of CO_2 and other greenhouse gases. However, the discovery of a large source of CO_2 emissions in tropical Africa does not mean that global CO_2 emissions are higher than scientists thought, he explains to Carbon Brief: "Because our carbon budget is a mass balance of sources and sinks constrained by the atmospheric CO concentration that we know very well, it means that if a new source appears that was not accounted before, another source might have been overestimated or sinks elsewhere are bigger than we estimated. "The point

being that the carbon burden in the atmosphere is not worse than we thought, just because a new source is discovered."

- https://nature.com/articles/s41467-019-11097-w
- https://www.carbonbrief.org/africas-tropical-land-emitted-more-co2-than-the-us-in-2016-satellite-data-shows

Peatland grazing in West-Ethiopia. Photo: Hans Joosten.

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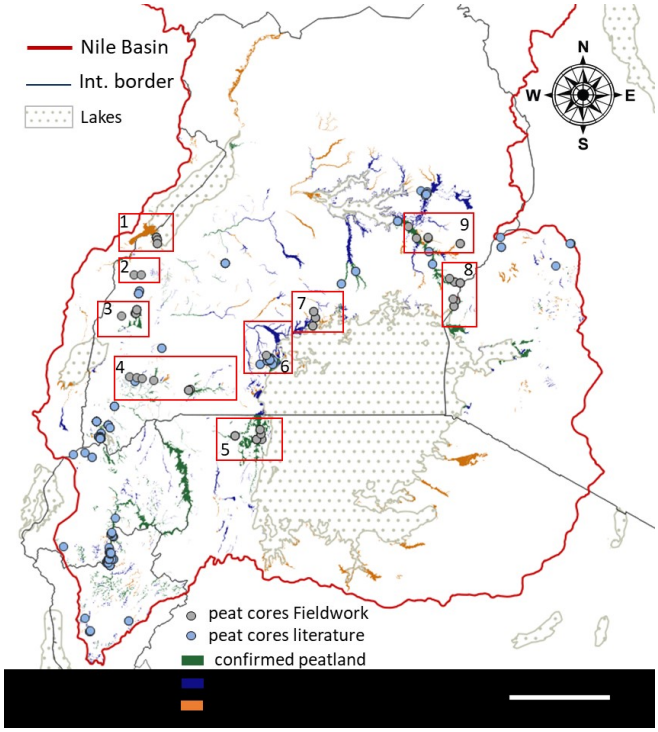
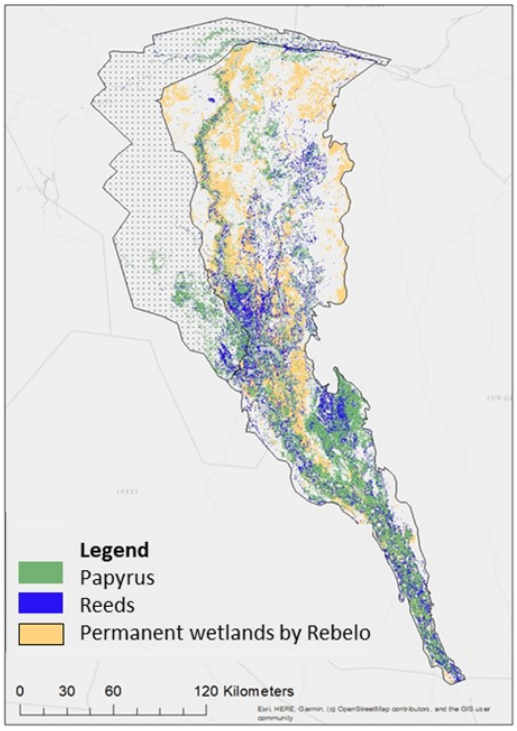
Nile Basin





Peatland probability map for the Nile Equatorial Lake region (l) and overlay of permanent wetland vegetation and permanent wetlands in the Sudd. From: Elshehawi et al. 2019. NBI-GIZ-report.

Samer Elshewashi (Greifswald Mire Centre) and Tatiana Minayeva (Care for Ecosystems) on successful Nile Basin Initiative peatland ground truthing mission in the Kenyan highlands. Photo: Jan Peters (GMC).

Democratic Republic of Congo

Congo's rainforest is getting smaller

The Congo basin rainforest is the second biggest tropical forest in the world, after the Amazon. Its peatlands hold the equivalent of three years' worth of global carbon emissions. But between 2001 and 2018 Congo lost 13m hectares of tree cover, i.e. 6% of the entire rainforest. At the UN General Assembly in September the president of Congo, Félix Tshisekedi, said he was committed to saving his country's trees and asked for more money to do so. "Nature has made my country the depository of 47% of the continent's forests," he said. "It is incomprehensible that the forests of the Congo basin capture only 1% of available financing." But even if Mr Tshisekedi gets more money, he may not have the clout to fulfil his promises. The election that he "won" in December was widely deemed to have been rigged. He and his predecessor, Joseph Kabila, are now glued together by a secret power-sharing deal. Mr Kabila has allowed corruption to flourish. And shortly before leaving office he approved a contract that allows two companies to explore for oil in the peatlands.

- https://www.economist.com/middle-east-and-africa/2019/10/17/congos-enormous-rainforest-is-getting-smaller

Inside the search for Africa's carbon time bomb

Journey into the wilds of the Congo rain forest with scientists trying to locate a shockingly large peatland so that they can help to preserve it.

- https://www.nationalgeographic.com/science/2019/09/inside-search-for-africa-carbon-time-bomb-peatland/

Republic of Congo

$65 million deal to protect Congo's forests raises concerns

On Sept. 3, the Republic of Congo secured a stream of funding aimed at protecting forests and peatlands. The signatures of French President Emmanuel Macron and Congolese President Denis Sassou Nguesso finalized a $65 million agreement outlining a set of strategies that the Central African Forest Initiative, or CAFI, which brokered the deal, says will keep ecosystems intact and lock away the carbon they contain. CAFI is a partnership formed in 2015 with the goal of combining forest protection with economic development in the region.

RC President Denis Sassou Nguesso, the Norvegian ambassador in France Oda Helen Sletnes and the French President Emmanuel Macron after signing the Central African Forest Initiative agreement, September 3, 2019.

But not long after the presidents' pens left the paper, critics began to voice their concern that the deal could pave the way for the destruction of the Republic of Congo's forests and peatlands. Other agreements in the Central African countries of the Democratic Republic of Congo and Gabon have led to similar skepticism. The pact "is unlikely to protect any forests," Simon Counsell, executive director of Rainforest Foundation UK, said in a statement. "It seems that interests other than protecting forests are being served."

In mid-August, two companies from the Republic of Congo announced that the peatlands of the Cuvette Centrale sit atop hundreds of millions of barrels of oil. Extracting it could nearly triple the Republic of Congo's daily output to almost one million barrels a day, but some experts question whether that figure is exaggerated.

Scientists first mapped the peatlands, which extend across some 145,500 km^2 of the Republic of Congo and its neighbor, the Democratic Republic of Congo, in 2017. They figure that the boggy mix of decaying organic matter and forest contains 30 billion metric tons of carbon, or about 20 times the amount of carbon emitted from burning fossil fuels in the United States each year. After the discovery, early signs from the Congolese government pointed to their interest in protecting the peatlands. Officials signed the Brazzaville Declaration in March 2018, committing to peatland conservation and enlisting the support of peatland-rich Indonesia in keeping them healthy. "Peatlands have grown over the course of [10,000] years, and they can be destroyed in a matter of days if the land use is not sensitive to the nature of the peatlands," Tim Christophersen, head of the freshwater, land and climate branch of U.N. Environment, said in a statement at the time.

In a peat swamp forest in the Republic of Congo. Photo: Hans Joosten.

But in September 2018, the Republic of Congo's Ministry of Hydrocarbons invited oil companies to bid for the chance to explore for oil in five blocks in the Cuvette Basin. One also encompasses Nouabalé-Ndoki National Park, a well-known national park. The tender drew criticism from Greenpeace. Now, with the recently signed letter of intent, Greenpeace and RFUK are concerned that the language in the agreement leaves the door open for continued oil and natural gas exploration, as well as full-on exploitation. The organizations noted that the text allows for the conversion of high conservation value and high carbon stock forests "in case of the development of infrastructure and extractive industries outside the agro-industrial sector, which are deemed of vital interest to the national economy." They also point to phrasing that calls for the "minimization" — rather than the outright prohibition — "of direct and indirect impacts of mining and hydrocarbon activities on carbon stocks and forest and peatlands biodiversity." "They definitely did not produce a letter of intent that is tightly protecting the peatlands or the forest," Tal Harris, international communications coordinator with Greenpeace Africa, told Mongabay.

A spokesperson for CAFI pointed out that some of the oil licenses covering the peatlands date back to the mid-2000s, before the Cuvette peatlands had been mapped. The source said it was unrealistic to think that the government would cancel them. (Crude petroleum accounted for almost half of the value of the Republic of Congo's exports in 2017, according to the Observatory of Economic Complexity.) "We would like the government of the Republic of Congo to say, 'OK, I will not undertake any activity on this area, and I will withdraw the existing licenses.' But we are in the real world," the spokesperson said, adding that canceling existing fossil fuel contracts was "not realistic." The source also took issue with the characterization of the language in the agreement as "soft." The spokesperson highlighted the commitments disallowing the conversion of high conservation value and high carbon stock forest for agriculture. A major focus of the agreement was to "prevent" the drainage of the peatlands, and it requires that environmental impact studies be carried out before development. Now, the objective for us as CAFI is to support the country in precisely assessing the risk and to agree on the roadmap to monitor the progress against these commitments they made, including with the ministry in charge of the oil sector and the private sector," the spokesperson said. "These are strong commitments," the CAFI spokesperson said. "I'm not saying they're perfect. I'm just saying that there are no easy solutions."

- https://news.mongabay.com/2019/10/65-million-deal-to-protect-congos-forests-raises-concerns/
- https://sdg.iisd.org/news/cafi-to-conserve-forests-peatlands-in-republic-of-the-congo/
- https://www.globalwitness.org/zh-cn/press-releases/strict-safeguards-crucial-for-new-central-african-forests-initiative-partnership-that-could-threaten-the-congos-peatland/

Sassou Nguesso: Drilling of oil at Congo's new field will adhere to environmental standards

Congolese President Denis Sassou Nguesso promised in a message on public television on August 14 to exploit the discovered hydrocarbon field in the Cuvette region (north) in an environmentally friendly way. “I take note (…) of the successful completion of the oil exploration operations carried out under the Ngoki permit, highlighting the presence of quality oil reserves in the northern part of our country,” said Mr. Sassou Nguesso.

On August 10, two oil companies presented the characteristics of the first onshore oil field discovered in the Cuvette region. Mr. Sassou Nguesso said that the discovered deposit is located on the periphery of wetlands that support peatlands. “Congo remains fully aware of the need to preserve peatlands, given their impact on global climate balance and the protection of biodiversity,” the Congolese president stressed. “Our country has never violated the obligation to protect peatlands in its lake areas. It has no intention of doing so in the future, notwithstanding the financial compensation announced and still to be received,” he said. The president was speaking in a speech related to the celebration of the 59th anniversary of the independence of Congo, a former French colony, on August 15.

The “Delta de la Cuvette” deposit could produce up to one billion cubic metres of hydrocarbons, including 359 million barrels of oil, or 983,000 barrels per day. The share of the Congolese State that granted a permit in 2006 amounts to 35%. Two oil companies own the Delta de la Cuvette. These two firms belong to Congolese businessman Claude Wilfrid Etoka, who is very close to President Sassou Nguesso. Both are from this region.

- https://www.africanews.com/2019/08/15/drilling-of-oil-at-congo-s-new-field-will-adhere-to-environmental-standards/

South-Sudan

Looking for peat in the Sudd: https://www.youtube.com/watch?v=f6JMUBWaOYo&feature=youtu.be

Peat swamp forest in Brunei. Photo: Hans Joosten.

Asia

Brunei

21st MSC on Transboundary Haze Pollution

The Twenty-first Meeting of the Sub-Regional Ministerial Steering Committee on Transboundary Haze Pollution (21st MSC) was held on 6 August 2019 in Brunei Darussalam, and attended by Ministers/representatives responsible for the environment, for land, forest fires and haze, from Brunei Darussalam, Indonesia, Malaysia, Singapore, and Thailand, and the Secretary-General of ASEAN. Read more

Read also Five Asean nations make pact to minimise cross-border haze

Georgia

Colchis rainforests and peatlands nominated as a UNESCO natural World Heritage site

Georgia has successfully prepared and submitted the application for nomination of the rainforests and peatlands of Colchis as UNESCO natural World Heritage site. An extensive feasibility study supports the nomination: https://www.umweltbundesamt.de/en/topics/sustainability-strategies-international/cooperation-eeca-centraleastern-european-states/project-database-advisory-assistance-programme/feasibility-study-for-nominating-georgias-colchis In October 2019 a UNESCO expert commission visited the area to evaluate the nomination.

Hannes Knapp in front of Quercus hartwissiana *in lowland rainforest in Colchis, Georgia. Photo: Hans Joosten.*

Indonesia

Riau lifts emergency status over forest fires

A state of emergency imposed on the Indonesian province of Riau following an outbreak of forest and land fires and haze has been lifted. Mr Jim Gafur, the head of emergency response at the Riau disaster management agency, said on November 1 that the situation on the ground was "very conducive" with the arrival of the monsoon season. "There (have been) no more hot spots since Oct. 26, and there are no more fires," he told The Straits Times, "But personnel are on standby and continue to monitor the situation (on the ground). They will immediately respond whenever a fire breaks."

Riau, which is close to Singapore, was among six provinces in Sumatra and Kalimantan that were largely affected by the forest and land fires due to a prolonged dry season this year. The other five were Jambi, South Sumatra, West Kalimantan, Central Kalimantan and South Kalimantan. The authorities deployed nearly 30,000 personnel to douse the blazes in these provinces. From January to September, 857,756ha of land across the archipelago was destroyed, figures from the National Disaster Management Agency (BNPB) showed. More than a quarter of that figure was made up of peatland. Nearly 9 % of the burnt area, or 75,871ha, was located in Riau and more than 70 % of this was made up of peatland. Peat fires are harder to put out as they can burn underground for weeks, especially in deep peat areas, producing thick haze.

A total of 919,516 people suffered from respiratory infections between February and September because of the fires and haze. The BNPB said the fires caused at least one death although local media reported at least two people had died. In Riau alone, the incidents will translate into material losses worth up to 50 trillion rupiah (US$3.6 billion), the Environmental Study Centre at Riau University estimated.

The monsoon season began in parts of Sumatra and Kalimantan in the middle of October, with Indonesia's northern-most provinces of Aceh and North Sumatra being the first ones to receive the rains. The agency forecast that the season, marked by intense rainfall, will soon spread to the rest of the archipelago.

- https://www.straitstimes.com/asia/se-asia/riau-lifts-emergency-status-over-forest-fires
- http://www.xinhuanet.com/english/2019-10/22/c_138494266.htm

Photos: Peatland fires rage through Sumatra

Aerial images taken on Oct. 24 in the southern part of Sumatra show wildfires burning through peat forests and producing clouds of toxic smoke. Peatlands in the districts of Ogan Komering Ilir and Ogan Ilir in South Sumatra province were among those pictured ablaze by Mongabay Indonesia's Nopri Ismi, who joined a water-bombing flight by the local disaster management agency BPBD.

- https://news.mongabay.com/2019/11/peat-forest-fires-indonesia-sumatra-photos/

A specially equipped helicopter dumps water on burning peatland in Cengal, Ogan Komering Ilir district. Photo: Nopri Ismi/Mongabay Indonesia.

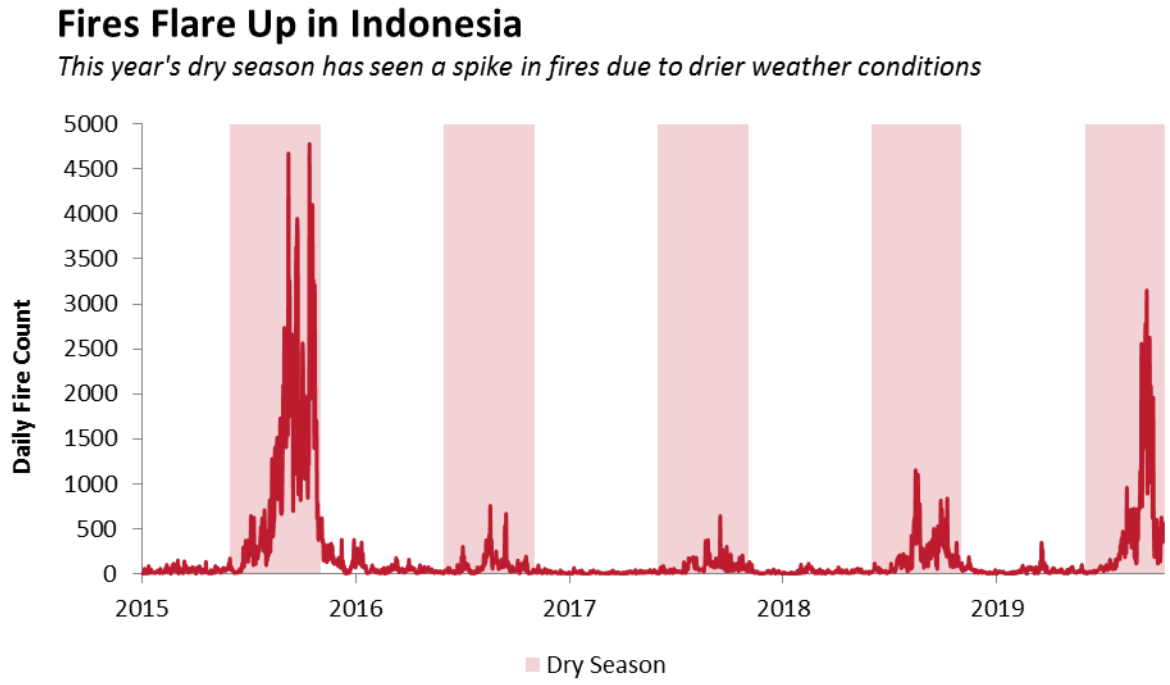
Fire season highlights failures of the Indonesian government's policies

Indonesia's dry season is drawing to a close and with it the seasonal fires that regularly produce haze across the region. This year's haze has been particularly bad in some areas. For example, the Air Pollutant Index (API) reading in Palembang city, in South Sumatra, reportedly reached 921 on 13 October, well above hazardous levels,

causing schools in the area to shut down. In response, the representatives of Thailand, Myanmar, Singapore and Malaysia on the ASEAN Intergovernmental Commission on Human Rights, called on member states to: 'fully implement the ASEAN Agreement on Transboundary Haze Pollution and revisit the Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control with Means of Implementation with its vision to be haze-free by 2020'.

Since the 2015 haze crisis, Indonesia has managed to keep on top of the fires, with the daily fire count dropping dramatically to record lows in consecutive years. That coincided with increased efforts by the Indonesian government in two areas: to restore dried out and degraded peatlands; and to improve laws and regulations to dissuade the use of the farming practices responsible for the fires. That coincidence had been touted as a sign of success by the Indonesian Government. In fact, after the 2017 fire season, which marked the first time since 2000 that fire numbers had been kept below 15,000 for two consecutive years, the Malaysian Prime Minister at the time, Najib Razak, praised the Indonesian Government for keeping the transboundary haze at bay.

As discussed in a previous *Strategic Weekly Analysis*, however, there is a strong correlation between the level of rainfall during the dry season in the three provinces where most fires occur (Riau, West Kalimantan and Central Kalimantan) and the severity of that year's fire season. The dry seasons in 2016 and 2017, in particular, saw much higher levels of rainfall and consequently fewer fires. This year's fire season, with mild El Niño weather conditions expected, was expected to be the real test of the success of the government policies implemented in 2015.



At face value, it appears that the policies put in place have not been successful. Indonesia's Peatland Restoration Agency, however, has maintained that its efforts have helped prevent an episode that could have been even worse. The Senior Manager for Climate and Forests with the World Resources Institute's Indonesia office also told the *New York Times* that while there were more fires this year than the previous three years, there are indications that some government efforts have worked, especially in supporting local firefighting agencies. It is difficult to be certain about this, because although the number of fires was not as high as in 2015, neither were the El Niño conditions as strong as in that year.

Strategies such as peatland restoration may produce greater improvements over the longer-term. Those strategies, however, need to be combined with short-term methods, such as effective enforcement of peatland regulations and deterrents for slash-and-burn land clearing methods. While such mechanisms already exist, they are plagued with loopholes and weak enforcement. It is unlikely that those issues will be addressed in the short-term, as it would require major changes to Indonesia's ineffective judicial system. Additionally, without significant repercussions being handed down to companies found guilty of slash-and-burn techniques, there will be little incentive for those companies to forgo the traditional practices. Consequently, future incidents of transboundary haze are likely to continue for some time under El Niño weather conditions.

- http://www.futuredirections.org.au/publication/fire-season-highlights-failures-of-the-indonesian-governments-policies/

Spiderman helps firefighters: http://www.xinhuanet.com/english/2019-09/13/c_138389175.htm

Indonesia under 'blanket of smoke' amid wildfires

October 16: Indonesia is under a "blanket of smoke" amid wildfires that threaten humans, wildlife and the global climate, researchers say. The wildfires – some started by "slash-and-burn" methods for turning forests into farmland – happen yearly in Indonesia, but 2019's fire season has been particularly damaging, with more than 320,000 hectares burned already. University of Exeter researcher Abi Gwynn, who is in the country to study how previous fires have affected orangutans, says smoke has obscured the sky over Palangka Raya in Central Kalimantan (Indonesian Borneo) for two months. She says hospitals are full of people in need of oxygen, and she warns that the fires are destroying precious wildlife habitats and peatland that stores vast quantities of carbon.

"Indonesia has been in a state of emergency for two months now and we have been living under a blanket of smoke," said Gwynn, "I can smell the smoke constantly and always have to wear a mask when going outside. "This fire season, Palangka Raya has been a very unhealthy place to be. We've experienced an *air quality index of over 2,000* – anything over 150 is considered unhealthy. "Many local people don't wear masks and carry on as usual. Schools were shut for about two weeks but have now reopened, as the air quality has improved a little over the last few days."

"The question of 'who started the fire' is complex. Small scale land clearance by fire can be sustainable in the long-term provided peatlands are undrained, in their natural flooded state. Problems tend to occur when people burn their land, whether this be local people or industrial oil palm/Acacia plantations, in areas which have been drained and thus the land is much more prone to burning indefinitely until the rains come." said Dr Alex Thornton, of the University of Exeter. "There is no quick fix to this issue in Indonesia. There are a host of political, social and economic challenges to be solved. Long-term solutions must come from better law enforcement to ensure land clearance in responsible and restoration of drained peatlands to prevent future fires."

- https://www.miragenews.com/indonesia-under-blanket-of-smoke-amid-wildfires/

Deforestation and fire in Kalimantan. Photo: Hans Joosten.

Treasure hunting on burned peatland in South Sumatra

Authorities in South Sumatra tighten security to put a stop to treasure hunting in areas where centuries-old ancient valuables were recently unearthed following months of wildfires. Residents of Ogan Komering Ilir regency discovered early October archeological objects on burned peatland, the origins of which are believed to date back to the Sriwijaya kingdom era in the seventh century. Some people have reportedly taken home some of the

treasure without reporting the findings to authorities. South Sumatra Police chief Insp. Gen. Firli Bahuri launched an air patrol to monitor the location of the findings, while regency officials urged district and village heads to make sure no one from outside the region paid a visit without permission to look for ancient treasures. “We are anticipating the possibility [of treasure hunting] in the area,” said Ogan Komering Ilir administration secretary Husin. Ogan Komering Ilir Regent Iskandar has called on people to refrain from carrying out mass excavations and to report any archeological findings, in accordance with a 2010 law on cultural heritage.

The locations of the unearthed ancient treasure — where people reportedly found gold and jewelry, among other things — were thought by archeologists to have been trading centers during the Sriwijaya Kingdom era which existed until the emergence of the Palembang sultanate in the 12th century.

Seringguk Umang, who lives in Cengal district, said he and other locals had been looking for ancient treasures on burned peatland for four years, having begun shortly after land and forest fires hit the province in 2015. He said that at the time, farmers in the district unearthed ancient jewelry, gold dust and beads while cultivating land that had previously been cleared by burning. Since then, more people had come to the area to hunt for treasure. Some people come in groups, while some have brought along tents to stay overnight, he said. Seringguk acknowledged calls from authorities about not taking items and selling them. However, he said locals considered the treasure hunting as means to increase their income as they had “economic needs”.

Locals usually sold the gold they found. Only when they find ancient vases, for instance, do they decide not to sell them, he said. “We don’t know the prices yet,” Seringguk told *The Jakarta Post.* Similar activities were also reported in other districts in the regency, including in Sungai Menang, Tulung Selapan and Air Sugihan districts.

South Sumatra Archeological Agency head Budi Wiyana deplored the treasure hunting, saying that the latter was a hindrance for archaeologists. Although he said ancient treasure hunting was illegal, Budi said it was OK for those who found archeological objects to keep them. However, he urged people to at least report their findings for research purposes. Budi further suggested that the local administration, police and relevant stakeholders, including heritage conservation agency and archeological agency, collaborate and raise awareness on the importance of preserving cultural heritage. “Such efforts need cooperation from all parties, otherwise the call will have no impact on society,” he said.

- https://www.thejakartapost.com/news/2019/10/10/treasure-hunting-burned-peatland-puts-south-sumatra-authorities-guard.html
- https://www.thejakartapost.com/news/2019/10/03/centuries-old-gold-jewelry-from-sriwijaya-era-reportedly-unearthed-on-burnt-peatland.html

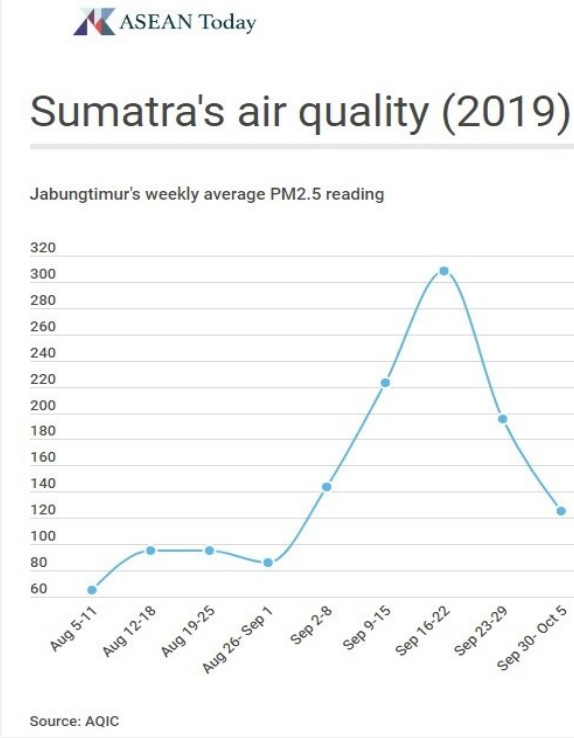
Indonesia's huge fires and toxic haze will cause health problems for years to come

So far, more than 35,000 fires have been detected in 2019 in the country and air pollution levels are classified as "hazardous" according to the Air Quality Index (AQI). This year's fires have been indeed the worst since 2015, when more than 2.5m hectares of land burned, causing a US$16 billion loss – a substantially larger sum than even the reconstruction costs of the 2004 Boxing Day tsunami. But exposure to the wildfires and their subsequent toxic smoke also causes short and long-term damage to human lives. The smoke generated by burning wood and vegetation contains lots of very fine particles, too small for the human eye to see. These particles can easily lodge deep into the lungs and can pass into other organs or the bloodstream.

To see what mass exposure to this sort of pollution may mean in the longer term, we can look at the effects of massive wildfires in late 1997, which burned more than 5 million hectares of land and sent a huge pollution cloud across South-East Asia. Before 2015, these were Indonesia's biggest fires on record. Various researchers have analysed data from population surveys taken during and after the fires, and found that the smoke generated by the fires harmed adult health and child survival rates at the time, and led to lower health and educational achievements in the longer-term. For instance, one study found that exposure to the toxic smoke resulted in significant worsening of physical functioning. These effects were especially prolonged among women aged 30-55 years and older adults. Other research has found that smoke-contaminated air, soil and food is particularly bad for pre and postnatal health. Toxicants inhaled by the mother interferes with her health, which in turn disrupts foetal nutrition and oxygen flow. One study found that exposure to the Indonesian wildfires of late 1997 lead to more than 15,600 child, infant, and foetal deaths, or a 1.2 percentage point decrease in the survival of the exposed cohorts. Poorer people were worst affected. Finally, child nutrition and health can be directly impaired through inhaling toxicants or ingesting them in contaminated raw food, and as a result of the temporary lack of adequate care given by unhealthy adult family members.

Exposure to fires and toxic smoke causes short and long-term damage to human lives. Photo: Hans Joosten.

Maria C. Lo Bue 's research, published earlier in 2019, looked at young children aged 12-36 months living in the affected islands of Sumatra and Kalimantan during the 1997 fires, and compared them with a comparable group of children who lived in areas not affected by the fires. It appeared that exposure to the fires resulted in a significantly slower growth rate of about 1mm per month within the three-month period between first exposure to the fires in September 1997 and the final measurement that December. Doesn't sound like much? Well bear in mind that children that age are growing around 1cm a month, so they were losing a tenth of their growth rate.



The burning of wood and vegetation in the Bornean and Sumatran peatlands released a plume of ash, carbon monoxide, cyanide and formaldehyde into the atmosphere, where it was swept across the Strait of Malacca to Singapore, Malaysia, and Southern Thailand. Many of these particles measured less than 2.5 micrometres in diameter, around five times smaller than a dust particle. These tiny fragments can easily enter the human body through the respiratory system and become lodged in the lungs, causing respiratory problems. From the lungs, they can enter the bloodstream, with catastrophic health effects.

Air quality is often measured by the concentration of atmospheric particulate matter that with a diameter smaller than 2.5 micrometres (PM2.5) per cubic metre. The World Health Organisation (WHO) recommends keeping PM2.5 readings below 20. In recent weeks, readings in Sumatra have topped 400.

The 1997 haze lasted for just a few months. But a few months is a long time when you are a toddler, and for the cohort Lo Bue studied the fires happened during a critical period where brain development is more sensitive to nutritional shocks. This then had important repercussions when these children reached school age: on average they delayed enrolment in primary school by six months, and eventually achieved almost one year less of education compared to the group not affected by fires.

It is not yet clear whether 2019's fires will reach the scale of the disasters seen in 1997 or 2015. But these studies all imply that exposure to the wildfires entails a real risk for human well-being. Previous generations of Indonesian children paid the price—if we are to ensure today's children don't suffer similar problems, then action needs to be taken to protect the most vulnerable.

- https://phys.org/news/2019-10-indonesia-huge-toxic-haze-health.html
- https://www.aseantoday.com/2019/10/the-next-generation-will-endure-the-health-effects-of-indonesias-wildfires/

Indonesia's fires are bad, but new measures prevented them from becoming worse

Once again haze is suffocating Indonesia, but some scientists say it could have been worse. Acrid smoke from fires set to clear land for agriculture has sent scores to hospitals with respiratory problems and closed thousands of schools in Indonesia and neighboring Malaysia. At its thickest, in mid-September, more than 100 flights had to be canceled because of poor visibility. Although the government has tried to seed clouds for rain and dump water from the air, only the monsoon rains later in October are likely to quench the fires.

Yet countermeasures Indonesia has taken since the last major haze event, in 2015, have helped limit this year's disaster. A new agency is restoring degraded peatlands, the government has also beefed up a moratorium on the conversion of prime forest land underlain by peat. The efforts "are providing some positive results," says Arief Wijaya of the Indonesian branch of the World Resources Institute in Jakarta. But virtually all experts agree that more is needed, including stricter enforcement of a ban on setting fires.

Small farmers in Indonesia have long practiced slash-and-burn agriculture, and in recent decades large corporations have industrialized the practice. Fires they set to clear the land can burn out of control.

Peatlands play an outsize role in the hazes because dry underground peat deposits provide "an inexhaustible supply of fuel," says Robert Field, an atmospheric scientist at Columbia University who studies Southeast Asia's haze. And because the very ground is burning, "the fires can't be contained until the monsoon." They release not just smoke, but vast quantities of greenhouse gases. Indonesian tropical peatlands, 36% of the world's total, hold an estimated 28.1 gigatons of carbon, according to a 2017 study—more than all the country's upland forests.

The conflagrations are paced by the weather. In 2015, an El Niño in the western Pacific Ocean combined with another irregularly recurring climatic phenomenon called the Indian Ocean dipole to make Indonesia's typically dry summer even drier, Field says. Fires raged from late June until the end of October, burning 2.6 million hectares. The haze affected countries as far away as Thailand and the Philippines.

Stung by criticism, Indonesian President Joko Widodo promised action. In January 2016, he established the Peatland Restoration Agency (BRG) in Jakarta, which is trying to restore more than 2.6 million hectares of degraded peatlands—two-thirds within corporate concession areas, the rest in government hands—by 2020. The agency blocks drainage canals, often with simple earthen or wooden dams designed in some cases to allow small boats to pass, says BRG head Nazir Foead. It also replants degraded areas with native vegetation and encourages local communities to use the lands in a sustainable way for fishing and planting crops adapted to wetlands, such as sago palm. By the end of 2018, the agency had initiated restoration projects in 366 villages in seven provinces, Foead says.

To remove the incentive to set fires—as well as preserve Indonesia's remaining rainforests—the government in 2018 decided not to grant new licenses for oil palm plantations, instead focusing on boosting yields from existing sites and lessening their environmental impact. And in August, Indonesia made permanent a temporary moratorium on converting primary forests and peatlands to agricultural use. The government has also promised stricter enforcement of laws that make concession holders responsible for fires in their holdings, regardless of whether they are deliberately set. Penalties can include criminal prosecution.

Because the years since 2015 have been relatively wet, the measures had never really been tested—until this year. The Indian Ocean dipole again gave Indonesia an extremely dry summer, Field says. When that happens, "You can't expect no fires and haze; the way to look at it is to see if there is improvement," he explains.

Peatswamp forest fire landscape in Central-Laöimantan. Photo: Hans Joosten.

BRG claims there is, and Wijaya agrees. Field inspections found no indications of fires at 65% of the village restoration sites. Between January and 15 September, fires consumed 330,000 hectares, according to Indonesia's Ministry of Environment and Forestry—less than 13% the toll of 2015. But some restored peatlands are still burning, says Bambang Saharjo, a fire forensics expert at IPB University in Bogor, Indonesia, pointing to shortcomings in the restoration program. For one thing, BRG directly manages projects only on nonconcession and village lands; it provides technical advice to oil palm concession holders but can't guarantee compliance, Saharjo says. He says the agency should monitor groundwater levels in peatlands to check the progress of restoration. Meanwhile, a different agency oversees restoration efforts in logging concessions, further confusing restoration efforts.

Moreover, loopholes limit the effectiveness of both BRG's efforts and the ban on forest conversion, says Yuyun Harmono, climate justice campaign manager for the Indonesian Forum for Environment in Jakarta, an affiliate of Friends of the Earth. For example, the maps defining where the permanent moratorium applies are incomplete and often revised. And enforcement is lax, Harmono and others say. Indonesian courts found a number of concession holders liable for damages from the 2015 fires, but the government has still not moved to collect GMCpayment, he says. "We need to ensure that companies [setting fires] fear law enforcement," Harmono says.

- https://www.sciencemag.org/news/2019/10/indonesias-fires-are-bad-new-measures-prevented-them-becoming-worse

Indonesian enforcement questioned as fires flare up on the same concessions as in 2015

At least three companies whose concessions burned in 2015 are also caught up in this year's fires. Much of the fires are on land granted as concessions to plantation companies, which have been routinely accused of burning forests as a cheap way of clearing the land in preparation of planting. One such company is palm oil firm PT Ricky Kurniawan Kertapersada: this year, some 1,200 hectares of its concessions have been burned, according to Rasio Ridho Sani, the Indonesian environment ministry's head of enforcement. In 2015, 591 hectares of the company's land were also burned, for which it was sued by the government and ordered by a court to pay 192 billion rupiah ($13.6 million) in fines. (It has still not paid.) "And now [the company's concession] has burned again," Rasio told reporters in Jakarta on Oct. 1. "We've sealed off the concession." At least two other companies in Sumatra have also experienced fires on their concessions this year after a similar problem in 2015, according to Rasio. He said the government would impose heavier sanctions on repeat offenders, including revoking their permits entirely. Companies with fires on their concessions typically receive a warning and have their permits suspended temporarily, but are invariably allowed to resume operations soon after. The fact that many of the same

companies responsible for the fires in 2015 are also implicated this time around is echoed in a recent Greenpeace report, which finds that the past offenders largely went unpunished or received only mild sanctions.
Greenpeace analyzed official government data and maps to identify the concessions with the most burned area between 2015 and 2018, how often they burned during that period, and the companies or conglomerates that held these concessions. The NGO then analyzed details of the palm oil and pulpwood companies with the largest areas of burned area during that period to identify whether serious civil and/or administrative sanctions have been handed down. The analysis found that of the 10 oil palm plantation companies identified, not a single one had had its permit revoked by the government. "So none of these 10 companies received [heavy] sanctions, even though their [burned] areas were big," Kiki Taufik, the global head of forest campaigns at Greenpeace Indonesia, said at the launch of the report in Jakarta. Greenpeace also analyzed 12 palm oil groups with the largest total burned area in their concessions between 2015 and 2018, and found that only two — Fangiono Family and Gama — had received serious sanctions from the government.

Repeatedly burned area in Sebangau National Park, Central Kalimantan. Photo: Hans Joosten.

This year, significant numbers of fire hotspots have been detected in seven of these companies' concessions. Kiki said this signaled a failure by law enforcement to prevent repeat fires on these particular companies' land. He described the law enforcement measures taken in 2015 as "weak and inconsistent." Responding to the report, Rasio said Greenpeace should have taken a broader look at enforcement actions taken by the ministry recently by comparing them to measures taken before 2015. Since 2015, the ministry has sued 17 companies in forest fire cases and won nine of the cases. Those companies have been ordered to pay a combined 3.15 trillion rupiah ($223 million) in fines, but only one, PT Bumi Mekar Hijau, has paid its tab of 78 billion rupiah ($5.5 million). Court hearings are underway in five cases, but have yet to begin for three others. Rasio said the scale of the fines was unprecedented for any industry across Indonesia, signaling the environment ministry's seriousness about cracking down on forestry-related violations. He also said the government had sealed off 64 concessions in Sumatra and Kalimantan, 20 of them owned by foreign companies, and had pressed criminal charges against eight of them. He acknowledged there was room to strengthen enforcement to prevent a repeat of the burning that occurs annually. "Since 2015 until now, we've studied the law enforcement that we've done [and seen that] it has just given a shock therapy effect, but not a long-term deterrent effect," Rasio said. He said the ministry would ramp up its efforts, including punishing companies for benefits gained from burning their land. At present, companies that are fined for burning and have their licenses suspended can resume planting once the suspension

ends. Rasio said the ministry was now looking at ways to fine companies that had developed plantations on land burned within the past two years.

The central government is also calling on local authorities to be more vigilant about violations on concessions granted locally. Rasio said this would put local governments on the front line, as intended when the process of issuing permits was decentralized from Jakarta to the regions, and increase the scope of law enforcement against violating companies.

While Greenpeace found that law enforcement against palm oil companies was lax, it said the government issued more serious sanctions against pulpwood companies with burned concessions, revoking three licenses between 2015 and 2018. But Greenpeace noted inconsistencies in enforcement, with the companies with the largest burned areas or more frequent fires not receiving severe punishments. For instance, the government-owned Perhutani/Inhutani and related companies had the second-largest area of burned land on their concessions during this period, but received just two serious civil and administrative sanctions. Greenpeace also found discrepancies in enforcement related to concessions owned by or affiliated with the two largest pulp and paper producers in Indonesia, Asia Pulp and Paper (APP) and Asia Pacific Resources International Holdings (APRIL). These concessions are held by APP affiliates PT Bumi Andalas Permai, PT Bumi Mekar Hijau and PT Arara Abadi as well as APRIL affiliates PT Sumatera Riang Lestari and PT Sumatera Silva Lestari. According to Greenpeace, PT Bumi Andalas Permai had the single largest burned area (81,800 hectares) of any concession in Indonesia between 2015 and 2018 across all commodities — and yet the company was only ordered by the government to not replant on the burned land. Another APP supplier, PT Bumi Mekar Hijau, was fined 78 billion rupiah by a court over fires on 20,000 hectares of its concessions in 2014. In 2015, another 63,000 hectares of its concession burned again. As a result, PT Bumi Mekar Hijau had the third-largest burned area of any concession in Indonesia between 2015 and 2018. “And yet, the only serious civil or administrative sanction received by the company that year was a temporary license suspension, but that was for replanting on previously burned land, not for the fires themselves,” Kiki said. PT Arara Abadi, another APP affiliate, was found by Greenpeace to have fires flaring up on its concession every year between 2015 and 2018. “Arara Abadi had 115 km^2 of its concession burned, but the company never received any sanctions,” Greenpeace forest campaigner Rusmadia Maharuddin said.

APRIL affiliates PT Sumatera Riang Lestari and PT Sumatera Silva Lestari were also found to have fires on their land every year from 2015 to 2018. Fires were also detected on PT Sumatera Riang Lestari’s concession as recently as early 2019. The company had its permit suspended in 2015 and received a government compliance order in 2017. PT Sumatera Silva Lestari only received a government compliance order once, in 2016. The government recently sealed off part of PT Sumatera Riang Lestari’s land. “However, a criminal investigation against the company was dropped in 2016 because there was a lack of evidence,” Kiki said.

Both APP and APRIL have refuted the findings in Greenpeace’s report, saying they’re based on inaccurate data. APP said some of the companies listed in the report weren’t even its suppliers and “to ensure accuracy, fire-related data should be obtained from the authorized government agency.” Greenpeace said accurate company concession data were not readily available in Indonesia, and thus it had to compile concession data from a variety of sources. As a result, there might be some inaccuracies despite efforts to make the data as accurate as possible, Greenpeace said. APRIL questioned the accuracy of the so-called burn scar map data used by Greenpeace, based on remote-sensing analysis of freely available medium-resolution optical-based satellite imagery and hotspot detection alerts. APRIL said there were various technical factors that could skew the accuracy of the burn scar map, such the level of certainty for hotspot detection, and cloud cover and cloud shadow affecting the results. “We’ve suggested a number of ways in which the accuracy of burn scars analysis can be improved,” APRIL sustainability operations manager Craig Tribolet told Mongabay. “For example, we believe that only hotspots with a confidence level of more than 90 percent should be included, as it is only above this level that a hotspot is more likely to be an actual fire.“ Given the high level of uncertainty, he said the kind of analysis that Greenpeace carried out would have to be supported by on-the-ground verification. Tribolet said APRIL had verified all the burned areas in its concessions from 2015 to 2018 and found a large difference between its final result, 1,300 hectares, and the total size derived by Greenpeace, 55,600 hectares. Tribolet said APRIL had been able to reduce burned area in the community land outside its forestry concession areas by 90 % since 2014 through the company’s Fire-Free Village Program. “The accuracy of APRIL and its supplier partners’ burn area over the period under study is only a fraction of that estimated in Greenpeace’s report,” Tribolet said. “This is something we’ve offered to clarify with Greenpeace.”

There’s also discrepancy between the number of hotspots in the Greenpeace’s report and the one identified by APRIL. As of the end of August, APRIL had identified 384 hotspots in its concessions, but said 245 of them were

confirmed as not being related to fires and only about 30 were confirmed as fires. The Greenpeace report showed there were 483 hotspots as of Sept. 16 in PT Sumatera Riang Lestari's concession. But that concession and that of fellow APRIL affiliate PT Riau Andalan Pulp and Paper are among five that have been sealed off by the environment ministry this year in Sumatra's Riau province, according to a document obtained by Mongabay. APRIL said the sealed concessions were those of the burned areas only, both of which were community-related fires, not the entire concessions.

Using remote-sensing technology to derive a figure for burned areas is less than ideal, according to David Gaveau, a landscape researcher at the Center for International Forestry Research (CIFOR). However, he said the data could be improved if APRIL were to publish its own burn scar maps. "If APRIL is questioning the ministry's data, they should publish their burn scar maps to the public for comparison," Gaveau told Mongabay. "At the moment APRIL does not share this information so it is impossible to compare and this casts doubts."

- https://news.mongabay.com/2019/10/indonesia-forest-fires-palm-oil-pulp-paper-concession-greenpeace/

Peatland Restoration Agency: 90 % of fires was intentional

After seeing a decline in severe incidents of forest and land clearing fires in the past three years, parts of Sumatra and Kalimantan are once again smothered by toxic smoke. Fingers were immediately pointed at the Peatland Restoration Agency (BRG), a non-structural agency set up by President Joko Widodo in 2015. With the mandate until 2020, the agency has so far restored 679,000 hectares.

It now seems the agency's three years' worth of work has also gone up in smoke. The National Disaster Management Authority BNPB stated that the fire has razed around 27 % of the restored peatlands in Sumatra and Kalimantan or 89,000 of the total 328,000 hectares as per the end of August. The number is not a far cry from the 29 % of the 2015 inferno. Many environmental institutions view the agency a failure. Nazir Foead, BRG's chief, begged to differ. "The restoration helped minimize the fires but the ones that were not yet restored burned too ferociously," Nazir said in a special interview with *Tempo* Thursday September 26.

Nazir Foead, chief of the Indonesian Peatland Restoration Agency BRG. Photo: Hans Joosten.

In the interview Nazir explained the complexity in fixing the peatland ecosystems, his anger at perpetrators behind the fires and his dream to drive economic activities in the peatlands. "If economic activities run well, people won't be tempted to burn the lands," reasoned the forestry graduate of the Gadjah Mada University, Yogyakarta. Excerpts: *Some environmental institutions view that the 2019 haze disaster cannot be separated from the failure in restoring the peatlands. What is your response?* I disagree. I reiterate that the data shows

few hotspots in the areas that we have restored. So, the restoration helped minimize the fires but the ones that were not yet restored burned too ferociously. *In reality, the percentage of the burned peatland is not very different from that of the 2015 disaster.* Yes, we have to acknowledge that the progress has not been optimal, however, there is no fire at all in the areas where we intervened. For example, in Riau, we prepared data tabulations for each village complete with the location of canals, canal partitions and the description of the burned areas. On average, almost 30 % of it was burned and the remaining 70 % was not. So, the comparison is one to two. *The burned areas were also located only in the outskirts of villages they share the borders with. How much?* Two percent of the total area targeted for restoration. *How crucial is peat in the land fires?* Unquestionably crucial. Three years ago, I consulted with an American forest fire expert. Throughout his career in America, he said he only dealt with wildfires. There, when there are peatland fires, only the melting snow in spring – around April – can extinguish them. Similar to downpours in Indonesia. Meanwhile, fires usually break out in July-August. So, they have to wait for eight months. In fact, the thickness of their peat layer is only about three meters. Compare it to ours, which has tens of meters in thickness. *Doesn't America have advanced fire-fighting technologies such as aerial water bombing?* I asked him about that and he laughed. He said that it served only to give the impression that the personnel were working, (laughs)...Aerial bombing only douses the surface fire but the fire continues to burn underneath. *Does it mean the government's planned artificial rain will be futile?* No, as long as it is heavy. It also depends on how long the areas have been burning. It will be able to put out newly ignited fires but beyond that, we would still need manual extinguishing which involves keeping the nozzle of the hose underground and spraying the ground. One can also water the ground the usual way but taking several minutes in each patch of land. *There are reports saying that the hotspots originated in oil palm plantations. How come?* There are in the concession areas, but small. Likewise, in the industrial plantation forest concession lands. In general, they are caused by fires from adjacent areas. Bigger fires are outside the concession areas. *What does the peatland restoration agency think started the fire?* Pak Doni (BNPB Chief Doni Monardo) said that 99 % was caused by humans. I say 90 % of the fires was intentional and only nine % was accidental as per the finding of the coordination meeting with the BNPB participated by peat and forest fire experts last April. What's worse is they were done by tycoons, because the fires are massive. *Do you know their identities?* Wait and see who plant there later. They are people with influence, either economically or politically. They have the capital to mobilize a certain number of people to simultaneously torch hundreds of hectares of lands. We have to find the perpetrators including their financial sponsors. *Who are they?* The police have more information. *In reality, many investigations and lawsuits against these suspects are dropped.* I don't want to comment on that.
Read the full interview in Tempo English Magazine

- https://en.tempo.co/read/1252726/peatland-restoration-agency-90-percent-of-fires-was-intentional

10 million children at risk from air pollution due to wild forest and peatland fires

Wild forest and peatland fires across Kalimantan and Sumatra in Indonesia are putting nearly 10 million children at risk from air pollution, UNICEF declared on 23 September 2019. Small children are especially vulnerable to air pollution because they breathe more rapidly, and their physical defenses and immunities are not fully developed. It is estimated that 2.4million children under five live in the areas most affected by the haze and wild fires, which have been burning in Indonesia since July 2019.

UNICEF warns that air pollution affects babies even before they are born. Research has shown that babies born to mothers exposed to high levels of pollution during pregnancy are more likely to experience reduced growth while in utero, low birth weight, and b e delivered preterm. "Poor air quality is a severe and growing challenge for Indonesia," said Debora Comini, UNICEF Representative. "Every year, millions of children are breathing toxic air that threatens their health and causes them to miss school – resulting in lifelong physical and cognitive damage." According to the Ministry of Education and Culture, more than 46,000 schools are currently affected by poor air quality, impacting more than 7.8 million students. Many schools have had to be closed in the most affected areas, depriving learning opportunities from children."

- https://www.unicef.org/press-releases/indonesia-10-million-children-risk-air-pollution-due-wild-forest-fires

Schoolchildren in Central-Kalimantan. Photo: Hans Joosten.

Professor Guillermo Rein, a fire scientist, explains why smouldering peatland fires are so dangerous and why we know so little about them: https://horizon-magazine.eu/article/picture-not-enough-people-are-aware-monster.html

The politics of peat and fire: https://forestsnews.cifor.org/62142/the-politics-of-peat-and-fire?fnl=en

Indonesian court fines palm oil firm $18.5m over forest fires in 2015

A court in Indonesia has ordered palm oil company PT Arjuna Utama Sawit to pay the equivalent of $18.6 million in fines and damages for fires on its land in Borneo in 2015, in the latest instance of a zero-tolerance enforcement approach against concession holders. The fires razed 970 hectares of forest in Katingan district, Central Kalimantan province. The company, a supplier to Singapore-based Musim Mas Group — which has committed to a "no deforestation, no peat and no exploitation" (NDPE) policy to ensure the sustainability of its palm oil supplies — holds a concession to manage 16,600 hectares in the district. The Indonesian Ministry of Environment and Forestry sued PT Arjuna Utama Sawit at the court in Palangkaraya, the provincial capital. On Oct. 23, the court found the company violated environmental regulations and ordered it to pay 99.6 billion rupiah ($7.1 million) in fines to the ministry and 162 billion rupiah ($11.5 million) for the environmental damages incurred.

The judgment, while far from the largest won by the state, is notable because it marks the latest instance of a growing push by the government and courts to take a zero-tolerance stance against companies with fires on their concessions. Winning a judgment is one thing; collecting the fines, though, could prove difficult. Prior to the PT Arjuna Utama Sawit, Indonesia had won judgments against nine companies in forest fire cases since 2015. Those companies were ordered to pay a combined 3.15 trillion rupiah ($223 million) in fines, but only one has paid its tab of 78 billion rupiah ($5.5 million).

- https://news.mongabay.com/2019/10/palm-oil-indonesia-arjuna-utama-sawit-musim-mas-forest-fires/

Indonesian provinces of Riau and Jambi shut schools due to haze caused by peatland fires

Indonesia's Disaster Mitigation Agency said more than 3,600 fires have been detected on Sumatra and Borneo, leading to very poor air quality in six provinces with a combined population of more than 23 million. The authorities have deployed more than 9,000 people to fight the fires, which have razed more than 162,000ha of land in the provinces of Riau, Jambi, South Sumatra, West Kalimantan, Central Kalimantan and South Kalimantan.

Several thousand schools in Riau's capital Pekanbaru and three other cities and districts have been closed since Sept. 10. The Indonesian government has deployed almost 10,000 disaster agency personnel and 37 planes to extinguish forest fires in the country, a disaster official said on Sept. 8

- https://www.straitstimes.com/asia/se-asia/indonesian-province-shuts-schools-due-to-forest-fire-haze
- https://www.washingtonpost.com/world/asia_pacific/indonesian-province-shuts-schools-due-to-forest-fire-haze/2019/09/11/e3048096-d464-11e9-8924-1db7dac797fb_story.html
- http://www.xinhuanet.com/english/2019-09/10/c_138379685_4.htm

Air quality worsens as smog blankets provinces

Smog caused by forest and land fires continues to haunt some regions in Indonesia and neighboring countries as the unhealthy air quality has put a halt to school and outdoor activities and affected the health of thousands. Data compiled by the National Disaster Mitigation Agency (BNPB) as of September 11 showed that smog had engulfed South Sumatra, Jambi, Riau as well as West, East and South Kalimantan. Between January and August, a total of 328,724 hectares of land were burned, 89,563 ha of which were peatland. The regions recording the largest area of burned land were Riau with 49,266 ha and Central Kalimantan with 44,769 ha

- https://www.thejakartapost.com/news/2019/09/13/air-quality-worsens-smog-blankets-provinces.html

Walhi urges government to evaluate peatland restoration

The Indonesian Forum for the Environment (Walhi) has urged the government to evaluate the implementation of the national peatland restoration following constant numerous forest fires in large areas. West Kalimantan Walhi Director Anton P. Wijaya said on September 11 that the evaluation must soon be done as forest fires continue to happen despite the constructions of the program's infrastructures. He says someone must take responsibility. He argues that the Peatland restoration agency must be responsible for the current smog from forest fires, especially if the areas that are experiencing the fires already have programs that see wetting of peat soils. The Walhi director also suggests that the Environment and Forestry Agency (KLHK) together with the Ministry of Agriculture should take responsibility for forest fires that continue to take place in concession lands, whether it is plantations or productive forests.

- https://en.tempo.co/read/1246950/forest-fire-walhi-urges-govt-to-evaluate-peatland-restoration?Engteco_newsUtama&campaign=Engteco_newsUtama_Click_1

'We've been negligent,' Indonesia's president says as fire crisis deepens

Indonesia's president has admitted negligence on the part of the government, as top officials engage in a blame game amid the worst spate of forest fires since 2015 that's sending clouds of toxic haze across large swaths of the country and abroad. This year's fires, most of them set deliberately to clear land for planting, have burned nearly 340,000 hectares as of Aug. 31. "Ahead of the dry season, everyone should have been prepared," President Joko Widodo said on Sept. 17 during a meeting with officials in Sumatra's Riau province, one of the worst-affected regions. "But we've been negligent again [this year], so the haze has become big," he added.

He reminded the officials that during a meeting in Jakarta in July, he had emphasized the importance of preventive measures to stop the fires spreading out of control. "Because if there are already fires, especially on peatland, then it's very hard to extinguish [them], based on our experiences in past years," he said. Widodo also lamented the failure of the relevant state institutions, including the police and the military, to respond quickly enough to the fires. "We have it all, but these instruments aren't activated well," he said. "If they're activated well, then I'm sure a single fire hotspot will be detected first before it grows into hundreds of fire hotspots. And I've reminded that numerous times. What we're dealing with here isn't forest [fires], but peatland, which if it's already burned, then no matter how many million liters [of water] we expend, it's still difficult to extinguish."

The president's remarks come after several of his top aides issued a series of widely ridiculed claims about the fires, haze, and their cause. Siti Nurbaya Bakar, the environment minister, was criticized for denying that the fires in Indonesia were sending haze to Malaysia and Singapore, despite overwhelming evidence to the contrary. Meanwhile, the president's chief of staff, Moeldoko, called on people affected by the haze to be patient and pray, blaming the disaster squarely on "God." The country's chief security minister, Wiranto, had a different take, blaming smallholders for setting the fires. He then also claimed that there was a political angle to the arson, linking the burning to the elections that took place in April.

In light of these claims, environmental activists have welcomed the president's acknowledgement of the government's lack of preparedness to deal with the fires. But just admitting it isn't enough, said Khalisah Khalid, head of politics at the Indonesian Forum for the Environment (Walhi), the country's biggest green NGO: "If [the

president] is really angry, then he should evaluate all ministries, government institutions and local governments. He has to do a comprehensive evaluation to find out where the bottleneck is. What's preventing [forest fire mitigation from being effective]?"

Activists and experts have long identified the problems hindering the government's efforts at preventing forest fires. These include ineffective enforcement of fines for companies found guilty in court of setting fires; lack of coordination between government agencies responsible for various aspects of fire prevention and mitigation; and lack of transparency over a government program to restore degraded peatland across the country.

"Threatening public officials during forest fires is a waste of time," Teguh Surya, the director of Yayasan Madani Berkelanjutan, another environmental NGO, said. "If he wants to give an ultimatum, then do it before the forest fires, so that fire prevention truly happens." Khalisah said she suspected the government wasn't serious about tackling forest fires, given that many top officials also have business interests in the agriculture and forestry industries, including palm oil, whose expansion contributes to the annual forest fires. She pointed to the government's continued refusal to publish data and maps about oil palm plantations, in violation of a ruling by the country's highest court that declared such information to be of public interest and to be disclosed immediately. If Widodo is truly committed to tackling forest fires, Khalisah said, then transparency should be high up on his agenda.

- https://news.mongabay.com/2019/09/indonesia-haze-fire-forest-jokowi-negligent/
- https://news.mongabay.com/2019/09/indonesian-minister-draws-fire-for-denial-of-transboundary-haze-problem/

Forest fires burn 2,200 ha in Jambi, threatening carbon trade deal

Forest fires in Jambi province over August have burned an estimated 2,200 hectares of land, leading to concerns that they will derail the province's attempts to get funding from a carbon trade deal. The Jambi regional administration has initiated a carbon trade partnership with the World Bank under the project Bio Carbon Fund (BioCF). The fires, however, may disrupt this partnership. Warsi Indonesian Conservation Community (KKI Warsi) director Rudy Syaf said that forest fires had occurred from July until August, with around 60 to 70 percent of the burned area being peatland. "With regard to carbon trading the government must properly measure the amount of carbon emissions in Jambi province," Rudy said. Rudy added that forest fires should be avoided if forest and peatlands are to become a new alternative source of income for the provincial government. Taking into account the value of a decrease in emissions, a large amount of income will be lost by the provincial government and local residents if forest fires continue.

- https://www.thejakartapost.com/news/2019/08/26/forest-fires-burn-2200-ha-in-jambi-threatening-carbon-trade-deal.html

Sumatran elephant sanctuary under threat from bridge and port projects

The planned construction of a bridge and private port in southern Sumatra threatens to damage one of the last remaining habitats of the island's critically endangered elephants. The project is part of the South Sumatra provincial government's tourism development drive, under which it plans to build a bridge from the Sumatran mainland to the island of Bangka. The site where the bridge will begin has also been earmarked for construction of a private port by a subsidiary of Indonesia's biggest paper producer, Asia Pulp & Paper (APP). Environmentalists say both proposed projects will damage a crucial habitat of the Sumatran elephant (*Elephas maximus sumatranus*), a critically endangered species whose population has plunged as a result of habitat loss, human-wildlife conflicts, and poaching. Forests in the area are already under intense pressure. APP's pulp and paper mill, said to be the biggest in Indonesia, has been lambasted by critics who say it will drive APP's appetite for pulpwood, compelling the company to clear more natural forest and peatlands. The mill has a greater production capacity than initially advertised. The location in question includes the Padang Sugihan Sebokor Wildlife Sanctuary, a particularly important hub for the elephants as it connects smaller populations in several other fragments of forest. Combined, these peatland habitats are home to an estimated 152 elephants, according to Jumiran, a local elephant conservation official. In December last year, conservation groups recorded five new elephant calves, indicating that the population is thriving in the sanctuary.

- https://news.mongabay.com/2019/08/sumatran-elephant-sanctuary-under-threat-from-bridge-port-projects/

Nazir Foead (left), the chief of the Indonesian Peatland Restoration Agency (BRG), sprays water to peat soils. Photo: BRG.

Haze from fires is back, maintenance of existing rewetting infrastructure necessary

Three years after forest fires in Indonesia sent huge volumes of smoke billowing into Malaysia and Singapore, the Southeast Asian neighbors are dealing with a repeat of the "embarrassing" transboundary haze problem.

The BRG is in charge of overseeing efforts to block the drainage canals and rewet peatlands. It has also drilled nearly 12,000 wells to provide easily accessible water for firefighting efforts as of 2018. BRG chief Nazir Foead acknowledged that canal-blocking infrastructure built in the past three years needed to be checked again. "Indeed, the construction of canal blocks hasn't reached all areas that are prone to fires," he said. "Furthermore, since 2016 we've been prioritizing local people to build canal blocks, instead of big contractors, of course using simple technology that can be mastered by the locals." This year, the agency is allocating 10 percent of its construction budget on maintaining existing infrastructure, Nazir said. He added the agency had detected peatlands drying out at worrying rates in regions vulnerable to peat fires. "At the end of May, the water level in peatlands detected by our monitoring stations started to decline, approaching 0.4 meters below the surface," he said. To keep peat soils resistant to fire, the water level has to be maintained at or above that level, he said. Any lower and the peat will catch fire easily; once that happens, the fire will be difficult to extinguish, Nazir said. As of July, the average water level at 90 locations monitored by the BRG had dropped below that critical threshold, with peatlands in Riau particularly very dry in the first three weeks of July. In Riau's Indragiri Hilir district, the water level at some points had dropped to 1.2 meters below ground level.

In addition to the preventive measures overseen by the BRG, the government has enlisted police and soldiers to help in the firefighting efforts. It has also declared a state of emergency in six provinces, including Riau, Jambi and South Sumatra, and West Kalimantan, Central Kalimantan and South Kalimantan in Borneo.

At the local level, however, officials don't appear to see the problem as being quite so urgent. Riau Governor Syamsuar said the haze was at an acceptable level, despite the fact that nearly 7,300 residents have reported respiratory ailments as a result of the smog. In South Sumatra, Governor Herman Deru blamed some of the fires on a convoluted quirk of optics. "Let me give an example: There's a car on a road and then there's dry land in front of it. The reflection [of the sunlight] from the windscreen could spark fires there," Herman said as quoted by Merdeka.com. "So don't think these [fires] are because of negligence or something intentionnal." He also said some of the fires were sparked naturally, by branches "rub, rub, rubbing together." In Central Kalimantan, Governor Sugianto Sabran has offered a reward of $350,000 to any shaman who can summon three days of rain

to extinguish the raging fires across the province. “Rather than using helicopters, this [way] is cheaper,” Sugianto said as quoted by Fajar.co.id. “But don’t just make it rain in certain areas, it has to be uniform.”

The return of the fires and haze this year coincides with a Supreme Court ruling holding the government, including the president, liable for the 2015 disaster. The government, having been defeated in three courts now, still plans to challenge the latest ruling. The Indonesian Forum for the Environment (Walhi) has blasted this continued refusal to be held to account and take meaningful fire-prevention measures, as demanded by the plaintiffs, that it says could have staved off the disaster that’s currently unfolding. “Amid the environmental emergency that threatens people’s environmental and health rights like now, the Supreme Court’s ruling related to forest fires hasn’t been immediately executed [by the government],” Walhi said in a statement. “Instead, the President filed a challenge. The government’s attempt to challenge the ruling isn’t relevant and hurts people’s hearts amid the fact that hotspots and haze keep increasing in number.” Wahyu A. Perdana, who heads Walhi’s department for food, water and essential ecosystems, also said the president’s statement on pushing investments, including in forest areas and peatland, cast further doubt on the government’s commitment to fighting forest fires. The president last month threatened to “chase” and “beat” anyone hampering investment in the country — a statement that activists say raises the prospect of increased exploitation of Indonesia’s forests. He also ordered the environment minister to “close your eyes” to prevailing regulations when issuing permits for forest concessions. Even Sembiring, Walhi’s head of policy analysis, said the president’s remarks were misguided in light of the current fire and haze episode, given that it was unbridled investment in the country’s forest areas that led to the annual forest fires. “If [the president] is still talking about investments, what else [does he] want to destroy?” he said. “What [he] should talk about is how to fix investments.” The government could start doing that by reviewing the permits already issued to make sure that companies with fires on their concessions are held to account, he said.

Eko Cahyono, an agrarian researcher at the Bogor Institute of Agriculture (IPB), said forest fires remained an annual event in Indonesia because the government never addressed the root of the causes. “So what’s the root cause of these fires? It’s clear that the hotspots are in companies’ concessions,” Eko said. “But the solution [by the government] is [to improve] the technology, such as firefighting systems. They never want to address the root cause. Do they have the courage to revoke [the permits of] companies with violations?”

- https://news.mongabay.com/2019/08/haze-from-fires-indonesias-national-embarrassment-are-back/

Hopes high that permanent ban on forest and peatland clearance will stop deforestation

Following President Joko “Jokowi” Widodo’s signing of a presidential instruction to upgrade a moratorium on the issuance of new business permits for use of forest and peatland areas to a permanent ban, hopes are rising that Indonesia’s remaining forests can be protected. In August, Environment and Forestry Minister Siti Nurbaya Bakar declared that the government had kept its promise by issuing a permanent ban on new permits for forest and peatland areas. “I made sure the President signed the instruction on Aug. 5. It will upgrade the previous instruction to a permanent ban and improve primary forest and peatland management,” Siti said. She added that the instruction would be followed by an executive order.

The restricted area, which covers around 66 million hectares, or 35 percent of the country’s total land mass, will be stipulated in an indicative map (PIPPIB). Around 52.3 million ha of the restricted area is still covered by primary forests. The total restricted area is actually less than the 69 million ha designated in the initial 2011 moratorium, as the presidential instruction mandates the government to revise the PIPPIB every six months. The restriction, however, will not apply to any projects related to environmental restoration, the construction of government or regional administration offices, national strategic projects, defense and security infrastructure as well as public safety support systems. The government will also allow companies that were granted permits in forest and peatland areas prior to the moratorium in 2011 to continue their business activities. Siti claimed the moratorium had succeeded in reducing deforestation by around 38 percent within the restricted area. She added it had helped the country fulfill its cooperation commitments with Norway under the Reducing Emissions from Deforestation and Forest Degradation (REDD+) scheme.

Two ministers, central in tropical peatland conservation: Siti Nurbay (Indonesia, l.) and Arlette Soudan-Nonault (Rep. of Congo). Photo: Hans Joosten.

In February, the Indonesian and Norwegian governments agreed that the latter would pay the former for successfully reducing its carbon emissions by decreasing its deforestation rate in 2017. According to data from the Environment and Forestry Ministry, the country saw a decline in the deforestation rate in 2017, with 480,000 ha of forest lost — a figure slightly lower than previous years. The decrease is believed to have prevented the release of about 4.8 million tons of carbon emissions into the atmosphere. "This decrease in deforestation along with changes in forest use plans have shown forest and peatland management has improved over the years," Siti said.

While the permanent ban has been welcomed as a solution to deforestation, environmental group Greenpeace argued the plan would be ineffective in protecting forests and peatland. According to Greenpeace's mapping analysis, around "1.2 million ha of forest has been lost inside moratorium areas in the seven years since it was first introduced [in 2011] at an average annual rate of 137,000 ha per year." "Deforestation and forest fires have continued inside moratorium areas and boundary maps get regularly redrawn to remove forest or peat areas that are of interest to plantation companies. Making it permanent [...] won't stop forest and peatland degradation in Indonesia," said Kiki Taufik, the head of Greenpeace Southeast Asia's Indonesian Forests Campaign in a statement. Further analysis conducted by the organization discovered that a total area of 4.5 million ha of forest and peatland was removed from the moratorium's PIPPIB. New permits have also been issued for around 1.6 million ha of restricted land for oil palm plantation, pulpwood and mining companies. Kiki argued the President should push for the full implementation of a long-awaited one-map policy and strengthen the government's commitment to preventing deforestation and wildfires to ensure the ban was effective.

- https://www.thejakartapost.com/news/2019/08/17/hopes-high-permanent-ban-on-forest-peatland-clearance-will-stop-deforestation.html

Greenpeace dismisses permanent forest clearance moratorium as inadequate

Indonesian Minister of Forestry and Environment Siti Nurbaya Bakar announced on 8 August that President Joko Widodo has issued a permanent moratorium on new forest clearance for the purposes of palm plantations, logging, and other activities. "The president signed an instruction on stopping new permits and improving

primary forest and peatland governance," Mdm Siti Nurbaya said in a statement. She added that the presidential instruction signed on 5 August mandates that ministers, governors, and other government officials are prohibited from issuing new permits within the moratorium area. According to Greenpeace, the deforestation rate in Indonesia is one of the highest in the world at over 74 million hectares of rainforest being logged, burned, or experienced degradation in the last 50 years. That's an area of nearly double the size of Japan.

While the moratorium might seem like it would be a welcomed move, Greenpeace Indonesia forest campaigner Arie Rompas was quoted by Reuters as saying that it still does not provide adequate protection for the remaining tropical forests in Indonesia in the long run, lamenting the lack of punishment and loopholes in current regulations. "The policy should not be via a presidential instruction because it is the weakest among legal instruments," he chided. According to data from the Indonesian Ministry of Forestry and Environment, the area mapped out for the moratorium was decreased from 69.1 million hectares previously to the now 66.1 million hectares. The Greenpeace campaigner said, "If it's a permanent one, changing the map should not be allowed anymore." He added that Greenpeace discovered permits for logging, mining, palm-oil and pulp wood was granted on the 1.6 million hectares from the original moratorium.

As Indonesia announced this permanent moratorium on August 8, Greenpeace revealed that more than a million hectares inside the moratorium area have been burned between 2015-2018 as a result of forest fires. According to their mapping analysis, Greenpeace said "1.2 million hectares of forest has been lost inside moratorium areas in the seven years since it was first introduced, at an average annual rate of 137,000 ha per year. In the seven years before the moratorium was introduced the annual average deforestation rate was 97,000 ha per year." So since the moratoriums, the deforestation rate has more than doubled – exactly what the moratoriums were supposed to curb.

Said Kiki Taufik, Global Head of Greenpeace Southeast Asia forests campaign, "The Indonesia forests moratorium is a good example of government propaganda on forest conservation. It sounds impressive but doesn't deliver real change on the ground. Deforestation and forest fires have continued inside moratorium areas and boundary maps get regularly redrawn to remove forest or peat areas that are of interest to plantation companies. Making it permanent doesn't fix its fundamental weaknesses and won't stop forest and peatland degradation in Indonesia."

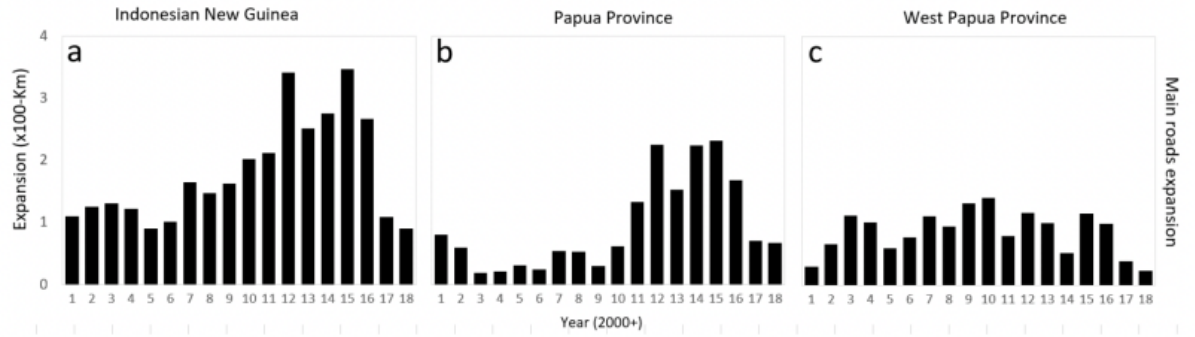
- https://www.theonlinecitizen.com/2019/08/09/greenpeace-dismisses-permanent-forest-clearance-moratorium-by-indonesian-president-as-inadequate-says-deforestation-has-doubled-despite-moratoriums/
- https://www.euronews.com/2019/08/08/indonesia-president-makes-moratorium-on-forest-clearance-permanent

The Papua Atlas: New tool tracks development on remote island, as-it-happens

The Papua region, which makes up the Indonesian half of the island of New Guinea, has often been seen as a 'last frontier'. Rugged, wild and resource-rich, the island holds one of the world's largest and most intact tropical rainforests, which is a 'hot-spot' for a wide range of unique and threatened flora and fauna. Its indigenous communities are famously diverse, too, with over 800 languages spoken and a number of cultures that are still relatively untouched by globalization. Compared to the rest of Indonesia, the Papua region has little infrastructure and high levels of poverty: currently, 53 % of the population don't have access to electricity, and over a quarter of residents live below the poverty line – more than twice the national average of 10.7 %. But thanks to recent government efforts to accelerate infrastructure development and boost connectivity in the region, Papua is poised on the brink of some pretty major developments, which could change its long-held reputation for remoteness and inaccessibility – and which may have major impacts for its communities and ecosystems. The most well-known of these developments, the Trans-Papua Highway – a 4,330 kilometer project stretching from Sorong in the north-west to Merauke in the south-east – is billed to be completed by the end of this year. The government aims to roll out full electrification by then, too. Seaports are being built as part of the maritime highway program, and the road network is expanding as industries like oil palm and mining grow their operations in the region.

Now, a new tool developed by scientists at the Center for International Forestry Research (CIFOR) aims to help planners, officials, policymakers and civil society members to design projects better – and monitor their impacts – in near-real-time. The Papua Atlas is an open-access, interactive online map that tracks data such as forest loss; plantation and mine development; and road construction. It uses satellite data collected yearly from 2001-2018, and collected weekly for 2019, as well as government information on land ownership, to create extremely detailed and engaging time-lapse animations that show how land use has changed over time. The Papua Atlas comes on the heels of a similar tool – the Borneo Atlas – which the team designed for tracking deforestation on

that island. But the Papua version boasts extra layers that track road expansion and mine development. According to CIFOR associate and project lead David Gaveau, these layers allow users "to verify, for example, the extent to which development projects like the Trans-Papua highway are impacting forest cover." Public roads have expanded rapidly after 2010 in Papua province.



Time series (2001–2018) data for main public roads expansion. Documents the annual expansion (in kilometers) of national and provincial roads (including Trans-Papua Highway) in Indonesian New Guinea (a), Papua (b) and West Papua (c) provinces.

Given the area's remoteness, geography and limited local capacity for geospatial analysis, the tool also provides an accessible means for local authorities "to find out the extent to which roads and other infrastructures have actually progressed," says Mohammad Agus Salim, Atlas developer. "They can now verify: did the roads that we've paid for get built? They can look at how the landscape has changed: how many roads have been added in the last 18 years – or just last year – connecting which cities, and so on." For example, the Atlas reveals that public roads have expanded rapidly between 2011 and 2016. "So it's a tool, beyond conservation, for spatial planning by local authorities," he says.

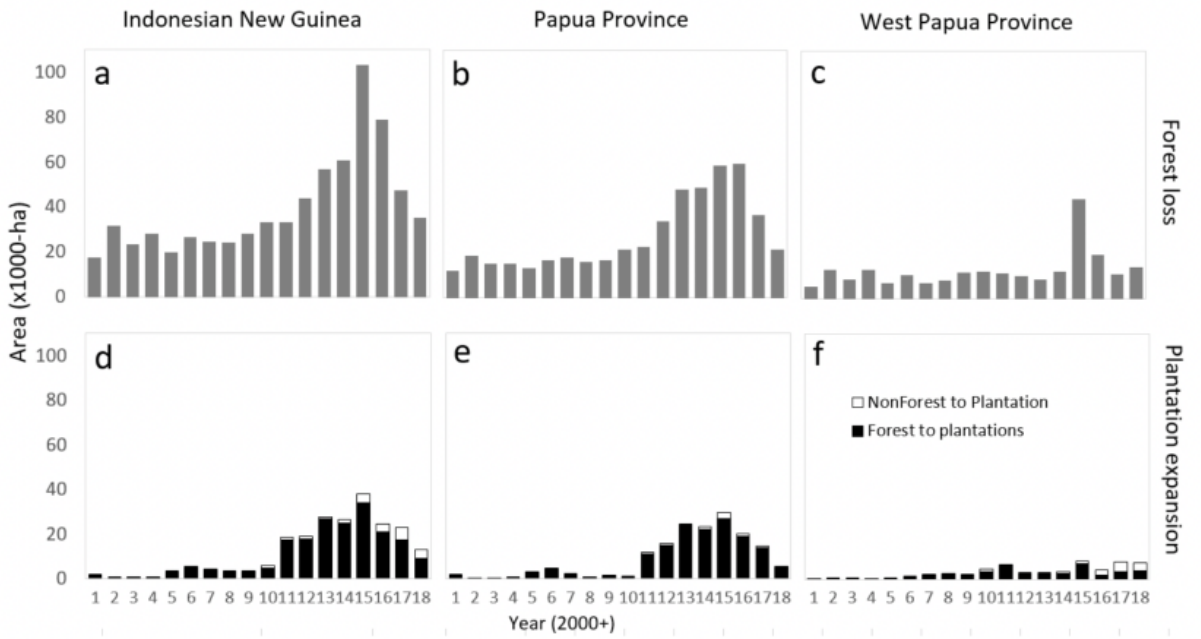
But conservation still remains a central concern of the project – and a hot topic in Papua, where old-growth forests are under threat from oil palm plantation expansion, mining and road expansion. Using the atlas, it's easy to see how annual forest loss in the region grew steadily from 2001 onward, with a concerning spike in 2015-16 of 103,000 hectares and 80,000 hectares lost, respectively. Meanwhile, the area occupied by industrial plantations – mostly oil palm – has more than quintupled from 50,000 ha in 2000 to 272,000 in 2018. Oil palm driven deforestation is not the sole cause of forest area loss, says Gaveau. It accounts for 30 % of total losses between 2001 to 2018. Small-scale agricultural expansion, logging, roads and urban expansion, forest fires, and mining also play a role. "Through our time-lapse visualisations," says Gaveau, "we also uncovered a little-known natural driver of forest loss: the movement of surface water. Expanding lakes, rivers changing course, overflows and surface run-offs cause significant forest loss." The authors will expand on drivers of forest loss in a forthcoming publication.

Hearteningly, the rate of forest loss (and roads expansion) has dropped markedly since 2016, with 2017 and 2018 both tracking much lower rates. According to Gaveau, this is likely due to policies to reduce deforestation and prevent forest fires (such as the 2018 moratorium on oil palm plantation expansion), coupled with a drop in the price of crude palm oil, and international restrictions from emerging no-deforestation markets.

However, Salim points out, forest loss is still higher than pre-2011 levels. "Expansion still continues," he says, "and this platform enables you to quickly detect the companies that continue to clear in 2018 and in 2019."

As the region gears up for significant transition, the developers hope that the Atlas will help government, civil society and consumers across the globe to hold would-be developers to the highest of environmental and social standards as they engage with this precious forested frontier.

- https://forestsnews.cifor.org/62074/the-papua-atlas-new-tool-tracks-development-on-remote-island-as-it-happens?fnl=en



Time-series (2001-2018) of Papua and West Papua's land cover change. Documents the annual loss of forest area (a,b,c) and the concomitant annual expansion (d,e,f) of industrial plantations of oil palm and pulpwood (mainly fast-growing Acacia). The black bars in (d,e,f) represent the forested areas cleared and converted to industrial plantations in the same year (or company-driven deforestation)

Malaysia

Sarawak to host AsiaFlux next year

Sarawak has won the bid to host the next AsiaFlux in Kuching from Sept 22 to 24, 2020. AsiaFlux is organised by the Malaysian Peat Society (MPS), the Sarawak Tropical Peat Research Institute (TROPI) and the AsiaFlux Scientific Steering Committee, and co-organised by the National Institute for Environmental Studies (NIES), and Hokkaido University. With the central theme 'Understanding Tropical and Subtropical Ecosystem Processes', the conference will have a special session on Tropical Peatland. "The main aim is for this conference to act as a platform to create awareness to the government, industries and people especially potential young scientists from South East Asia such as Indonesia, Philippines, Thailand and Vietnam, on the importance of greenhouse gas cycling in guiding sustainable land use policies in the region," said the organising chairperson Dr Lulie Melling. She said, in 2020 Sarawak will be celebrating the 10th anniversary of TROPI Flux Study in collaboration with AsiaFlux (including Korea Flux and Japan Flux). TROPI runs and manages three flux towers to study the carbon and energy fluxes for different ecosystems on tropical peatland in Sarawak. Supported by the Ministry of Tourism Arts and Culture Sarawak, this conference follows up on the 15th International Peat Congress 2016 (Kuching). AsiaFlux2020 is expected "to bring progressive and cutting-edge solutions and breakthroughs to existing peatland development problems that Sarawak and the world is currently facing".

- https://www.theborneopost.com/2019/11/09/sarawak-to-host-asiaflux-next-year/

Malaysia will continue to address palm oil issues via roundtable sessions

Malaysia will continue to engage with European counterparts to address misunderstandings and allegations related to the palm oil industry and simultaneously seeks feedback on the issues and concerns related to the sector. Ministry of Primary Industries secretary-general Datuk Dr Tan Yew Chong said Malaysia had taken concerted efforts to accelerate its model of sustainable development, specifically for the local palm oil industry, whilst continuing to redress the allegations on the vegetable oil to ensure it receives fair treatment at the global level. "Despite all of our efforts, sadly, there are many misunderstandings in Europe which alleges that Malaysia is rapidly deforesting, destroying biodiversity, and so on. Of course I vouch that these allegations are certainly not true, hence, for the purpose of transparency and to assure our relationship is based on utmost trust, I believe that it is crucial for us to have this session to address concerns with our European counterpart," he said in his speech at the Malaysian Palm Oil Roundtable Dialogue in Warsaw, Poland. The dialogue, organised by the

Malaysian Palm Oil Council (MPOC), also aimed at elevating the trade relationship between Malaysia and the European Union (EU) particularly on palm and palm-based products.
Malaysia is the World's second largest producer and exporter of palm oil and this commodity is exported to more than 150 countries, with the EU, China, India, the Middle East, Pakistan, Japan, the US, and South Korea among the top destinations. Tan also elaborated on Malaysia's recent initiatives to clear the air on the commodity, which included capping the total oil palm cultivated area to 6.5 million hectares, stop new planting on new peatland areas and to further strengthen regulations with regard to existing oil palm cultivation on peat soil.

- https://www.thesundaily.my/local/malaysia-will-continue-to-address-palm-oil-issues-via-roundtable-sessions-LF1502184

Drained, deforested and burned peat swamp forest in Sarawak, Malaysia. Photo: Hans Joosten.

Philippines

Leyte peatland degradation reaches alarming level

Concerns have been raised over poor conservation of the more than 3,000-hectare Leyte Sab-a Peatland Forest that resulted in a forest fire, wildlife poaching, and conversion of its portions into agricultural lands. The communities and local authorities are not fully aware of the value of peatland to mitigate the impacts of climate change, said Juvilyn Salazar, Forest Foundation project coordinator for the Leyte Sab-a Peatland Forest Restoration Initiative. "When a peatland expert from Indonesia visited Leyte Sab-a Basin, they considered the area as heavily degraded due to draining. For a peatland to store carbon, it should be wet all the time. Since it is dry, it emits carbon more than accumulates it," Salazar said in a presentation to local government officials on Tuesday 8 October. Draining of water since the 1970s has caused peatland fires over the years. The most recent was recorded last April and it lasted for weeks, Salazar said.
The Leyte Sab-a Peatland Forest in the towns of Alangalang, Sta. Fe and San Miguel in the central part of Leyte province is one of the two major peatlands in the Philippines. Due to lack of awareness or the absence of local policies protecting peatlands, hunting of wildlife in the area such as Philippine tarsiers, bats, migratory birds, and wild pigs have been rampant. Residents have been poisoning threatened freshwater fishes that thrive in the area. About 1,160 hectares of the peatland have been categorized as alienable and disposable land with 660 hectares distributed to farmers under the Comprehensive Agrarian Reform Program. Some 15 % of the area has been cultivated, Salazar said. "Local stakeholders are not aware that soil and water from peatland are not suitable for agriculture since it is acidic. They lack essential elements for crops to grow well," Salazar added.

The International Institute of Rural Reconstruction and Forest Foundation has been implementing the four-year Leyte Sab-a Peatland Forest Restoration Initiative since January 2018. The PHP20 million project aims to produce legal and scientific studies, come up with a comprehensive map of the forest, and raise community and local leaders' awareness on the importance of peatland forest.

The Leyte Sab-a Basin peatland is a large catchment basin with an area of 3,088 hectares, more than half of which has been reclaimed for agriculture. The remaining 1,740 hectares in the eastern half of the basin consists of small remnant areas of swamp forest and grass peat swamp.

- https://www.pna.gov.ph/articles/1082580

Fire in Agusan Marsh

Government foresters were mobilized Friday September 13 to try and put out the fire in estimated 63-hectare wetlands near the protected area of Agusan Marsh in Agusan del Sur province. Some villagers in the area believed that the fire sparked on August 25, 2019. Reports said dark smoke has been billowing from the area for several days since the fire began. According to Bunawan Community Environment and Natural Resources Officer (CENRO) forester Jerome I. Albia the firefighters tried but failed to penetrate into the exact location of the fire because the area is "swampy" and considering the water and vegetation of peat soil. Initial findings believed that about 64 hectare of drained peatland was damaged by fire. He said a drone was used to spot the exact location of the fire and the photographs revealed some areas of peatland were reduced to ashes. "It could be that somebody wants to convert that portion into paddy fields". Peat does not burst into flames so much and instead of towering fires, it produces thick walls of foggy smoke. Forester Emily Tevez, Protected Area Superintendent overseeing the Agusan Marsh believes the fire may have started when local residents began to burn dry grass to clear an area "for fishing purposes."

On Monday September 16, government authorities declared the peatlands fire under control.

- https://news.mb.com.ph/2019/09/13/foresters-mobilized-to-contain-fire-in-agusan-marsh/
- https://news.mb.com.ph/2019/09/17/peatlands-fire-near-agusan-marsh-now-under-control/

The aftermath of the Agusan del Sur peatlands fire. Photo: DENR CENRO Bunawan

Russian Federation

Nest of extremely rare bird captured on video in Russia

The Nordmann's greenshank (*Tringa guttifer*) is an extremely rare species of migratory shorebird that breeds in small, isolated parts of eastern Russia. It's a difficult bird to spot in general, but its nests have proven especially elusive. Now, researchers have captured the first-ever footage of a nesting Nordmann's greenshank. In June this year, the team, led by Vladimir Pronkevich of the Institute of Aquatic and Ecological Problems at the Russian Academy of Sciences, had spent several weeks following and observing Nordmann's greenshanks on mudflats in

the Bay of Schastye, in the southwestern corner of the Sea of Okhotsk in the Russian Far East. At some point during their survey, they noticed that a pair of greenshanks would keep flying off into a bog that had patches of larch forests (*Larix*). They kept watch at different sections of the bog, and finally zeroed in on the forest stand the birds would repeatedly visit. Once inside, they noticed a Nordmann's greenshank perched on a branch of a larch tree. "We carefully searched every tree limb, every nook and cranny, every crevice until we spotted a Nordmann's greenshank sitting on a nest." The Nordmann's greenshank, also called the spotted greenshank, is with fewer than 2,000 individuals estimated to live in the wild today, listed as endangered on the IUCN Red List. Much of the bird's life, both in Russia and in parts of Asia, however, remains a mystery. "Almost nothing is known about their breeding ecology, which makes this new discovery so important," Pronkevich, who has been studying the Nordmann's greenshank in Russia for decades, said in a statement. In fact, building nests in trees makes the Nordmann's greenshank stand out among other sandpipers, which usually nest on the ground on beaches. Only two other sandpiper species, the green sandpiper (*Tringa ochropus*) and the solitary sandpiper (*Tringa solitaria*), are known to nest in trees. But even these two species tend to use old nests of songbirds and other species, and not build one from scratch like the Nordmann's greenshank has been observed to do. The nest that was observed in June, however, failed, with at least two eggs having been eaten by crows.

Despite this, the team isn't disappointed. The researchers also captured seven adult greenshanks and eight chicks, attached tiny, unique bands on their legs, and released them. By early August, birdwatchers in Shanghai, China, had already seen three of the banded adults, some 3,000 kilometers to the south. The researchers say that most Nordmann's greenshanks will continue to travel another 3,000 kilometers to Thailand and Malaysia for the winter, with some returning to the Bay of Schastye next spring.

Conservation of a rare, migratory species like the Nordmann's greenshank is a huge challenge, though. A study published in 2018 found that most of the Nordmann's greenshank population winters in Thailand and Malaysia, with smaller numbers in Myanmar and Sumatra. Most of the sites in which they occur are unprotected. The species also passes through numerous other countries, including mainland China, Hong Kong, South Korea, Japan, North Korea, India, and Sri Lanka, and is known to winter in Bangladesh, Cambodia, and Vietnam. While some of the biggest threats to the greenshank in Southeast Asia are illegal hunting and the loss of coastal wetland habitat, the type and extent of threats differ across countries and sites.

- https://news.mongabay.com/2019/09/holy-grail-nest-of-extremely-rare-bird-captured-on-video-in-russia/

Uzbekistan

Peatlands in Uzbekistan

They do exist - peatlands in the desert state of Uzbekistan (see pictures below). Researchers of the Succow Foundation, partners in the Greifswald Mire Centre, found peat deposits in the high mountains of the Tian Shan, in the foothills of the Nuratau and along the course of the Syrdarya. These peat layers of 30-70 cm thickness were largely unknown and are threatened by agricultural overuse and degradation. The data collected during field work in July 2019 are included in the GMC Global Peatland Database. The research was part of the Succow Foundation's CAViF-Project project, funded by the German Federal Ministry of Education and Research.

Looking for peatlands in the Nuratau desert foothills (l) and in Tian Shan (r). Photos: Leonie Hebermehl.

Australasia and Oceania

Australia

International Conference on Geotechnical Aspects of Peatland Management, May 17-18, 2021, Sydney, Australia

Themes will include: Geotechnical aspects of peat embankments and dykes, field monitoring of the stability and hydrology of peatland, understanding the link between geotechnical properties and botanical constituents of peat, numerical modelling of geotechnical and hydrological behavior of peat, improving predictions of the behavior of peat as hydrogeological medium under drainage or rewetting

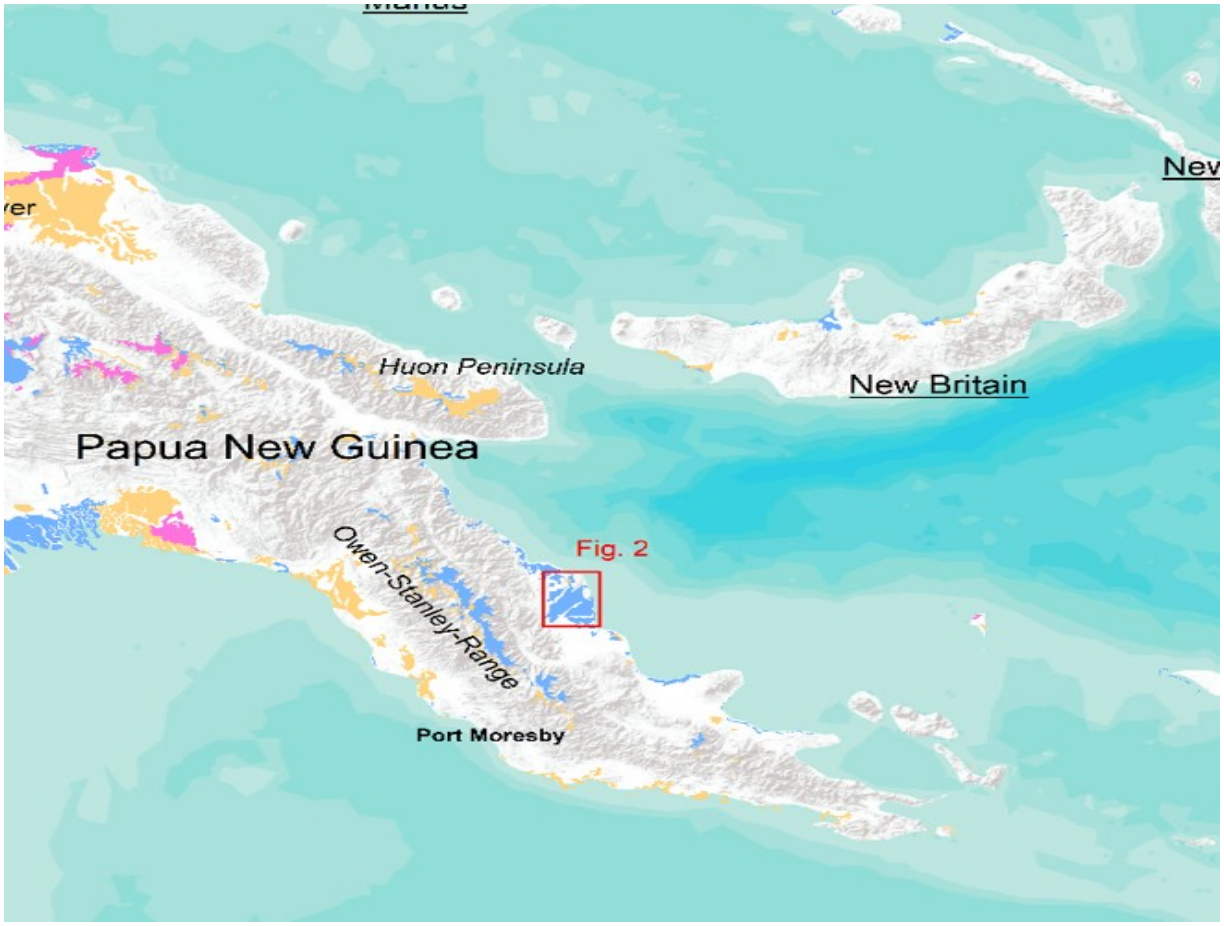
- https://waset.org/geotechnical-aspects-of-peatland-management-conference-in-may-2021-in-sydney

Moorland on the Skullbone Plains, Tasmania. Photo: Hans Joosten.

Papua New Guinea

New roads in Papua New Guinea may cause 'quantum leap' in forest and peatland loss

Papua New Guinea hopes to nearly double the length of its road network by 2022, posing grave threats to more than 50 parks and biodiversity-rich areas, according to a new analysis. The country, occupying the eastern half of the island of New Guinea and a smattering of islands in the South Pacific, is home to some 328,000 km^2 of tropical rainforest. These forests seethe with species found nowhere else on Earth along with massive amounts of carbon locked in the lush vegetation and soil. But Papua New Guinea's plans to add more than 6,000 kilometers of roads in the next few years, as part of broader efforts to lift the country out of poverty, could seriously endanger that natural wealth, a team of scientists cautions in a new paper published July 24 in the journal *PLOS ONE*. "The new roads will create many deforestation hotspots for rainforests and carbon-rich peatlands, sharply increasing greenhouse-gas emissions," the study's lead author, Mohammed Alamgir, an environmental scientist at James Cook University in Cairns, Australia, said in a statement. Alamgir said the government should reconsider the environmental risks. "It's not the short-term impact it will have, but in the future if you have any uncontrolled burning or anything, you are creating a vulnerable situation for the remaining peatlands in that area." Many wildlife species in PNG's rainforests would also be put at risk if peatlands were burned.



Relief map of Papua New Guinea with peat distribution. peat s1: 30-50%, peat s2 and peat s3: 20-40% of the area covered by peat soils. Source: Felix Beer, Greifswald Mire Centre, 2018.

To understand the impacts of Papua New Guinea's push for road construction, Alamgir and his colleagues compared the government's development plans with satellite maps showing areas of intact and degraded forest in the country. They also plotted out the locations of parks and reserves, peatlands, and potential or current mining sites, along with the steepness of the slopes throughout the still mostly forested highlands. The team found that Papua New Guinea stands to lose 3,080 km^2 of core forests and 3,740 km^2 of "connectivity forests". More than 300 kilometers of the planned roads will also traverse around 680 km^2 of peatlands, around half of which stretch 4 or more meters down. The project "will lead to a quantum leap in forest loss and loss of connectivity, and substantial areas of peatland forest," tropical ecologist and co-author William Laurance, also of James Cook University, told Mongabay. "A few politicians and land developers are getting very rich, but the rest of the country suffers — with traditional communities potentially losing their forests, fisheries, and clean water," Alamgir said in the statement. Indeed, he said, the team's work shows that several of the roads will go to areas nearly devoid of people. Instead, proposed mining concessions lie along some stretches, hinting at the value of these conduits to companies involved in extracting resources like gold and copper from the country's interior. Many of the roads that already exist in Papua New Guinea aren't currently well maintained, raising serious questions about the value of expanding the network so aggressively. "Two-thirds of PNG's existing roads are nearly unusable," Laurance said. "Why spend a fortune building new roads that you can't maintain? If history is a guide, they'll be big money-losers and will create years of social and environmental crises."

- https://news.mongabay.com/2019/07/new-roads-in-papua-new-guinea-may-cause-quantum-leap-in-forest-loss/
- https://www.rnz.co.nz/international/pacific-news/395441/png-roading-to-bring-environmental-disaster-study

Europe

Humans are drying out Europe's ancient peat bogs

Graeme Swindles at the University of Leeds, UK, and his colleagues used fossil amoebae — shell-building organisms abundant in soils — to reconstruct the depth of the water table in 31 peatlands across the British Isles, Scandinavia and Continental Europe. They found that almost two-thirds of sites have dried extensively over the past 300 years from the combined effects of climate warming and peat extraction, draining and burning. Effective management and restoration are indispensable to prevent Europe's peatlands from losing their carbon storage capacity irreversibly, the authors say.

- https://www.nature.com/articles/d41586-019-03156-5

European Union

Common Agricultural Policy (CAP) and paludiculture

Wetlands International European Association together with Greifswald Mire Centre met with EU actors on post 2020 Common Agricultural Policy (CAP) and its effect on farming on wet organic (peat) soils, so called paludiculture, on April 9, 2019. The report of the meeting is now available: https://europe.wetlands.org/download/3512/

To feed the current policy discussions on the post 2020 CAP, we brought the importance of rewetted peatland to reduce CO_2 emissions to the attention and showcased examples of paludiculture. So far, peatlands have not been given as much attention as needed. They cover only 3% of the world's land surface but hold 25% of the global soil carbon, making them the world's most space-effective carbon stocks. However, if drained, they excessively emit carbon due to decomposition of organic matter.

Paludiculture is the productive use of wet peatlands. Paludiculture cultivates commercially interesting crops on wet or rewetted peatlands under conditions that maintain the peat body, facilitate peat accumulation and sustain the ecosystem services associated with natural peatlands. Research has shown its cost effectiveness and its ability to meet international commitments with respect to protecting climate, water and biodiversity.

Despite all these benefits, obstacles and counteracting incentives exist in the current CAP that prevent farmers to go for paludiculture. Action for better legal integration of paludiculture into the post 2020 CAP has to be taken in order to give suitable incentives for the farmers. We call on new Members of the European Parliament, European Commission and all Member States to ensure that the proposal specifically recognizes the importance of paludiculture for farmers, environment and climate by setting the following overarching objectives:

Policy instruments in agriculture guiding towards sustainable use of peatlands in Europe

Sompa in Estonia hosted a two day research seminar on policy instruments guiding towards sustainable use of peatlands in agriculture between Nordic and Baltic projects focused on sustainable use of peatlands in agriculture. During Sept 24th and 25th researchers and stakeholders from Sompa, MYR –project and LIFEBaltOrg discussed how to advance research that supports policy measures incentivising effective measures and farm management for mitigating greenhouse gas emissions from peatlands.

Seminar slides are available publicly and they cover facts about peatlands, their cultivation and importance for agriculture, as well as existing policy measures for reducing GHG emissions from peatlands in the three represented countries; and facts about the participating projects, their work on GHG mitigation measures on peatlands and related policies. Climate smart management practices on Norwegian organic soils – MYR is carried out in NIBIO, Norway. Demonstration of climate change mitigation potential of nutrient-rich organic soils in Baltic States and Finland – LIFE OrgBalt is coordinated by Silava, Latvia. As part of the seminar a public event was held consisting of lecture on economic incentives for climate smart agriculture on peatlands in the EU by Sabine Wichmann from University of Greifswald (Greifswald Mire Centre, Germany), short introduction to the Norwegian prohibition of land clearing on peatlands by Teresa Gómez de la Bárcena (Norwegian Institute of Bioeconomy Research (Nibio), Norway), and stakeholder comments followed by discussion.

- https://www.luke.fi/sompa/2019/08/11/open-lecture-24-9-2019-policy-instruments-in-agriculture-guiding-towards-sustainable-use-of-peatlands-in-europe/

Belarus

Belarus to pass climate change adaptation documents by 2023

A set of documents on climate change adaptation will be passed in Belarus by 2023, Natalya Aleinikova, Head of the Office for Regulating the Impact on Atmospheric Air, Climate Change, and Expert Evaluation of the Belarusian Natural Resources and Environmental Protection Ministry, told reporters at the end of August. These documents include national action plans to enhance the country's adaptive capacity to climate change, to increase absorption of greenhouse gases by carbon sinks and to adjust the forestry and agriculture sectors to climate change for the period of 2030. Another important document is the long-term national pathway to low carbon emission economy. Natalya Aleinikova added that Belarus takes action to preserve and promote sustainable use of peatlands. “It is important to highlight this issue, as peatlands are the most powerful tool to reduce carbon emissions. Other measures (reduction of the use of fossil fuels or reforestation) are a way less efficient. Peatland restoration is a great contribution to climate,” the expert concluded.

- https://eng.belta.by/society/view/belarus-to-pass-climate-change-adaptation-documents-by-2023-123758-2019/

Carex dioica *in Beresinsky Biosphere Reserve, Belarus. Photo: Hans Joosten.*

Belarus to adopt peatland protection law

The House of Representatives will give the first reading to the bill on protection and use of peatlands. This will be the first document in Belarus to comprehensively regulate this subject, according to Tatiana Kononchuk, Chairperson of the Commission for Environment, Nature Management, and Chernobyl at the House of Representatives of the National Assembly of Belarus. “The new bill is unprecedented not only in the former Soviet countries but also in Europe,” Tatiana Kononchuk noted. Some matters regarding protection and use of peatlands are regulated by the Natural Resources Code, the Water Code, laws on environmental protection, special protection areas, and melioration. The bill was prepared by the Belarusian Natural Resources and Environmental Protection Ministry in cooperation with scientists and public associations. “The bill focuses on terminology and classification, describes protection and use of natural mires, the procedure of drawing up borders of peatlands, peatland restoration,” Tatiana Kononchuk said. The bill aims to preserve natural mires, outline requirements for economic activities (agriculture and timber industry) in order to reduce adverse impact on peatlands and mires. “We need to provide precise requirements for protection and use of peatlands for land users,” she added. Plans are in place to draw up bylaws regulating a procedure to develop and adopt a mire management plan, carry out monitoring, and compile an inventory and a register of peatlands. The House of Representatives intends to adopt the bill in the first reading in the author's edition. The bill will then be finalized with participation of the public. Tatiana Kononchuk expressed confidence that other countries will follow Belarus'

example in terms of protection and use of peatlands. Europe is interested in preserving Belarusian mires (26 areas in Belarus are protected under the 1971 Ramsar Convention) and welcomes Belarus' efforts to restore peatlands. In 2019, Belarus plans to restore over 7,600 hectares of peatlands in line with the UNDP Wetlands project. Peatland restoration helps stabilize groundwater level, prevent mineralization of peat and soil degradation, reduce CO_2 emissions and risk of wildfires, and leads to the growth of endangered species populations.

- https://eng.belta.by/society/view/belarus-to-adopt-peatland-protection-law-123464-2019/

Belarus helps developing measures to combat land degradation at UNCCD COP14

At the Conference of the Parties to the United Nations Convention to Combat Desertification (UNCCD COP14, 2-13 September 2019 in New Delhi, India), Belarus joined efforts to work out measures to protect and restore forests and peatlands as key tools in combating climate change, loss of bio-resources and land degradation. UNCCD national focal point in Belarus Andrei Kuzmich: "Belarus brings to COP14 national indicators of achieving land degradation neutrality (LDN) and the political will to implement them. We have amassed some experience is reversing land degradation, in particular, peatland restoration, and we are eager to share these results with other UNCCD Parties at COP14." An international project on restoration of drained peatlands, implemented with technical assistance from the Republic of Korea and UNCCD, resulted in more than a thousand hectares of degraded and inefficiently drained bogs restored in Mogilev Oblast, where land in some areas there still bears the scars of the Chernobyl disaster. Peatland restoration helps prevent possible cross-contamination of other areas as a result of peat fires and radionuclide migration. On the one hand, at present the natural environment in Belarus does not allow for the extreme form of desertification. On the other hand, Belarus suffers from water and wind erosion, mineralization of the organic matter of peat soils, human-made contamination, soil disturbance during mining and other issues. Belarus is also experiencing higher air temperatures and more severe or frequent droughts, which is attributed to climate change. Therefore, as early as 2015 Belarus' government passed a strategy to implement UNCCD and a national action plan to fight land degradation for the period of 2016-2020.

- https://eng.belta.by/society/view/belarus-to-help-develop-measures-to-combat-land-degradation-at-cop14-event-123463-2019/
- https://wildlife.by/ecology/articles/v-sentyabre-sostoitsya-konferentsiya-storon-konventsii-po-borbe-s-opustynivaniem/

Estonia

Restoring peatlands for climate – photo exhibition.

The German Naturschutzbund (NABU, Birdlife Germany) and the Embassy of Estonia as the generous host are excited to announce the photo exhibition opening, showcasing the beauty of the northern European peatlands. The exhibition introduces you to the biodiversity and ecosystem functions of peatlands, as well as to the restoration areas from the LIFE Peat Restore project extending over five EU countries

- https://life-peat-restore.eu/en/the-embassy-of-estonia-is-hosting-the-life-peat-restore-photo-exhibition-restoring-peatlands-for-climate/

France

Peat exploitation in la Manche stopped by court

On October 15, the Criminal Court of Coutances found Florentine SA and its CEO guilty of unlawfully destroying protected plant species by peat extraction in Baupte near Carentan-les-Marais (département de la Manche; région Normandie). The company was fined €20,000, of which €10,000 was suspended, and its representative was fined €6,000, of which €4,000 was suspended. These penalties are accompanied by a suspension of the operation of the Sainte-Anne marsh, accompanied by provisional enforcement. Even if they appeal this conviction, operators will have to stop peat extraction at this site.

- https://actu.fr/normandie/baupte_50036/une-exploitation-la-manche-stoppee-par-justice-proteger-especes-vegetales_28931071.html
- https://france3-regions.francetvinfo.fr/normandie/manche/perte-inestimable-biodiversite-exploitant-tourbiere-baupte-banc-accuses-1724855.html

Germany

Wetscapes Conference Rostock: final address

Gerald Jurasinski (gerald.jurasinski@uni-rostock.de) & John Couwenberg (couw@gmx.net)

The WETSCAPES conference 'Understanding the ecology of restored fen peatlands for protection and sustainable use', held September 10-13, 2019 in Rostock, Germany very well reflected the width of peatland science. The covered topics included rewetting as a restoration measure, greenhouse gas (GHG) exchange, lateral carbon and nutrient losses, carbon and nutrient cycling, the agents of GHG production, consumption and emission as well as plants and micro-organisms. All these topics were addressed with a multitude of methods and the very important belowground processes were also included. Striking was the finding that belowground biomass production may be much higher than aboveground production. The outcomes of greenhouse gas measurements using chambers and eddy covariance were presented, but we also saw results from state of the art genome sequencing, via in-depth analysis of carbon species, to experimental and field scale hydrological measurements and broad scale budgeting.

Excursion in drained Alder peat swamp forest during Wetscapes conference. Photo: Franziska Schmacka.

1. We saw amazing plenary keynotes, which also covered the width of the field, starting with a very sophisticated experimental approach to soil organic matter decomposition (Philipp van Cappellen), offering a very clear overview on what we know about the subject.
2. Another keynote (Marcel Silvius) presented a jurisdictional and landscape wide approach to tropical peatland restoration, making it very clear that we don't act in science space alone but that there are huge societal challenges and implications.
3. The keynote on newly emerging data from England by Chris Evans led to the discussion whether it is good to accept small steps to finally get the big leap or whether such an approach is rather counter-productive.

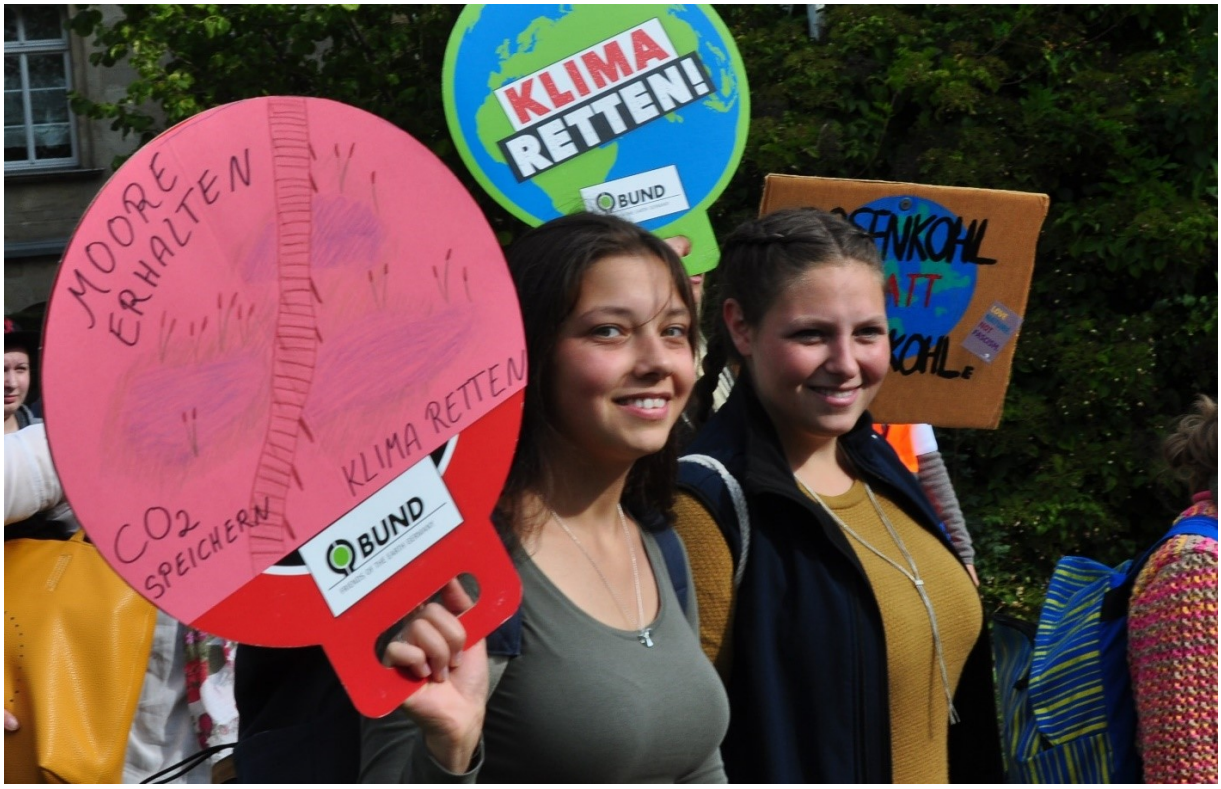
Other issues addressed were

- the strong microbial response to peatland rewetting telling us that there is really still much to learn on microbiology especially in fen peatlands (Susanne Liebner), and
- alternative pathways of methane emissions in tropical peatlands (Sunitha Pangala): while we in general know much about possible pathways, we are still very much at the beginning of really understanding the full picture of methane pathways in forested peatlands.

Eventually, we got deep insight into radiative forcing of the different GHG and learned that we should leave the simplified global warming potential (GWP) behind to better understand the roles of the different GHG gases over time which has implications for the management of peatlands: They have to be rewetted immediately to avoid further adverse effects on the climate system.
The conference essentially followed an ecosystem approach, which we also pursue in the WETSCAPES project. Also researchers that do really in depth disciplinary studies to gain better process understanding may take home that there are neighbouring disciplines that can offer explanations for observed phenomena and help to gain further insights. The conference showed that many different disciplines contribute to understanding the complex functioning of peatlands and especially of rewetted, managed peatlands, which are in essence novel ecosytems. We hope you have learned to appreciate your role and importance in this endeavour and how we together can take the science further and inform society and politics how to best manage peatlands.
We saw promising results from rewetting and restoration projects working on different scales and with respect to different target organisms but also talked about the societal implications and learned that it is challenging to convince especially smallholders to accept rewetting. What we really liked was the statement of Marcel Silvius who said that „every rewetting project is also a social project". Restoration or rewetting is not only a technical problem but a social task. Various human demands are affected on various levels: the smallholder farmer who is directly affected by the rewetting, but also regionally when you think about water quality and regional climate effects and even nationally when you think about national climate reporting and the necessary transformations of laws and regulations that are needed to put rewetting and paludiculture in place. And globally, if you think about the future of our planet. When we heard about the tropical smallholders in several talks, we thought that the challenges here in Germany are very similar despite the quite different realities of the people. There are many challenges and conflicts but we have to start immediately because the process will take a while when we want to take the people with us. There are many technical and societal barriers but remember the talk of Anke Günther that showed clearly that Peatlands have to be wet, the sooner the better.
We also saw that peatland or WETSCAPES science is no exception to general science: with new and developing methodologies we can learn ever more. But we also have to state, that the basics are already rather well understood: Wet peatlands tend to have more methane emissions and dry peatlands emit a lot of carbon and, especially if they are half wet, they also emit N_2O. After all, carbon dioxide emissions pose the greatest threat for reaching the Paris goals and, therefore, wet peatlands are better than dry peatlands. But still there is much to learn, especially when we turn to new pathways or processes, like trees as conduits for methane emissions or metagenome sequencing for better understanding changes and functioning of the microbial communities.
We liked the conference very much and like to thank you all for your contributions. Tell your colleagues how great it was to be part of such a widely inter-disciplinary meeting focussing on one type of ecosystem we all love. We think the conference made it very clear that we need more interdisciplinary science to better understand especially managed peatlands as novel ecosystems.

Report summarizes results of MoorDialog

The 2016-2019 German MoorDialog project has now published a 84-page report Klimaschutz auf Moorböden - Lösungsansätze und Best-Practice-Beispiele (Climate protection on peat soils - solutions and best-practice examples) in the Greifswald Mire Centre (GMC) series. In its recommendations, the GMC outlines a possible transformation path for peatlands in Germany, as it would be necessary to achieve carbon neutrality by 2050. The task now is to further develop the transformation path in dialogue and to bring the solutions with increasing speed to society, politics, the economy and ultimately in the field.



Conserve peatlands, store CO_2, save climate. Fridays for Future peatland demonstration in Coburg, Germany. Photo: Hans Joosten. https://www.br.de/nachrichten/bayern/demonstration-fuer-rottenbacher-moor-1-000-teilnehmer-erwartet,RcyG5AX

- https://www.np-coburg.de/region/coburg/Es-geht-um-Moore-und-den-Rosengarten;art83420,6920413

Climate-friendly business trips: Hamburg Environmental Agency buys MoorFutures from M-V.

The Senate of the Hanseatic City of Hamburg has set itself the goal of making the state administration to be CO_2-neutral by 2030. One component of this is CO_2 compensation for business flights. Since 2008, compensation payments have been made for all staff flights on duty. For the first time, these funds are being used for a project within Germany: By purchasing 3,000 MoorFutures (https://www.moorfutures.de/), the environmental authority is investing in the rewetting of an entire peatland: the Kamerunwiese north-east of Neustrelitz in the the adjacent federal state of Mecklenburg-Vorpommern. "I am very pleased that the environmental authority has decided on a product from Mecklenburg-Vorpommern! It is the first time that a prospective customer buys the emission reduction of an entire peatland", said Mecklenburg-Vorpommern's Environment Minister Dr. Till Backhaus. At the Conference of Environment Ministers in Hamburg-Harburg on 9 May 2019, he presented Hamburg's Senator for the Environment Jens Kerstan with a corresponding certificate.

"Peatlands are very important for climate protection because they store a lot of carbon dioxide. Peatland protection is all the more worthwhile since large quantities of climate-damaging gases are released when peatlands are drained and destroyed. I am very pleased that we have found a North German project for CO_2 compensation for the unavoidable business flights and can thus invest in climate protection projects in the region. The Kamerunwiese will also be ecologically upgraded and thus contribute to the preservation of regional biodiversity," emphasised Kerstan. In this context, Minister Backhaus also underlined the importance of the interaction between rural areas and the metropolis of Hamburg. "We are experiencing here the case where funds from urban areas are made available to improve the ecological infrastructure of rural areas. This is exemplary for me, because the ecosystem services of rural areas, which are often only known in expert circles, are no longer only "visible", but also financially scalable. The ecosystem services provided by rural areas are indispensable for cities! We must point out even more strongly that these services are also socially relevant. According to calculations by the Federal Environment Agency, every additional tonne of carbon dioxide in the atmosphere has a damage potential of at least 80 euros. The output of the Kamerunwiese is therefore around a quarter of a million euros. This may be the basis for an ecologically justified state financial compensation, even if it is still a long way off."

An overview of all MoorFutures projects in the federal states of Brandenburg, Schleswig-Holstein and Mecklenburg-Vorpommern can be found here.

- https://www.moorfutures.de/news/klimafreundliche-dienstreisen-hamburger-umweltbeh%C3%B6rde-kauft-moorfutures-aus-m-v/

Mecklenburg-Vorpommern Environment Minister Dr. Till Backhaus (l) and Hamburg Environment Senator Jens Kerstan, Photo: BUE / P. Sun

Ireland

Crucial climate weapon' – urgent need to protect and restore our peatlands

Continued drainage and degradation of Ireland's bogs will ensure that we lose one of our crucial weapons in our efforts to avoid climate catastrophe, a leading peatland expert has warned. Speaking at a hearing of the Climate Action Committee on October 23, UCD's Dr Florence Renou-Wilson said that restoring our peatlands ecosystem – the largest global store of land-based carbon – is vital if we are serious about going carbon neutral by mid-century. A major research project led by Dr Renou-Wilson and UCD colleagues between 2007 and 2013 revealed that Irish peat soils contain 1.5 billion tonnes of carbon. This carbon accumulation relies on waterlogged conditions that prevent the complete decomposition of organic matter. Peatlands also provide vital ecosystem services, supporting wide-ranging and unique biodiversity, as well as filtering water and protecting against flooding. Yet, today, the majority of peatlands are degraded due to historic and ongoing drainage for extraction for domestic fuel, energy generation and horticultural, and to make way for agricultural expansion and forestry. According to Dr Renou-Wilson, drainage for the above sectors has impacted the vast majority of our 1.4 million hectares of bog – roughly one-fifth of our entire landmass. This, she warned, has led to the large-scale release of carbon that would have remained within the bog under normal conditions.

It is estimated that 11 million tonnes of CO2 are released every year, even accounting for any carbon sequestered in natural and rewetted bog. This figure is just short of total emissions from the energy sector last year. "One hectare of drained bog, cutover or cutaway, emits six tonnes of CO_2 per year for each year that it remains dry," Dr Renou-Wilson said. In addition to high emissions, the peatland scientist said that drainage also leads to the release of nitrates and ammonium, the loss of flood alleviation and water storage, and an increase in the risk of fire at dried out bogs. The impacts of climate change will only exacerbate this situation, she said, as the likes of summer drought become a more frequent occurrence.

It is estimated that only 10 % of our raised bog (310,000ha) and 28 % of the blanket bog (774,000ha) areas are suitable for conservation that Dr Renou-Wilson said are "barely holding on to their carbon store". Blanket bogs

are generally found in the west and also in mountainous areas in the east while raised bogs are mainly confined to the midlands. Raised bogs contain deeper peat deposits while blanket bogs tend to form more extensive carpets across flat or gently rolling landscapes. Ireland holds eight per cent of the world's blanket bog.

There are currently 75 raised bog (23,000 hectares) and 73 blanket bog (37,000 hectares) areas that qualify as natural heritage areas (NHAs) for their national importance as a habitat or their role in supporting species. A Bill currently before the Seanad seeks to extend the Government's power to review the status of bog habitats, including the power to de-designate both raised and blanket NHA bogs.

There are also 53 raised bog sites and 50 blanket bogs that are protected under European law. The proper restoration of the protected raised bogs alone would lock in 28 million tonnes of carbon, Dr Renou-Wilson said. The blanket bog network – three times greater in size – "could lock in 10 times more carbon" if a proper management plan was in place, she added, reminding the Committee that we have a legal imperative to act, alongside our moral duty to tackle emissions and protect our declining biodiversity. While there is a national management plan in place for protected raised bog sites, there is nothing yet in place for blanket bogs despite a requirement to do so under the Habitats Directive. Nine out of 11 peat habitats listed for special protection under EU directives are in 'bad' condition, one is 'inadequate' and only one is 'good', according to the National Parks and Wildlife Service.

Dr Renou-Wilson said that full peatland ecosystem restoration or the "low hanging fruit" of rewetting hold the key to halting emissions and making our bogs more climate-resilient. In both scenarios, the water table is raised and managed, ensuring that degraded peatlands stop emitting "immediately" and instead lock in their carbon store. They are the preferred options, she said, as opposed to rehabilitation such as abandonment of extraction sites or the re-establishment of vegetation on drained sites without rewetting. In such scenarios, she warned, "peat will continue to decompose and continue to release carbon to the atmosphere". "Restoration should be supported where conditions are adequate and, where not possible, the minimum required intervention should be rewetting," she added. She also called for funding for local communities to participate in the rewetting and restoration of their local bogs, as well as the roll-out of climate adaptation toolkits to help landowners to "farm carbon" on their holdings.

During the roll-out of Budget 2020, the Minister for Finance Paschal Donohoe TD said that €5 million from revenue raised by the carbon tax will go toward peatland rehabilitation to support the "reduction of greenhouse gas emissions and enhanced biodiversity". The Department of Climate Action later clarified that this funding will also go toward restoration work carried out by the NPWS at 1,800ha of bog across seven counties. Earlier Bord na Móna announced that it will offer redeployment opportunities for up to 200 workers to transition into its program to rehabilitate bogs in the Midlands.

- https://greennews.ie/peat-climate-weapon/

Peat extraction in Ireland. Photo: Hans Joosten.

Peatland emissions: the unspoken caveat to our net-zero ambitions

On October 31, the Irish Government published the first progress report on its cross-departmental climate action plan that it says will secure a cleaner, more sustainable Ireland for future generations. Critics are equally clear, however, that the year-on-year decline in emissions that would be achieved by the plan is nowhere near enough to get us to net-zero by 2050, let alone sooner as scientists warn may be necessary to stay below the 1.5-degree threshold. The Environmental Protection Agency openly admits that they have yet to calculate where the Government's action plan will leave us in 2050, assuming the hundreds of action points in the plan (many incredibly ambition) are fully implemented. There is also the giant elephant in the room that no-one seems to want to talk about in our emissions calculations – that of the extra 6 million tonnes of CO_2 (around 10 % of total annual emissions) that we will have to account for when our peatlands, drained and exploited to near-total depletion, finally fall under our emissions accounting portfolio in 2026. As one of Ireland's leading peatlands experts, Dr Florence Renou-Wilson, told the Climate Action Committee last October: "This is not an 'if' and 'but' [scenario]. In 2026, Ireland will have to report all its drained bogs in any event. We will be in trouble by then."

The Government will argue that the €5 million put aside from the carbon tax increase in Budget 2020 to accelerate the work of the National Parks and Wildlife Service in protecting raised bogs will help. However, as Deputy Thomas Pringle correctly outlined at the climate action committee hearing, this seems to be just tinkering at the edges as the 27 bogs that the NPWS envisions targeting over the next three years will account for just 100,000 tonnes of carbon. Perhaps if more revenue from the carbon tax went toward climate action – only revenue raised from €6 euro of the now €26 tax charged per tonne of carbon is ring-fenced for climate measures – more work could be achieved by the heavily-underfunded NPWS.

Even if this was to happen, we will solve only a portion of our peat problem as the protected state-owned network that the NPWS is in charge of accounts for just 20 % of our peatlands. The rest is in private hands, and, as Dr Renou-Wilson told, we still don't have a concrete policy in place to manage peatlands outside of our national and European protected network. To make matters worse, a Bill that has largely managed to sneak under the radar looks set to put an additional spanner in the works by allowing the State to weaken protection for natural heritage area (NHAs) bogs.

The *Wildlife Amendment Bill*, almost certain to pass, will extend the State's power to review the status of bog habitats, including the power to de-designate any of the 75 raised bogs (23,000 hectares) and 73 blanket bogs (37,000 hectares) in the NHA network. The only bona fida climate champion left in the Seanad since the Green's Grace O'Sullivan upped stick for Brussels, Senator Alice Mary Higgins has tabled numerous amendments and spent hours debating the Bill to try and remove its most worrying aspects. Despite her best efforts to date, many dubious amendments have passed, including one that will see the installation of sporting grounds such as golf courses included as a potential reason for de-designating NHA bogs. Equally as worrying, most of Ms Higgins peat-protecting amendments were defeated, including a call for only raised bog NHA sites identified in a recent review to be open to potential de-designation. The review outlines 39 raised bog NHAs that have marginal ecological value or that would be prohibitively expensive to restore. The review also outlined that we have decimated the network to date, with many bogs dried up and emitting six tonnes of CO_2 per hectare every year. The decision to also include blanket bogs for potential de-designation, as Dr Renou-Wilson put it, would be like "shooting ourselves in the feet" – not just for our climate targets but also in protecting our important peatland heritage.

- https://greennews.ie/peatland-emissions-caveat-climate/
- https://www.vice.com/en_us/article/ywakwj/irish-communities-are-reclaiming-bogs-peat-to-fight-climate-change

Consultation launched over peat extraction for horticulture

The Government has launched a public consultation to examine the use of peat in the horticultural industry that critics say is helping to drive the exploitation of our carbon-rich bogs. The consultation is part of a belated review process, long sought after by conservation groups and peatland experts, that was listed as an action in the National Peatland Strategy released in 2015. A working group made up of the Departments of Heritage and Climate Action and the Environmental Protection Agency (EPA) has identified key issues that concerned stakeholders and the public are now encouraged to comment on.

Peatlands provide vital ecosystems, acting as the largest global store of land-based carbon, supporting wide-ranging and unique biodiversity, as well as filtering water and protecting against flooding. Yet, today, the majority of our peatlands are degraded due to historic and ongoing drainage for peat extraction. Drainage has impacted the vast majority of our 1.4 million hectares of bog – almost one-fifth of our entire landmass. It is estimated that

only 10 per cent of our raised bog (310,000ha) and 28 per cent of the blanket bog (774,000ha) resources are suitable for conservation. Drainage occurs in order to allow extraction for domestic fuel, energy generation, and to make way for agriculture and forestry. There is also extraction for the horticultural sector, with peat used as a growing medium by gardeners in Ireland and abroad. Two million tonnes of CO_2 are released per year due to peat extraction for horticultural uses. Over 420,000 tonnes of peat exports went to the UK last year, and a further 400,000 tonnes went to mainland Europe and further afield.

There are currently up to 50 companies mining moss peat in Ireland, including the semi-state Bord na Mona that owns seven per cent of Irish bogs. While the company plans to phase out the extraction and use of peat for electricity generation, it will continue to extract peat for horticulture and announced plans last summer to increase its production of peat bedding for livestock.

The mushroom industry is also a major user of horticultural peat for casing that holds moisture and allows the industry to grow year-round. Harte Peat, Ireland's largest supplier of mushroom casing, was taken to court by the EPA last year for the extraction of wet peat up to five meters deep at an unlicensed Co Westmeath site. In an affidavit read during court proceedings, Monaghan Mushroom Group (MMG) founder Ronald Wilson said that the industry "relies entirely" on peat for mushroom casings. Any move to halt the flow of peat, he said, would "devastate the mushroom industry within days". According to the National Parks and Wildlife Service, the mushroom and soft fruit sectors are actively looking to reduce their peat usage by using wood fibre and coir in their growing medium. The closing date for consultation submissions is Monday 20 January 2020 and can be sent to peatinhorticulturereview@ chg.gov.ie.

- https://greennews.ie/public-consultation-peat-horticulture/

Bord na Móna to create jobs rehabilitating peatlands

Two hundred peat workers could be retrained to help with rehabilitating peatlands, Bord na Móna has said. The semi-state agency, which has usually been focused on developing Ireland's peatlands, has moved towards renewable energy in response to concerns over the environmental impact of extracting peat. The company would provide details about the new jobs in the next few months but Tom Donnellan, the chief executive, said the programme would be "the biggest peatland rehabilitation programme ever undertaken". He said: "This is of international importance and will yield significant benefits in terms of biodiversity, carbon emissions mitigation and carbon sequestration." A spokesman said the agency had organised 25,000 hectares for rehabilitation and expected to increase it.

- https://www.thetimes.co.uk/article/bord-na-mona-to-create-jobs-rehabilitating-peatlands-p2gqfpd3v

Peat extraction in Ireland. Photo: Hans Joosten.

Bord na Móna unveils €1.6 billion programme as peat burning reductions continue

Bord na Móna has unveiled a €1.6 billion development programme as part of the next phase of its restructuring towards decarbonisation, according to company CEO Tom Donnellan. It was also confirmed that Bord na Móna has concluded its agreement with the ESB to supply two power stations to the end of 2020. On October 16, the company outlined how the next phase will support employees to transition away from peat-based activities into opportunities in Bord na Móna's green businesses and peatland rehabilitation activities. Speaking following the meeting of the company's board, the chief executive said: "We launched our Brown to Green strategy last year with a mission to transition the company away from our traditional peat-based activities towards a green, low-carbon company that will play a leadership role in building Ireland's green economy. "The first phase of our plan restructured the company, paid down our debt and put in place a sound financial base to fund this transformation and our green investment programme," Donnellan said. The next phase of the company's plan will see a €1.6 billion development programme that will benefit the midlands and is "strongly aligned to Government policies", according to Bord na Móna. The programme comprises of:

- Investments of over €1.5 billion in renewable energy development – the first part of this plan will be delivered when the €180 million Oweninny wind farm becomes fully operational before the end of the year;
- Investments of over €60 million in waste recycling and resource recovery;
- Investment of over €20 million in new green business projects over the next five years.

The firm estimates that, by 2025, 80% of its employment base and revenue will come from green, low carbon and sustainable businesses.

A significant section of the workforce will be migrated into peatland rehabilitation "and other opportunities" under the coming phase, while the volume of peat burned in ESB power stations will be reduced and peat-related activities scaled back. On the company's transition, Donnellan said: I can confirm we have concluded an agreement with ESB to supply peat to their two midlands power stations through to the end of 2020. "To provide opportunities for those impacted by the reduction in peat harvesting, we are in discussion with our department about accelerating a programme of enhanced rehabilitation of peatlands that will see potential redeployment positions for approximately 200 employees.

- https://www.agriland.ie/farming-news/bnm-unveils-e1-6-billion-programme-as-peat-burning-reductions-continue/
- https://www.newstalk.com/news/bord-na-mona-bog-rehabilitation-915450

The end of fuel peat extraction in Ireland. Photo: Hans Joosten.

600,000 trees to be planted on disused peatland

1,500 hectares of bog, no longer used for peat extraction, will be initially targeted in Offaly, Laois, Westmeath, and Tipperary with at least 600,000 new trees planted. Bord na Móna will work with Coillte Nature on the new project to provide the management, forestry, nursery and technical expertise to establish and maintain the woodlands. Its part of their extensive peatland rehabilitation and bog restoration programme that will see a total of 35,000 hectares of peatland rehabilitated by 2025.

- https://www.midlands103.com/news/midlands-news/600000-new-trees-will-be-planted-in-the-midlands/
- https://www.irishcentral.com/news/climate-change-irish-bogs-plant-trees
- https://www.newstalk.com/news/bord-na-mona-bog-rehabilitation-915450
- https://www.irishexaminer.com/breakingnews/ireland/over-600000-native-trees-to-be-planted-on-unused-bogland-954443.html

Irish Wildlife Trust: new laws threaten the protection of Irish boglands.

The Irish Wildlife Trust is warning that the Wildlife (Amendment) Bill, passed in the Seanad on November 6, will open protected boglands to further exploitation. The bill allows the State to review the status of 60,000 hectares of bogland in the Natural Heritage Area (NHA). One amendment to the bill allows for protection to be removed to make way for the installation sports facilities, such as golf courses. In a statement, the Irish Wildlife Trust said boglands are of national importance to Ireland's biodiversity. Boglands also act as extremely effective sinks for atmospheric carbon dioxide and, as soon as they are destroyed, that carbon is released into the atmosphere. The IWT is warning that the new bill can only lead to the "further degradation of boglands along with associated pollution, extinction and greenhouse gas emissions." Campaigns officer Pádraic Fogarty said: "It is beyond belief that we would be talking about removing key protections from peatlands given what we know about them." "They are central to our goals to tackle climate change and provide refuge to unique biodiversity - at a time when we should be putting all our resources into protecting and restoring them. "It is bonkers to think that we're moving in exactly the wrong direction." He said the "deeply flawed" bill is not compatible with the climate emergency declared by the Dáil earlier this year and urged TDs to speak against when the amendments are discussed.

- https://www.newstalk.com/news/bonkers-threaten-boglands-protection-922685

ESB to close two peat-powered generating stations

The ESB has announced the closure of two peat-powered generating plants after failing to secure permission to switch them to biomass power stations. The plants – at Shannonbridge in Offaly and Lanesboro, Co Longford – will stop generating electricity from December 2020. The two plants, which were commissioned in 2004, employ 80 people between them. In a statement, ESB noted that the current planning permissions for the plants expire at the end of next year and said their closure marks the end of power generation solely from burning peat in the State. Lanesboro produced 135 megawatts of power and Lough Ree Power produced 100 megawatts; together, they could power about 245,000 homes. The State energy utility submitted an application to An Bord Pleanála in 2018 to switch Shannonbridge from peat to biomass over a number of years, starting in 2020. That proposal was rejected in July. "Since then, ESB has undertaken a review of the options for both West Offaly Power [Shannonbridge] and Lough Ree Power [Lanesboro] stations post 2020 in the context of the requirements of the single electricity market," the company said. ESB said it would now begin the process of engaging with staff and stakeholders to prepare for an orderly closure of the stations. The Irish Times understands that compulsory redundancies are not envisaged. The Minister for Communications, Climate Action and Environment Richard Bruton has appointed Kieran Mulvey to be a "just transition commissioner" to co-ordinate Government response to the State's accelerated exit out of peat and the effect that will have on workers and the midlands region. Both plants support hundreds of jobs at Bord na Móna, which supplies the peat that they burn to generate electricity.

- https://www.irishtimes.com/business/energy-and-resources/esb-to-close-two-peat-powered-generating-stations-1.4076614

Peat extraction in Ireland. Photo: Hans Joosten.

Plans to relocate turf cutters rejected

Plans by the Minister for Culture, Heritage and the Gaeltacht, Josepha Madigan, to relocate turf cutters to allow them extract peat from Coolree Bog near Prosperous, Co Kildare, have been rejected by the planning authority An Bord Pleanála because the activity would add to greenhouse gas emissions. As part of the Government's conservation plans to protect designated raised bogs, Ms Madigan had wanted to allow nine turf cutters who had right to cut turf on Ballynafagh Bog to carry on their tradition on a 4.6 hectare section of the adjacent Coolree Bog for a period of 65 years. Under a compensation scheme established in 2011, active turf cutters on 53 raised bog special areas of conservation were either given an annual payment of €1,500 index-linked for 15 years or relocated where feasible to a non-designated bog. The overall cost of the scheme for over 2,300 qualifying applicants over 15 years is estimated at €54.1m, of which €7.63m is being spent on relocating 476 turf cutters. Outlining its decision An Bord Pleanála acknowledged there were conflicting national policies applicable to the proposed development. However, the board concluded that it was in contravention of the national climate action policy objective to achieve a transition to a low-carbon energy system.

It noted that the bogland policies of the Kildare County Development Plan 2017-2023 also sought to protect and conserve bogland habitats by limiting peat extraction to areas already under development. Kildare County Council had also rejected the plans on the basis, if allowed, it would set an undesirable precedent for further development of inactive bogs and result in a loss of natural landscape. The plans were also opposed by the Irish Peatland Conservation Council which accepted there needed to be a site for turf cutters but maintained that Coolree Bog was not an appropriate location because of its complex geophysical environment. It accused the Department of Culture, Heritage and the Gaeltacht of "poor judgement" in proposing such a site. Environmental campaigners welcomed the ruling but expressed concern that Ms Madigan was still proposing to spend over €7.6m on assisting turf cutters to continue "their damaging activity".

- https://www.irishexaminer.com/breakingnews/ireland/josepha-madigans-plans-to-relocate-turf-cutters-rejected-by-an-bord-pleanala-950370.html
- https://greennews.ie/turf-cutter-abp-decision/

Irish bogs could be transformed into medical cannabis farms

The Minister for Health of Ireland continues to tackle the issue of access to medical cannabis, unemployment and sustainable energy via the idea of peat bogs as medical cannabis farms. In 2018, the Minister for Health, Simon Harris, said to agricultural programme Ear to the Ground: "This is not about recreational use and people

smoking joints. This is about using in a controlled way, in a monitored way, with the support of your clinician, a product that could ease your pain and suffering after you've tried all the conventional treatments." "This is a major priority for me and I really want to see this happen in 2019."
In June of this year, Minister Harris signed the legislation into law which enables medical cannabis to be prescribed to patients until 2024 via the Medical Cannabis Access Programme. In July, he had an "interesting" and "good" meeting with Bord na Móna, who are responsible for the development of Irish peatlands and creating energy security from this resource. Currently, despite recent investments into the preservation of biodiversity, Bord na Móna are facing the fact that most peat-fired electricity sources will be finished in 25 years. In addition, the Irish government is reluctant to continue harvesting fossil fuels. In the pressing urge to go from brown to green in sustainability, the company have confirmed their interest in producing cannabis on the peatlands, have previously suggested that they could give 5,000 hectares for farming the plants. There is cross-party support for the creation of cannabis farms for internal medical use, with murmurs of an eventual export business.
Fianna Fail Seanad leader Catherine Ardagh has moved to confirm the support of her generally conservative party for the scheme. She said: "I commend the Minister for Health, Deputy Harris, on meeting Bord na Móna to discuss the supply of medicinal cannabis. Bord na Móna has huge infrastructure and land and there are jobs at risk in the company. That the Government is collaborating with Bord na Móna in this novel way is heartening."

- https://www.openaccessgovernment.org/medical-cannabis-farms/71562/

Netherlands

Nitrogen Programme PAS completely rejected

On 29-5-2019, the Council of State of the Netherlands, ruled on the first six appeals by peatland conservation NGO Werkgroup Behoud de Peel (WBdP) against Nature Conservation Act permits for livestock farms that had been granted with the Nitrogen Approach Programme (PAS). The permits concerned increasing ammonia emissions and thus an increase in nitrogen deposition on the Peel raised bogs. The responsible province had stated that the increases could be granted, because the PAS would ensure that the nitrogen deposition on the Peel would eventually decrease sufficiently to prevent deterioration of the peat bog values. WBdP had high hopes for a favourable judgement by the Council of State, because earlier (7-11-2018) the European Court of Justice had left little of the PAS intact in its judgement. WBdP therefore expected at least that the PAS would have to be tightened up considerably. But in fact, with the judgement of the Council of State, the PAS was completely shot down.

The Council of State Administrative Law division serves as one of the four highest courts of appeal in administrative matters in the Netherlands. The King is president of the Council of State but he seldom chairs meetings. The Vice-President of the Council of State chairs meetings in his absence and is the de facto major personality of the institution. Under Dutch constitutional law, the Vice-President of the Council is acting head of state when there is no monarch such as if the royal family were to become extinct.

The main conclusions of the Council of State's decision are as follows
(1) The impact of measures taken under a programme, or the impact of autonomous measures, may be included in the assessment only if the impact of those measures has already been established. This is not met at all in the PAS. On the contrary, the PAS anticipates a variety of measures and autonomous developments, which have not yet been implemented and/or the impact of which has not yet been established at all.
2) Measures that are already mandatory for the conservation of habitats, or to prevent the deterioration of habitats, should not be included in the assessment of project authorisation (e.g. extension of livestock farms).

The first point has been highlighted many times in recent media reports on the PAS ruling. However, the second point is just as important. The Council of State discusses this in detail in its decision. Tthe Council is of the opinion that under Article 6(1) and (2) of the European Habitats Directive the Member State is obliged to take measures to ensure that the habitats do not deteriorate and, if necessary, are also restored. According to the Council, in an area heavily overloaded with nitrogen, such as the Peel, most of the measures included in the PAS are therefore mandatory and could not be used at the same time to permit increases in nitrogen deposition. This will only be possible if 'the conservation status of the natural values in a Natura 2000 site is first guaranteed'.

The ruling will mean that the government will no longer be able to grant permits under the PAS, plus that all pending procedures against permits already granted will in all likelihood be won. And indeed, until August 25, WBdP had already won 51 court cases against expansion of nitrogen deposition from intensive cattle husbandry.

On October 4 the government of the Netherlands has announced which nitrogen measures will be taken. These include a.o.:

- Targeted - voluntary – acquisition and closing of agricultural holdings with high emissions or outdated facilities near Natura 2000 sites
- Speed reduction on national and provincial roads with measures being worked out by the provinces in an area-specific manner
- In addition to the speed reduction, effective measures will be sought in the vehicle fleet, shipping, air traffic and industry (within Europe).
- Expansion and acceleration of restoration work for nature
- Mitigating an increase in deposition by revoking permits elsewhere, in such a way that on balance the deposition does not increase. The government wants to skim off 30% in order to achieve a reduction in deposition.

- http://wbdp.nl/actueel

The vido-club Deurne, Netherlands, has produced a visual report of how two painters captured de Peel bog in several seasons. Beautiful paintings and especially beautiful images of de Peel. Here you can see what we do it for: https://youtu.be/6VBQui0Gd6E

Russian Federation

Sergey Mikhailovich Novikov (93) has passed away on October 1. Sergey Mikhailovich was the oldest employee of the State Geological Institute and one of the founders of peatland hydrology. A huge loss... My condolences and mourn.

The era of fundamental knowledge is passing, knowledge on mire hydrology is disappearing. Sergey Mikhailovich's contribution to Soviet, Russian and world science has been invaluable. The network of mire hydrological research stations created with the active participation of Sergey Mikhailovich and his colleagues, the organization of the monitoring system on them and the attempt to integrate hydrological observations in peatlands into the formal network of Hydrometeorological observations is a unique phenomenon on a global scale and one of the greatest achievements in the organization of scientific research. At the same time, their breakdown is one of the most tragic losses associated with the social and economic transformations of the country.

In recent years, Sergey Mikhailovich has made a huge contribution to ensuring the continuity of Russian peatland studies, inspiring young people with his participation in the work of the section of peatland studies of the Botanical Society of Russia and of Siberian peatland schools, shared his knowledge and was actively publishing.

Sergey Mikhailovich and Lyudmila Ivanovna Usova opened the eyes of the Siberian oilmen to the peatlands as a water body, especially to their hydrology. And it really began to work, for which I thank them very much.

The constant vigour, optimism and activity of Sergey Mikhailovich made everyone believe in his eternal engine. Still, it appeared not to be eternal…

You are forever in my memory, colleague and teacher. Thank you.

Tatiana Minajewa (tania.minajewa@gmail.com)

Switzerland

Market players reduce the use of peat by mutual agreement

Peat exploitation damages the climate and biodiversity. In Switzerland, peatlands are protected since 1987 and it is prohibited to extract peat from them. However, it is estimated that up to 524,000 m^3 of peat is imported each year. In order to reduce the ecological damage caused abroad, the Federal Council adopted a peat abandonment plan in 2012, which provides for voluntary measures to be taken by the private sector in the first phase.

In the summer of 2019, all members of JardinSuisse, the Swiss Horticultural Business Association, as well as representatives of the retail trade, soil production and the Confederation signed a new declaration of intent to reduce the use of peat in commercial horticulture and horticultural trade sectors. This collaboration focuses in particular on a coordinated reduction in the manufacture of peat-based substrates for horticultural production and a reduction in the supply and use, in producing horticulture as well as in retail trade and garden centres, of plants in containers or pots containing peat. It is thus implementing the second phase of the peat abandonment plan adopted by the Federal Council.

- https://www.bafu.admin.ch/bafu/fr/home/themes/economie-consommation/info-specialistes/torfausstieg.html

Schwändital Bog. Photo: Departement Bau und Umwelt

Canton supports peatland restoration in Schwändital valley

The Swiss Ordinance on the Protection of Raised Bogs and Transitional Mires of National Importance obliges the cantons to ensure that existing impairments of objects are reversed as far as possible at every opportunity. The biotopes must be preserved undiminished and impaired areas must be regenerated.

The Grosses Moos in the Schwändital is the largest raised bog in the Canton of Glarus. It is of national importance. Since the early 1990s, the use of the peatland has been contractually regulated between Canton Glarus and the alps corporations Vorderschwändi and Hinterschwändi. Grazing of the raised bog has ceased since then. Over 100 years ago, attempts were made to drain the peatland with deep ditches. The drainage ditches did not lead to the desired drainage of the peatland, but they have a strong impact on its water balance. The result is a continuous degradation of the peat and the release of CO_2 through microbial peat degradation. Part of the peatland is also acutely threatened by progressive erosion by a stream that flows in a deep trench and continues to erode the soft peat.

A canalized stream is to flow again in its old course over the peatland. To prevent water erosion, ditches must be dammed. In order to promote vegetation in the western part of the peatland, the water should no longer flow quickly into the ditches but flow slowly again and be distributed over the peatland surface. These measures will raise the water level in the peatland and greatly reduce fluctuations. In 1999, a ditch was filled with sawdust as a pilot project and the peatland water was raised with a buried clay dam at the northern edge of the peatland and wooden sheet pile walls across the ditch. The project was successful. On the basis of this pilot project, a basic study was commissioned and subsequently a construction project was drawn up. The investigations have shown that further ditches have to be dammed in order to successfully restore the peatland.

The costs of backfilling the trenches are expected to amount to CHF 705,000, of which the Confederation will contribute CHF 410,000 and the canton CHF 98,000. The additional costs for the project will be financed by the "myclimate" foundation, Zurich, and Pro Natura Switzerland. Myclimate expects the project to reduce CO_2 emissions by 3,000 tonnes over the next 50 years. The Alpkorporation Vorderschwändi takes over the coordination er and implements the project. It is to be realised in autumn 2019.

- https://www.gl.ch/public-newsroom/details.html/31/news/8149

United Kingdom

Cambridgeshire's peatland to be counted in carbon emissions data

A report by the Cambridge University Science and Policy Exchange says all peatland emissions will be included in the Government calculations from next year. The accounting effect on Cambridgeshire, the researchers say, could be an increase in recorded emissions of between 65 and 90 per cent. But the researchers also have positive

news - restored peatland can act as a carbon sink, and so contribute to a reduction in emissions. Cambridgeshire County Council declared a climate emergency in February this year.

At October 15, the county council passed a motion to appeal to the Government to run a pilot on council owned peatland farmland to address the issue. But speaking after the meeting the chairman of the commercial and investment committee, Councillor Josh Schumann, played down the interpretation that it could mean flooding peatland, saying there are other ways to bring about the sink effect. Cllr Schuman said: "[CUSPE] identified that peatland is a main contributor to giving off CO_2 - as the peatland dries out it emits CO_2 - and so with that information we then decided we couldn't ignore it and just say, well, that's just the lie of the land in this area… although the motion said to restore peatland, we are looking at a wider definition of restoration, so that doesn't mean flooding peatland again." "It's been proven elsewhere that there are other options," he said, giving wetland farming as an example. "Let's not pre-empt this," he added, saying the first step is to go to Government with the findings and present the opportunity to pilot new strategies.

Peatland is not included in the report's forecasts or policy suggestions, but the researchers note it "has the potential to change from a net emissions source to a net sink. "Cambridgeshire has the opportunity to be a leader in the effective restoration of peatland, an activity which will be important for climate change mitigation efforts all over the world, and thus the county could potentially have an impact on climate change mitigation at an international level."

- https://www.huntspost.co.uk/news/cambrigeshire-s-peatland-to-be-counted-in-carbon-emissions-data-1-6333355

Veolia calls for peat compost ban to hit zero carbon targets

In a statement issued 16 August, resources and waste firm Veolia called for peatland to be protected and for the end of growing media containing peat, if the UK is to meet its target on net zero carbon emissions by 2050.

Ending the use of peat as a growing media could also offer a boost for the composting of organic wastes, Veolia said. The company – which describes itself as the UK's largest peat-free composter – reported that the UK is "destroying" 805,000 tonnes of peat for horticultural use, including imported peat. This is the equivalent to cutting down 80,500 mature trees. There are 4 million tonnes of peat-free compost available in the UK – which Veolia says means a transition "is not just realistic but an environmental obligation". "Veolia collects green waste from millions of households through its nationwide composting sites, processing the organic material into a sustainable, peat-free, nutrient rich product for gardeners and farmers alike," Richard Kirkman, chief technology and innovation officer at Veolia UK & Ireland said: "We have the tools, supply and motivation to replace peat with a greener compost – but resolve must be reflected in legislation in order to encourage a quicker transition."

Veolia says that there has been an increase in use of peat-based products for the growing media industry, with 56% of growing material in stores using the material. Mr Kirkman called for the government to take action to protect peatland and encourage the transition to peat-free compost – by incentivising consumers to go peat-free and discouraging peat use by a "phased, wholesale ban". He said: "If we are serious about our planet's health and childrens' futures we need a root and branch removal of such a ruinous practice, especially when there is an alternative readily on hand to replace it." Veolia produces 150,000 bags of peat-free compost per year. It says this figure is likely to increase if green waste becomes more regular and free to collect, as was pledged in the Resources and Waste Strategy. Currently Veolia handles 400,000 tonnes of household waste annually, which is derived from a network of ten composting sites across the country. The material is processed using windrows.

- https://www.letsrecycle.com/news/latest-news/veolia-calls-for-peat-compost-ban/

Fresh call for ban on peat sales as ITV Tonight discovers UK garden centres set to miss green target

The ITV Tonight programme has learned garden centres no longer expect to end peat sales by next year. The sector agreed the voluntary deadline with government eight years ago because extracting the ingredient for compost is environmentally damaging. The programme's findings have led to fresh calls for a legally-enforced ban on peat sales. The gardening industry has responded with a new pledge to reduce peat sales, giving consumers more environmental information in future. Footage for ITV Tonight shows large scale peat production continuing this summer in Ireland, as agricultural vehicles remove it from land where it has taken centuries to form. As peat goes from bog to bag, the production process destroys a unique habitat and releases greenhouse gases. The ITV investigation reveals no major garden centre chain has yet completely stopped selling peat and that "reduced peat" compost can still contain up to 90%.

James Barnes, the chair of the Horticultural Trades Association which represents garden centres, said: "I think in all honesty the 2020 target will be very difficult to reach." He said by introducing reduced peat compost the

industry has achieved a 56% cut over recent years, but he admits more is needed. Now the gardening industry is to launch a new labelling scheme giving more detailed environmental information. Mr Barnes told ITV Tonight: "What we are hoping to launch later this year is a responsible sourcing scheme ... to inform the consumer what is in a bag of growing media." Some campaigners reject the garden industry's voluntary efforts at peat reduction and now want a legal ban. Dr Catherine O'Connell of the Irish Peatland Conservation Council described peat extraction as a "total disaster". She told ITV Tonight: "I'm very disappointed that peat sales continue in UK garden centres. "We now need clear leadership from the top and a legal ban is the solid way forward."
The UK government responded to the programme's findings saying it is "working with the horticultural sector to overcome barriers to going peat free" and is "considering further measures".

- https://www.itv.com/news/2019-08-22/fresh-call-for-ban-on-peat-sales-as-itv-tonight-discovers-garden-centres-set-to-will-miss-eco-friendly-target/

Peatlands: Commercial exploitation – Question in the House of Lords on 9th September 2019.
Lord Teverson Chair, EU Energy and Environment Sub-Committee: To ask Her Majesty's Government what plans they have to end the commercial exploitation of peatlands.
Lord Gardiner of Kimble The Parliamentary Under-Secretary of State for Environment, Food and Rural Affairs : My Lords, we have taken action to tackle domestic extraction of peat. The National Planning Policy Framework, published in 2012, ended the granting of new licences for peat extraction. We continue to focus on reducing demand for peat in horticulture in England, and on the uptake of alternatives. We are investing in research to overcome barriers to peat replacement. The forthcoming England peat strategy will set out our approach to speeding up progress.
Lord Teverson: My Lords, I welcome some progress in this area, but the Minister will know that our peatlands hold the equivalent, or a carbon sink, of something like 20 years of industrial emissions. Although I welcome things such as the peat restoration programme, surely it is better that they are not destroyed in the first place than that they need to be reconstituted? The voluntary process for reducing the commercial use of peat is not meeting its target, so when are we going to have mandatory targets that end the use of peat for commercial reasons?
Lord Gardiner of Kimble: My Lords, I sympathise with all that the noble Lord has said. That is why we are working on recovery plans. Amateur gardeners account for two-thirds of the peat being used. We have to reduce our use of peat and go for peat-free products. I read of one that incorporates wool and bracken, for instance. We are working with industry; I am very pleased that Kingfisher, one of the big retailers, is moving towards peat-free compost. That is how we must all proceed in reducing the use of peat and restoring what we have. It is vital to our environment.
Baroness McIntosh of Hudnall: My Lords, building on that Answer, amateur gardeners find it very difficult to get high-quality compost that does not contain peat. Can the Minister expand a little on what the Government are doing to get retailers not only to stock less peat-based compost—ideally, none at all—but to be more informative about the price that the environment is paying for the quality of the compost that they are selling?
Lord Gardiner of Kimble: As an amateur gardener, I agree with what the noble Baroness has said. It is precisely why we have embarked on a £1 million project, which ends at the end of this year, co-funded by the Agriculture and Horticulture Development Board, with growing-medium manufacturers and commercial growers. It is being undertaken by ADAS and the Quadram Institute. The results so far are very promising. Some of the new mixes

have proved very successful, and that must be the way forward. Clearly, we need to produce different materials if we want ericaceous compost for seeds and all the different components of agriculture, but the results so far are promising, and that is how we must proceed.

Baroness McIntosh of Pickering**:** My Lords, will my noble friend perhaps display a greater sense of urgency, considering that it takes 200 years to create a peat bog? Since there are flood prevention schemes, such as the Pickering pilot scheme, will the Government ensure that peat bogs are created as part of such restoration schemes and will they form part of the land management system under the eventual agriculture Bill?

Lord Gardiner of Kimble: Undoubtedly, peat bogs and fens help with flood management and improve water quality. Indeed, they play a considerable part in climate regulation, which is why in the wider research beyond what I have already described we are funding research into mitigation strategies—for instance, for lowland peatland. This research is being led by the Centre for Ecology & Hydrology. One of the things, of course, is not to let peat dry out.

Lord Clark of Windermere: My Lords, the problem is much wider than compost. Flora and fauna are being drastically affected. For example, the numbers of the iconic bird of the upland in summer, the curlew, have fallen dramatically because, without the peat bogs, they find it difficult to feed, in spite of their long beaks. Will he draw that to the attention of the agricultural civil servants in his department?

Lord Gardiner of Kimble: My Lords, the noble Lord is absolutely right. The merlin, the dunlin and the golden plover are all birds that are also significant in their impact on the ecosystems and important in the peatlands. That is precisely why we want to concentrate on restoring peatlands and reducing peat extraction. Interestingly, the worst damage is being done in the lowland areas of peatland.

Lord McColl of Dulwich: My Lords, why do we not go back to using manure, which was very effective?

Lord Gardiner of Kimble: My Lords, being a farmer as well as an amateur gardener, I say that manure by itself would be a little too rich for some of the seedlings which we all need to prosper, but my noble friend is absolutely right about using compost and manure. Using them in the right mix and getting the right alternatives—natural alternatives such as wool and bracken—is the way forward.

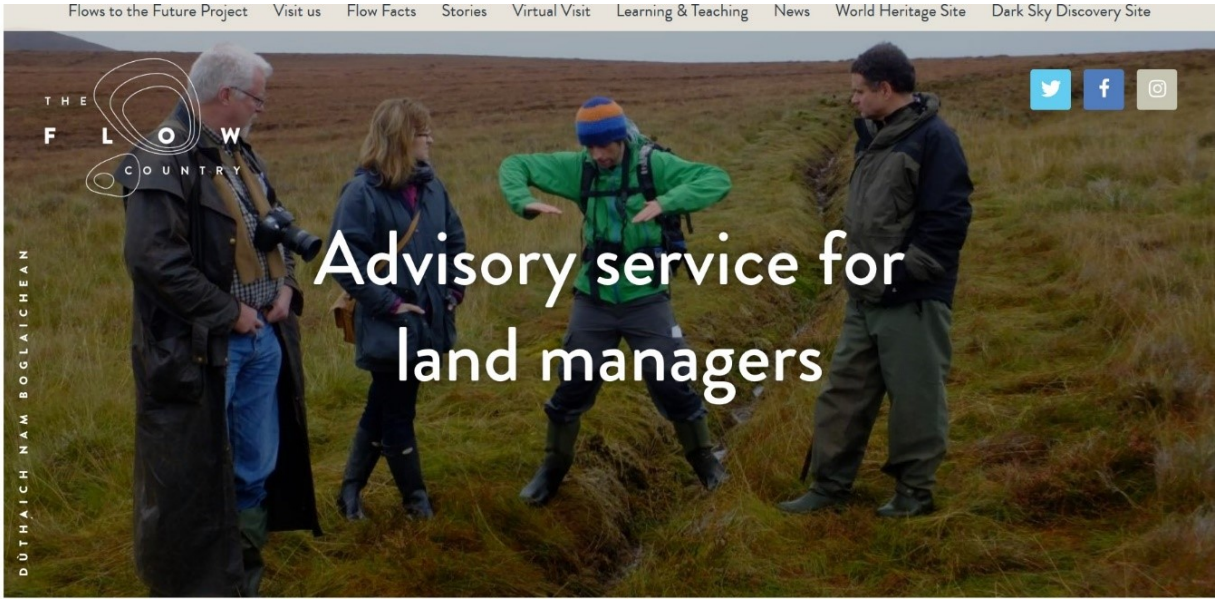
Baroness Bakewell of Hardington Mandeville: My Lords, specifically on commercial peat extraction, as my noble friend Lord Teverson said, this is causing irreversible damage to some of the most historic and vulnerable nature conservation habitats and environments, so 2030 is too late to tackle this problem. Wonderful wetland habitats are being created from previous peat workings, such as at Westhay Heath. Why are the Government not doing more to promote such schemes to preserve more wildlife habitats?

Lord Gardiner of Kimble: My Lords, I am pleased to say, as I think I may have said before, that we have already allocated £10 million to restore nearly 6,500 hectares of degraded peatland. These projects started last year and are due to complete in 2020. They are about raising the water table and re-wetting peat, along with the revegetation of bare peat. A lot of work is going on and we absolutely recognise that we need to roll these large-scale projects out more widely.

Lord Grantchester: My Lords, what work—and to what conclusion—has the Minister's department undertaken on the application of a carbon tax on sales of peat?

Lord Gardiner of Kimble: My Lords, obviously, that is a possible action, but we want to find the alternatives that will make the use of peat redundant and unnecessary. Peat is a very important natural resource that we need for our ecosystems, which is why we want to pursue that route. However, the noble Lord is right: in the end, if we cannot get it done through this voluntary approach, we will have to look at all eventualities. That is where, with the peat strategy, we will need to be determined to improve the peatland situation.

- https://www.theyworkforyou.com/lords/?id=2019-09-09a.1279.0&p=13564



Carbon Capture: This game lets you take on the role of peatland manager!

- https://www.theflowcountry.org.uk/virtual-flows/carbon-capture/

Study to look at wildfire impact on peatland

A new study is set to investigate the impact on peatland of this year's major wildfire in north Sutherland. The Fire Blanket project will focus on the effects of the blaze on some 60 km^2 of land between Melvich and Strathy in May. The area is part of the Flow Country, which is under consideration for World Heritage Site status. The project team, led by researchers from University of the Highlands and Islands, will explore how the wildfire affected features such as vegetation and water quality. It will also follow the fate of carbon once it enters the streams and rivers draining from the site.

The blaze in May affected some 60 km^2 of land between Melvich and Strathy. Photo: Thurso Fire Service

While data collection will be the main focus of the project, the team will also hold a workshop with land managers and other stakeholders to consider whether changes in management practices could help to reduce fire risks. Such changes could include restoration of drained areas by drain blocking, removal of brash material (branches from coniferous trees left on site after harvest and extraction) or creation of fire breaks in areas where forestry on peat is removed as part of ongoing restoration efforts. The year-long project is being funded by the Natural Environment Research Council. It will include researchers from the Environmental Research Institute at North

Highland College UHI, the Centre for Ecology and Hydrology, the National Oceanographic Centre, the University of Nottingham and the Royal Society for the Protection of Birds. Scottish Natural Heritage, the James Hutton Institute, the Flow Country Rivers Trust and Scottish Water are also partners. Dr Roxane Andersen, a senior research fellow at the Environmental Research Institute, is leading the Fire Blanket project. She said: "Understanding how land use interacts with climate extremes in peatlands is essential to inform which management practices best maintain and enhance peatland carbon storage. "However, this is notoriously challenging to achieve because climate extremes are rare and ephemeral. In addition, their effects can only be truly assessed where high-quality, ground-based observations predate an extreme event and where data from both impacted and similar control areas can be compared afterwards. "All these conditions have come together in the recent Flow Country fire, providing us with a unique opportunity to fill important gaps in knowledge required to improve management of peatlands to minimise fire risk and maximise resilience. We also hope it will open up avenues for further research."

- https://www.johnogroat-journal.co.uk/news/study-to-look-at-wildfire-impact-on-peatland-182321/
- https://www.bbc.com/news/uk-scotland-highlands-islands-49495704?intlink_from_url=&link_location=live-reporting-story
- https://www.pressandjournal.co.uk/fp/news/highlands/1830881/peatland-fire-a-unique-opportunity-to-fill-important-gaps-in-knowledge/

Establishment of Typha plantation in NE Germany, one day before flooding. Photo: Hans Joosten.

£1m Water Works project in Cambridgeshire will help save our peatlands

The government's Nature Capital Committee has warned that cultivated peatlands such as the Fens, where high winds whip up and remove the dried-out surface soil in the phenomenon known as 'Fen blow', are losing about 1-2cm a year and emitting seven million tonnes of carbon dioxide. Ultimately the peat will be completely lost, hitting the productivity of the important arable land, unless action is taken.

A pioneering two-year scheme, the Water Works project, is being run by the Wildlife Trust in Cambridgeshire at the Great Fen and aims to tackle these problems in partnership with Cambridgeshire ACRE, the University of East London and the Centre for Ecology & Hydrology. The project is exploring a new type of wet farming system using crops that like having soggy feet, and could help protect soils and cut carbon emissions. Raising the water table to grow the crops will help prevent the peat soils blowing away, reduce the carbon dioxide emissions from soil drying out and store it instead, and offer many benefits for wildlife. It also aims to provide farmers with economically viable crops – including innovative new products. Crops being tested include bulrush whose tubers can used for animal fodder and stems can make building materials and cavity wall insulation when dried out, while sphagnum moss can be used to replace peat as a growing medium. Insulation board. The seeds of *Glyceria*

fluitans, also known as floating sweet-grass or water manna grass can be used to make porridge or milled for bread, and could have a high value as a niche cereal. Novel crops with edible or medicinal properties that will be trialled are likely to include meadowsweet, with ambitions for a meadowsweet-flavoured gin, yellow flag iris and wild celery. Awarded £1million by the People's Postcode Lottery Dream Fund earlier in the year, the project is now under way.

- https://www.cambridgeindependent.co.uk/lifestyle/1m-water-works-project-in-cambridgeshire-will-help-save-our-peatlands-9080561/

Environment minister Rebecca Pow confirms backing for driven grouse shooting

In a letter to Labour MP for Don Valley Caroline Flint, dated 18 October and obtained by environmentalist and Wild Justice co-founder Mark Avery, Pow said the government has "no plans to ban or make any changes to grouse shooting regulation". She said the government "considers that shooting activities bring many benefits to the rural economy and can beneficial for habitat and wildlife conservation", adding that DEFRA would "continue to ensure a sustainable, mutually beneficial relationship between shooting and conservation". The same line was given by DEFRA in September, in response to a petition to ban grouse shooting which garnered 112,000 signatories. In its response, the department said it appreciated that "many people hold strong views on the issue of driven grouse shooting", but added that "shooting activities bring many benefits to the rural economy and can in many cases be beneficial for wildlife and habitat conservation". On the related issue of raptor persecution, the department said it had identified it "as a wildlife crime priority" with a "delivery group to consider what action should be taken, and develop a plan to prevent crime, gather intelligence on offences and enforce against it". The Raptor Persecution Priority Delivery Group focuses on the golden eagle, goshawk, hen harrier, peregrine, red kite and white-tailed eagle.

Reacting to the letter, Avery noted that Pow is the species champion for the snipe, but called her a "block on progress on raptor persecution" as well as the "minister in charge of badger culling – so not much of a species champion really". He added: "Why is it that Conservative DEFRA ministers are associated with killing wildlife rather than conserving it?"

- https://www.endsreport.com/article/1667204/pow-confirms-backing-driven-grouse-shooting

Illegal killing of birds of prey is rife

With grouse shooting season underway, the mass killing of wildlife is taking place up and down the country. The RSPB's Birdcrime 2018 report has revealed that the illegal killing of birds of prey is rife throughout the UK, confirming 87 incidents in 2018. This total included 31 buzzards, 27 kites and 6 peregrines, with hen harriers, red kites and owls also illegally slaughtered. Despite the 87 confirmed killings, only one incident resulted in a conviction. According to the report, these figures only offer a glimpse into a far larger problem, as intelligence and data gathered from the satellite tagging of raptors suggest that many more birds will have been killed and not found. The report raises strong concerns around grouse shooting, which takes place each year from 12 August, known as the 'Glorious Twelfth', to the 10 December. According to the report, there are illegal killing blackspots in the Peak District, North Yorkshire and southern Scotland, where the land is managed for driven grouse shooting. In these areas, birds of prey and other protected species are considered a threat to grouse stocks, and are therefore routinely and illegally trapped, shot and poisoned. Hen harriers have suffered the most from this culling – a recently published ten-year scientific study using Natural England data revealed that 72 per cent of satellite-tagged hen harriers were confirmed or considered very likely to have been illegally killed. On 11 August, former Green Party leader Natalie Bennett joined thousands of protestors in Derbyshire for Hen Harrier Day, a day of campaigning against the unjust slaughter of the bird of prey.

Significant concerns have also been raised around the environmental impacts of grouse shooting, with the RSPB report highlighting issues with moorland management practices such as the burning of heather to provide a habitat for the grouse. This practice is leading to degradation of the peatland, causing serious environmental damage through increasing flood risks and releasing carbon dioxide into the atmosphere. The Committee on Climate Change has reported that damage to UK peatlands – often caused by moor burning for grouse shooting – is releasing 18.5 million tonnes of carbon dioxide equivalent into the atmosphere each year. The RSPB is therefore demanding an independent review of driven grouse shooting in England, strengthening its calls for grouse moors to be licensed across the UK. Commenting on the environmental impacts of grouse shooting, Martin Harper, Conservation Director at the RSPB, said: "Any industry which includes criminal and environmentally damaging practices needs reform. The driven grouse shooting industry has, despite decades of

warning, failed to put its house in order – most shockingly turning a blind eye to the ongoing illegal persecution of birds of prey. Given we face a climate and ecological emergency, we believe it is time for governments to intervene. A first step should be, as is happening in Scotland, independent reviews of driven grouse shooting for the rest of the UK. Ultimately, the RSPB believes that change will only come through regulation."

- https://greenworld.org.uk/article/illegal-killing-birds-prey-rife
- https://www.theguardian.com/uk-news/2019/oct/29/grouse-shooting-estates-face-ban-on-burning-of-peat-bogs

'Even if you think it is reasonable to rear grouse so they can be driven in front of the guns of rich people for the 'sport' of killing them, even if you think the routine illegal killings of birds of prey and legal slaughter of incredible numbers of mountain hares, crows, foxes and other animals is acceptable, the climate emergency means that the management of all the peat-rich grouse moorland in Scotland will have to change radically.'

Dr Richard Dixon, director of Friends of the Earth Scotland

- https://www.scotsman.com/news/opinion/columnists/why-even-those-who-think-grouse-shooting-is-glorious-must-back-radical-change-dr-richard-dixon-1-4981923

Building windmills on peatland in Scotland. Photo: Hans Joosten.

Windmills on peatland tearing island community apart

When plans for a giant wind farm to be built on pristine peatland on Shetland were proposed in 2005, it was presented to the islanders as a community-owned enterprise with the potential to earn them £37 million a year. But after 14 years and growing concerns over Shetland's fragile biodiversity being shattered by the 155 meter turbines being built on pristine peatland and the infrastructure required to construct them, hundreds of islanders are now calling for the project to be scrapped. Frank Hay, chairman of Sustainable Shetland, an action group formed in 2009 to take on the council-owned Viking Energy Shetland (VES) and partner Scottish and Southern Energy (SSE)'s multi-million pound Viking Wind Farm, said: "It's basically economics against the environment. The scale of the wind farm and where they are proposing to build the turbines, it's simply not right." More than 800 members of Sustainable Shetland, who raised £200,000 to challenge the farm's planning consent, resulting in a hearing at London's Supreme Court in 2014, cite the approval of the wind farm without a Public Local Inquiry as another motivator. The involvement of Shetland Islands Council (SIC) as developers soon attracted accusations of conflicts of interest, which led to the council transferring its share – 50 % of ownership – to Shetland Charitable Trust, which invested about £10m in the project. In March this year the trust announced it would not be contributing further to the wind farm, with SSE providing all future financing.

The risk of peatslides is just one of the concerns held by local meteorologist and geologist Allen Fraser. He said: "Most of the access roads are floating roads on peat more than five metres deep, which will disrupt the natural drainage into the valleys, resulting in erosion and peatslides. "Carbon release and pollution risk was not properly investigated. It is clear from the works already begun that planning and environmental constraints placed on the developers are being circumvented or ignored." Sustainable Shetland says the community has "real concerns" over the health implications for those who live near or within the wind farm. The 129 km^2 wind will stretch in a practically unbroken line through the length of the islands for more than 70 kilometres, all on peat, on an island chain of low hills that is 110 km long and only 10 km wide at the widest point. "Access roads and power lines, along with at least 12 super quarries, will criss-cross and permanently scar the hills for 150 km." Richard Lindsay, head of Environmental and Conservation Research at the University of East London, said: "The simple fact is that just 30cm of peat over one hectare contains the same amount of carbon as one hectare of tropical rainforest – around 280 tonnes. "Most of Scotland's peatlands have been absorbing carbon for thousands of years, so when you damage them you release this long-term store." Efforts to restore the peat by SSE could prove fruitless, said Mr Lindsay. "One way of looking at it might be robbing Peter to pay Paul, in that some of the peat is being restored but what is the long-term damage?" he said.

Campaigners have argued that Shetland cannot support the £700m interconnector cable that would transmit energy from the islands to the Scottish mainland. Mr Fraser said: "Not one amp of power generated by these giant windfarms is for use in Shetland, it is all for export down the cable. There is no guarantee of any community benefit after the shareholders and owners of the windfarms have taken their cut." In 2012, when the original planning application was submitted, SIC received 2,772 individual objections and 1109 letters of support. Mr Hay said: "The question is, is the environmental damage justified? We don't think it is. Shetland has a unique landscape and we're just horrified by the prospect of it." A spokesman for SSE Renewables said: "Viking wind farm is a unique onshore wind project that will deliver millions of pounds of direct investment into the Shetland economy and employment during construction and its lifetime. "Green energy from Viking will deliver a significant contribution to climate change targets and help Scotland's transition to net zero emissions by 2045 and provide a vital source of economic diversification for the islands."

- https://www.heraldscotland.com/news/17858289.shetland-windfarm-plans-sparked-furious-response-locals/

The fate of blanket bogs: windmills in the Xistral Mountains, Galicia, Spain. Photo: Hans Joosten.

Concerns raised over impact of proposed Yell wind farm, Shetland

Plans for a 29-turbine wind farm in Yell have received objections from a number of organisations, including the island's community council and Shetland Amenity Trust. Yell Community Council said it objected to current plans for the Energy Isles wind farm, which would be located west of Cullivoe, on the grounds of noise level and environmental and visual impact, as well as the height and number of turbines. The consortium behind the proposals for the Energy Isles development submitted a planning application to Scottish Government ministers

in May. The overall capacity of the proposed development is in the region of 145 to 200 MW. As the proposed development is over 50MW in capacity, the decision on whether it gets the green light will come from the Scottish Government's energy consents unit.

Shetland Amenity Trust said it objected as it believes the location of the wind farm is not suitable for development, mainly due to concerns over the impact on active blanket bog on the site. Chairwoman Ruth Mackenzie said there was "clear tension" between the Scottish Government's current policy on renewable energy and the importance it attaches to the role of peatland in tackling global climate change. "We feel that the construction of industrial-scale wind farms on active blanket bog is incompatible with the government's national peatland plan," she wrote. "It is misleading to suggest, as developers continue to do, that active blanket bog can simply be returned to an active state following the impacts of major development." The trust also said the area of Yell "should clearly have been identified" as a wild land area as part of Scottish Natural Heritage's 2013 consultation on core areas of wild land. "We would urge the government to ask Scottish Natural Heritage to revisit this extensive tract of land on Yell and redress this omission," it said. The trust concluded that while it supports "successful' development of all types of renewable energy, "we consider that it would now be appropriate for the community, led by the council and with the support of the Scottish Government's energy consents unit, to pause and reflect on all existing and desired consents, and carry out a suitable public consultation exercise that would focus on the impact and consequences for the islands as a whole". The amenity trust also warned that if approved then the development should have "independent and properly resourced means" of ensuring that planning conditions to minimise environmental damage are met. It said that Shetland Islands Council does not have sufficient resources to deal with this at present and "first-hand experience tells us that the developers can take advantage of such situations to cut corners" in the knowledge they are unlikely to be held to account. Scottish Natural Heritage (SNH), meanwhile, said it believed the current proposal would have "significant adverse effects on the special qualities of the Shetland National Scenic Area such that the objectives of the designation and overall integrity of the area would be compromised". The organisation expressed concern over the possible impact on regional populations of breeding birds, particularly the red-throated diver, with SNH keen to see further information. "We believe that there is scope for a wind farm of smaller scale in the north of Yell and would be happy to work with the developer to find a solution that avoids unacceptable impacts, but the changes necessary to do so are so extensive that this would effectively constitute a new proposal," SNH added.

Shetland Bird Club said it objected to the plans as the "environmental impact assessment report seriously underestimates the adverse effects of this proposed development on important species and habitat in the area". It believes the wind farm would have a "serious adverse effect on the populations of red-throated diver, merlin, golden plover, dunlin, whimbrel, curlew and arctic skua and would severely damage the active blanket bog which is present on much of the site". However, the club suggested that if ministers were minded to approve the plans then the habitat management plan should be more extensive.

- https://www.shetnews.co.uk/2019/07/29/concerns-raised-over-impact-of-proposed-yell-wind-farm/

Huge Flow Country wildfire 'doubled Scotland's emissions'

A massive wildfire on peatland in the far north in May doubled Scotland's greenhouse gas emissions for the six days it burnt, a study has estimated. About 5,700 hectares of blanket bog in the Flow Country, which stretches across Caithness and Sutherland, was affected. The WWF Scotland study claimed 700,000 tonnes of CO_2 equivalent was released into the atmosphere as a result. That is similar to the amount released across the rest of Scotland. The study called for more government investment to protect and improve peat bogs. Head of WWF policy Gina Hanrahan said: "This analysis puts into stark figures the importance of our peatlands and the huge cost to climate and nature when something goes wrong." Emma Goodyer, from the International Union for Conservation of Nature (IUCN), said: "Healthy peatlands are more resilient to fire. A great deal of peatland restoration work is being undertaken across the UK already with at least 150 projects carried out in Scotland. "However, we need to increase the scale of funding available for peatland restoration if we are to urgently respond to the climate crisis and to increase the resilience of our peatlands." A Scottish government spokesman said restoring peatland had an important part to play in delivering climate change ambitions. He said the government was committed to delivering the peatland restoration targets set out in the Climate Change Plan.

"We are currently updating our Climate Change Plan which will set out detailed actions to deliver on our climate change ambitions," the spokesman said.

- https://www.bbc.com/news/uk-scotland-50435811

Peat pilots set to revive English peatlands

Five of England's most iconic peatlands sites are a step closer to being revived and restored as part of Defra & Natural England's Peat Pilots. The pilots could play an important part in reducing UK carbon emissions in the future and are taking place in the areas of Northumberland, Greater Manchester, North York Moors, East Anglia and Dartmoor. Environment minister Thérèse Coffey said: 'The restoration of England's iconic peatlands will make a vital contribution to reducing the UK's carbon emissions. The peat pilots are the latest in a series of measures we're taking with Natural England and will play an important role in the development of a new English Peat Strategy. This will explain how, over the next 25 years, we will improve the condition of our peatlands, so that they meet the needs of wildlife, people and the planet.'

The projects which form part of the pilot are located in five areas across England:

- Dartmoor: Working with National Park, Duchy of Cornwall, South West Water and others; particularly focusing on restoration of peat in Molinia-dominated areas on common land
- East Anglian fens: This project will work with internal drainage boards to look at water flows on and around the fens. It will also bring in long-term sustainability of peat management opportunities which will assist with the creation of the Lowland Agricultural Peat Taskforce
- Greater Manchester: Working with Greater Manchester Combined Authority and other partners, the pilot will demonstrate how management of peat is key to the resilience of the city-region
- Northumberland: This project will be working with partners including the Northumberland National Park and Forest England. It will explore new opportunities for ecological restoration and ongoing funding for land managers with peat on their land in the Cheviot Hills and the 'Forgotten Lands' east of Carlisle
- North York Moors: Working with the North York Moors National Park this project will examine data on peat depth and extent and will explore how novel peat restoration techniques can be applied

It is hoped the projects will help to turn around the fortunes of England's peatlands, with around two thirds of peatlands now considered degraded as a result of cutting, drainage, burning, over-grazing and atmospheric pollution. The emissions of greenhouse gases to the atmosphere from England's peatlands have recently been estimated as being equivalent to 11 Million tonnes of CO_2per year.

Clifton Bain, director of IUCN UK Peatland Programme, said: 'The international community has recognised the importance of peatlands in our global future. Investing in peatland health is one of our easiest actions against climate change. The UK peatland community have the knowledge and skills to secure the long term future of our peatlands - supporting our natural carbon stores, helping wildlife and people.' Dr Olly Watts, senior climate change policy officer for the Royal Society for the Protection of Birds said: 'Peatlands are central to tackling the decline of nature and the climate change crisis, and require more action. Ahead of Defra's much-awaited England Peatland Strategy, the RSPB welcomes and will contribute to these pilot projects.

Particularly exciting, the challenge of farming in lowland peat areas, with thinning soils and our peatlands' largest greenhouse emissions: how can economic land use develop towards a sustainable, nature and climate friendly future? We look forward to effective ways to assess the state of, and more sustainable management for, all our varied peatlands.

- https://naturalengland.blog.gov.uk/2019/08/12/peat-pilots-set-to-revive-english-peatlands/

Spaceport to be build in Scottish Highlands after project bosses reach agreement with local farmers

Plans to build Britain's version of Cape Canaveral in remote Scotland peatland is to go ahead after project bosses reached an agreement with local crofters. The UK Space Agency in partnership with Aerospace giant Lockheed Martin and Highland and Island's Enterprise (HIE) put forward a plan to create a launch site for rockets to carry micro-satellites last year. Their plan to build a vertical launch site on the Melness Crofting Estate, on the A'Mhoine peninsula of the Scottish Highlands beat competing bids from other remote Scottish regions for the launch site, which would propel the micro-satellites into low orbit as early as 2021. The plan has now been given the go ahead after project bosses reached an agreement with local crofters following a dispute. They say that the area is home to rare birds and insects - like white-tailed eagles and Great Yellow bumblebees - that will be threatened by the development as well as concerns that dozens of acres of rare peat bog would be replaced with concrete. Three of the seven directors of the Melness Crofters Estate, a company representing 56 local crofters who own the land HIE wants to build on, have resigned over how the plans have been handled in November 2018 after 27 of 56 crofters voted in favour of leasing the land to the UK Space Agency, while 18 voted against and 10 failed to vote. George Wyper, one of three directors who stepped down, said that much of the local crofting community had been kept in the dark about what was involved and the fact that there was a lack of information

from the developers. However, following a long period of negotiation, representatives of MCE and HIE have signed an agreement on July 31, 2019, which allows for HIE to lease the land from the Crofting Estate to build the Spaceport once planning permission has been granted by the local council.
Dorothy Pritchard, chairwoman of the Melness Crofting Estate, said: 'We look forward to continuing our links with HIE, and to working with the launch companies and site operator to maximise job opportunities and community benefits for our area. 'Like everyone else, we want to make sure the environmental and safety aspects of the proposed development are thoroughly examined and fully addressed as part of the process.'
However, John Williams, co-founder of the Protect the Mhoine group who are campaigning against the development, said: 'The A'Mhoine is part of a rare peat bog ecosystem that requires TLC, if it is to survive, for future generations. 'We believe that a rocket launch site, without adequate environmental protection monitoring, is not tenable. 'The environmental arguments against this project are relevant, reasonable and powerful.'
The project, nicknamed the 'British Cape Canaveral', will create more than 40 permanent jobs and 400 construction jobs. The commercial space sector is estimated to be worth a potential £3.8 billion to the UK economy over the next decade with funding for the project coming from £17 million from Highlands and Islands Enterprise and £23.5 million coming from the UK Space Agency. An additional £5m will come from Orbex, a British Rocket Company who will develop technology for the site.
At the time of choosing the site, the UK Space Agency (UKSA), said: 'Scotland is the best place in the UK to reach in-demand satellite orbits with vertically launched rockets and there is a real opportunity here to capture the growing market for launching an estimated 2,000 small satellites by 2030.

- https://www.dailymail.co.uk/news/article-7311341/British-spaceport-built-Scottish-highlands-dispute-local-farmers.html

North- and Central-America

Canada

In response to the article co-authored by Hans Joosten and Greta Gaudig on their rebuttal of restoration work in Canada (Is IPS going to miss the train? IMCG bulletin – April-May 2019)

Among the speakers attending the International Peatland Society Annual Convention in Bremen in 2019, Paul Short, president of the Canadian Sphagnum Peat Moss Association, gave a talk about the management of environmental issues by the Canadian peat industry. He stated: “In Canada, successful restoration is achieved within 50 years.” In their rebuttal, Hans Joosten and Greta Gaudig qualified this statement as a ‘fallacy’ (sic) and responded: “This restoration concerns – if at all – only vegetation cover, not the peat body. If peat would be practically renewable, peat extractors could perpetually use the same site, which they don’t”.
The Canadian peat industry does not question the statement regarding the non-renewability, from a horticultural use perspective, of the peat accumulated in a restored peatland. This is why the term responsible rather than sustainable has been used regarding the peatland management practices in Canada. One should be strongly concerned about the fate of the few bogs and fens remaining in a more or less natural state in Europe. However, to suggest that peatland restoration in Canada is a fallacy (Merriam-Webster: an often plausible argument using false or invalid inference), in spite of 25 years of combined efforts of scientists and industrial partners to find scientific solutions to this problem, is vexing. In this letter, we challenge this opinion – with facts – and argue that peatland restoration in Canada is much more than merely re-establishing a plant cover.
The Peatland Ecology Restoration Group (PERG; www.gret-perg.ulaval.ca) has been monitoring 114 restoration projects across Canada since the first experiments conducted in 1991. With the Moss Layer Transfer Technique (MLTT; Graf & Rochefort 2016), we can restore, in a post-extracted surface, a moss cover composed of *Sphagnum* and *Polytrichum* species and other vascular plants in less than 5–15 years (Gonzalez & Rochefort 2014; 2019). Abundant research – 25 peer-reviewed papers published to date – have been done on the response of vegetation to the restoration procedure we developed.
But vegetation studies are only part of our research program. Since its foundation, PERG has published over 220 scientific articles on various aspects of peatland restoration, such as evaluating the return of microorganisms, insects, mammals, birds, or different functions of the ecosystem such as water regulation, filtration or plant nutritive status. More important for this rebuttal, Canadian researchers have demonstrated, with data, the

return of a strong C sequestration function in restored peatlands (Global Change Biology 24: 5751, 2018). We found that a restored peatland is an annual sink for CO2 (–90 g C m^{-2} yr^{-1}), a source of CH4 (4 g C m^{-2} yr^{-1}), and a source of DOC (7 g C m^{-2} yr^{-1}), resulting in mean net ecosystem C uptake of 79 g C m^{-2} yr^{-1}. In fact, the MLTT has been very effective at not only re-establishing a plant cover, but also at creating a net C sink rate similar to that of an undisturbed peatland.

One could argue that regardless of this performance, it is still better to not use peatlands at all. But Sphagnum peat has a lot of environmental advantages in the greenhouses' market. Although alternative growing media to peat exist, it is important to compare the full life cycle of all options to make responsible decisions about appropriate use. Canadian researchers have been criticized for working with the peat industries, especially since they partly fund our research through partnership programs with the Natural Sciences and Engineering Research Council of Canada. Some even question our independence, in spite of our binding code of ethics. However we strongly believe that it is far better to cooperate with industrial partners to find solutions, than to criticize everything they do on environmental issues, whatever their efforts to better manage peatlands. Criticism is important, and as a research group, we have never hesitated to speak out on aspects associated with peatland management we felt were wrong. But it is obvious that solutions are urgently needed, not only critiques, and this is what PERG and Canadian researchers are working on. We know, based on scientific evidence accumulated over 25 years of research, that our bog restoration solution works. It is extremely disappointing to not see our work recognized.

PERG researchers throughout the years, signing this rebuttal note:

André Desrochers – Laval University (fauna), *Line Lapointe* – Laval University (small berries), *Claude Lavoie* – Laval University (invasive plants, historical ecology), *Monique Poulin* – Laval University (biodiversity), *Jonathan Price* – University of Waterloo (hydrology), *Line Rochefort* – Laval University (plant ecology, biochemistry), *Nigel Roulet* – McGill University (peat-atmosphere interface), *Maria Strack* – University of Waterloo (carbon biogeochemistry), *Ian Strachan* – McGill University (C cycle), *Mike Waddington* – McMaster University (carbon biogeochemistry)

Followed by a list of >220 peer reviewed publications related to peatland restoration by PERG. The list can be requested from Hans Joosten joosten@uni-greifswald.de or Line Rochefort Line.Rochefort@fsaa.ulaval.ca

The Paris Agreement implies the end of peat extraction worldwide… Photo: Hans Joosten.

And the re^3-action on the response

Hans Joosten (joosten@uni-greifswald.de) and Greta Gaudig (gaudig@uni-greifswald.de)

We had never thought that the IMCG Bulletin would ever be spelled out so intensely ;-).

Just to recall: in IMCG-Bulletin 2019-4 we summed up a series of 14 common "fallacies" with which the peat industry continues to repeat "outdated arguments in favour of the use of peat". One of these fallacies reads that

"in Canada successful restoration is achieved within 50 years", which we challenged by arguing: "This restoration concerns – if at all - only vegetation cover, not the peat body. If peat would be practically renewable, peat extractors could perpetually use the same site, which they don't". And it was this statement that has roused attention (see letter of our Canadian colleagues above). So let's take a look at the issue at hand:

- Firstly, we need not argue about what a "fallacy" is: the Merrian-Webster definition covers what we mean rather well: A mistaken belief, […] based on unsound arguments (Oxford English Dictionary).
- Our ten Canadian colleagues challenge only one of the 14 fallacies. This allows us to focus on this fallacy alone.
- Remember that we were talking about "[t]he increasing societal demands of climate change mitigation and guaranteeing food security".
- The Paris Agreement and the 2018 IPCC 1.5° Special Report have made it perfectly clear: in order to limit climate change to 2° C, and more ambitiously to 1.5° C, we have to reduce net CO_2 emissions to 0 (zero) by 2050. And after 2050 we even need net CO_2 sinks. Not the sinks of already existing peatlands; we need those too, but they have already been factored in. No: we need *extra* sinks. The Paris Agreement simply implies the end of the use of fossil carbon resources, including the use of peat.
- The point we aimed at was that even with successful restoration of a peat forming vegetation, ongoing peat extraction is violating this central implication of the Paris Agreement.
- It seems we do not disagree here. Our Canadian colleagues confirm: "The Canadian peat industry does not question the statement regarding the non-renewability … of the peat accumulated in a restored peatland."
- Which is actually what we were talking about: Peat extraction mobilizes fossil carbon that has accumulated over thousands of years and brings it into the atmosphere. Even "creating a net C sink rate similar to that of an undisturbed peatland" cannot compensate for these losses. We all agree on that.
- Now that the entire world has to pursue net zero carbon, the phrase "responsible rather than sustainable" is problematic. Since Paris, peat extraction might– for the time being – be inevitable, but it has stopped to be "responsible" and we should try to stop it as soon as possible. Since Paris, the use of the term "responsible" in this context is wrong and irresponsible.
- Therefore we are deeply concerned when we see that the International Peatland Society (largely funded by the global peat industry) mainly seems to care how to secure peat delivery, when China announces to double the global peat demand. Instead, IPS as a peatland society should worry about this threat to climate stability and strengthen its efforts to find alternative solutions.

But back to Canada...

- In Canada, compared to Europe, the problems with peat extraction do not seem to be that large: a huge country, an even larger, basically untouched peatland expanse, that has suffered only little from drainage-drainage-based agriculture and forestry (which have given the lethal judgment to peatlands in other parts of the world), a comparatively small peat industry, which from the early days has included environmental concerns in its business concept…
- The combination of all these things would have kept Canada largely out of the line of fire of global peatland conservation. But Paris has changed the scene. Like all other sectors, which have to reach zero net emissions, the industry has to orient on a (fossil) peat-free future, also in Canada.
- Our reproach that the peat industry is not doing enough to find alternatives is corroborated by the industry's persistent claim that peat constitutes about 95% of the growing media of professional horticulture. You simply cannot claim effort by repeating insignificance.
- The good performance of the *Canadian* peat industry has already for 30 years been used to show off how well the *global* peat industry is performing. This approach is getting more and more unreasonable … In fact worldwide only a very small fraction (1%?) of the peatland area destroyed by peat extraction has been restored/rewetted. In this context, Canadian scientists have to be careful not to be instrumentalised by the global peat industry.

Last but not least: we appreciate the work done by our Canadian colleagues in science. We have been strongly inspired by their work in developing "Sphagnum farming" as a possible alternative to peat extraction in Europe. And we are convinced, that the challenges posed by the Paris Agreement, to rewet/restore 20,000 km^2 of drained peatland worldwide every year until 2050, will benefit from the insights the Canadian scientific community has gathered. But in the framework of the Paris Agreement, Canadian scientists should not only focus their work on peatland restoration but also increase their efforts in finding and producing alternatives to fossil peat in horticultural media.

Stefaan Vandaele, Chairman of Growing Media Europe (GME): "Peat-free growing media have recently gained momentum, thanks to NGOs and decision-makers who **mistakenly** see **peat-free** as a solution to preserving biodiversity and reducing greenhouse gas emissions. As GME, we call for a **scientifically based** debate and policy that looks at the big picture, rather than relying on the simple way out of certain ideologies." (*emphases GME*)
https://www.gabot.de/ansicht/baltic-peat-producers-forum-torf-zwischen-jetzt-und-2050-399711.html

Québec RE³ Conference will be held in Québec City from June 7 – 11th, 2020.
At the dawn of the UN Decade of Ecosystem Restoration (2021-2030), it is great timing for this joint conference between the Canadian Land Reclamation Association (CLRA), the Society for Ecological Restoration (SER) and the Society of Wetland Scientists (SWS). Furthermore, the conference will follow the 50th Anniversary of Earth Day, and will celebrate SWS's 40th year as a society. The theme of the conference is "From Reclaiming to Restoring and Rewilding". More information: http://www.re3-quebec2020.org

Peat for saving permafrost?
Researchers at Canada's National Research Council are testing the properties of peat to make it into a building material that could be used to preserve permafrost under buildings and infrastructure. "In research and investigation of peatlands, we've noticed that peat has a unique dual thermal conductive properties," said Igor Egorov, a research officer in civil engineering infrastructure for the NRC's Construction Research Centre. "We're thinking, can we use these unique properties for application in the construction industry?"
Peat is porous, so it contains air in the summer and ice in the winter in the NWT, each working in their season to cool the ground. During summer, the unfrozen peat has very low thermal conductivity – it is basically an insulator, protecting the permafrost layer from heat. In the winter, the frozen peat becomes conductive. It contains ice and draws warmth from the soil to the atmosphere. A problem that the peat used in construction may not be crushed or flattened – it must remain porous. Egorov's team is looking at ways to reinforce its structure, as well as methodologies for measuring the properties of peat. By 2050, 15 to 20 % of near-surface permafrost may be thawed or degraded, according to Egorov. "We have to understand how this peat works and why permafrost is associated with peat and maybe we will be able to mimic these properties to preserve our Northern communities from degradation processes." Regions of the northwestern Northwest Territories (NWT), in particular, have seen increased thermokarsts and thaw slumping – sinkholes and landslides caused by permafrost thaw, respectively – in recent years. Egorov said the NRC's peat system would ideally be part of a larger mix of systems called "inter-seasonal cold redistribution." "It means we're capturing extra cold during the winter and we're storing this extra cold in the soil, in the form of ground ice, and redistribute the cold in the summer. In this way we can protect and preserve the permafrost." Some methods, such as the peat, would be passive – requiring no energy – while others would run off renewable energy sources. Egorov's team is working a powered permafrost-freezing method that works on renewable energy that has already seen some success in testing in the NWT. He says it would prove very competitive with thermosyphons, the most common stabilization technology in use in the North, as it is more efficient and effective during mild seasons. "We've managed not only stabilize permafrost but refreeze it where it's already degraded." Egorov said his team will soon reach out to Northern governments to pitch partnerships.

- https://nnsl.com/yellowknifer/could-peat-moss-save-permafrost/

Mexico

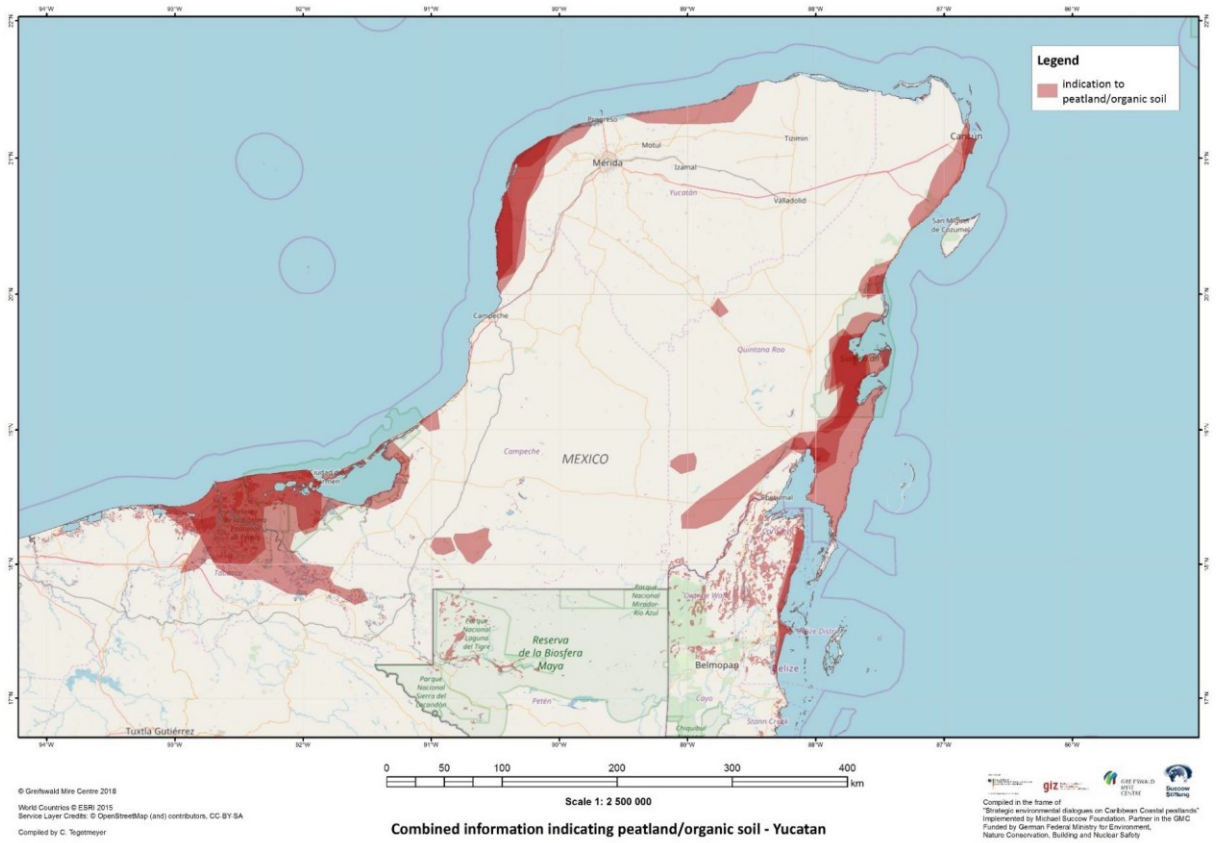
Mexico plans huge increase in palm oil production in sensitive ecosystems

The Mexican state of Campeche has the largest percentage of land designated for environmental conservation of any state in Mexico. However, the Mexican government in March 2016 announced its plans to plant 100,000 hectares of oil palm in the coming years. “Campeche is laying the foundation to transform, to remove petroleum from its economy and be a national and international example, igniting the enormous productive potential of the countryside,” the official press release states.

According to León Enrique Ávila, a agroecology engineer at the Universidad Intercultural de Chiapas, the agroindustry companies operating in Campeche have obtained land “aggressively” and with the assistance of the government. He says that the area planned for oil palm expansion in Campeche is home to wetlands with high conservation value that are home to threatened species. “The risk, above all, is to the southern part of the Laguna de Términos protected area,” Ávila said. Ávila says that when he took students to southern Campeche, he found beautiful wetlands and lakes he had never seen. “They are some lovely areas [but] the oil palm is approaching.”

The Flora and Fauna Protected Area of Laguna de Términos is part of the largest watershed in Mexico, formed by the Grijalva and Usumacinta rivers. Satellite data from the University of Maryland show the progression of heavy land clearance around – and within – the Laguna de Términos protected areas. 2019 has been a big year for deforestation, and several new areas of clearance have displaced primary forest. “Everything is in Laguna de Términos, all the palm is around it, all the rivers are surrounded by palm,” Ronny Aguilar, a journalist and activist from Campeche said. “They have drains, dams they made illegally. The Candelaria River, the Escárcega River, and Palizada River. It’s a red flag. It’s estimated that there are 42,000 hectares registered around Laguna de Términos.”

- https://news.mongabay.com/2019/11/mexico-plans-huge-increase-in-palm-oil-production-in-sensitive-ecosystems/



Peatland occurrence around Laguna de Términos, Mexico. From: Peters & Tegetmeyer 2019: Inventory of peatlands in the Caribbean and first description of priority areas. Proceedings Greifswald Mire Centre 05/2019.

United States of America

Trump Administration rolls back Clean Water Protections

The Trump administration on September 12 announced the repeal of a major Obama-era clean water regulation that had placed limits on polluting chemicals that could be used near streams, wetlands and other bodies of water. The rollback of the 2015 measure, known as the Waters of the United States rule, adds to a lengthy list of environmental rules that the administration has worked to weaken or undo over the past two and a half years.

An immediate effect of the clean water repeal is that polluters will no longer need a permit to discharge potentially harmful substances into many streams and wetlands. But the measure has implications far beyond the pollution that will now be allowed to flow freely into waterways. The Obama administration implemented the rule in response to a Supreme Court decision that opened the door to a more expansive legal definition of "waters of the United States" under the 1972 Clean Water Act. With the announcement of September 12, the Environmental Protection Agency is aiming to drastically narrow that definition, a move that critics fear could be difficult for future administrations to undo because the ideological balance of the Supreme Court has shifted to the right.

Overhauling the rule had been a central campaign pledge for President Trump, who characterized it as federal overreach that impinged on the rights of farmers, rural landowners and real estate developers to use their properties as they see fit. Mr. Trump signed an executive order in the early days of his administration directing federal agencies to begin the work of repealing and replacing it.

The Obama rule was designed to limit pollution in about 60 percent of the nation's bodies of water, protecting sources of drinking water for about one-third of the United States. It was issued under the 1972 Clean Water Act, which gave the federal government broad authority to limit pollution in major water bodies, like Chesapeake Bay, the Mississippi River and Puget Sound, as well as streams and wetlands that drain into those larger waters.

But two Supreme Court decisions related to clean water protection, in 2001 and in 2006, created legal confusion about which smaller streams and headwaters and wetlands fell under federal authority. Obama officials said the rule was meant to clarify that authority, allowing the government to once again limit pollution in those smaller bodies of water.

Under the rule, farmers using land near streams and wetlands were restricted from doing certain kinds of plowing and from planting certain crops, and would have been required to obtain E.P.A. permits in order to use chemical pesticides and fertilizers that could have run off into those bodies of water. Those restrictions will now be lifted.

A wide range of environmental protections are similarly being eliminated. The administration is rushing to clear the way for oil exploration in the Arctic National Wildlife Refuge, for instance, and weakening protections for endangered species in an effort to help drillers. And, in December 2017, Mr. Trump embarked on the biggest land protection rollback in United States history when he reduced two national monuments in Utah by some two million acres.

Under the provisions of the Clean Water Act, legal challenges must be heard in Federal District Court, which is based at the state level, rather than federal appeals court. Richard J. Lazarus, a professor of environmental law at Harvard Law School, said that meant that opponents of the Trump administration would focus their challenges in states they perceived as friendly. "It's going to be chaos," Mr. Lazarus said. "We're going to see suits brought all over the country."

- https://www.nytimes.com/2019/09/12/climate/trump-administration-rolls-back-clean-water-protections.html

Duke-led team wins $3M grant to study peatlands and climate change

Peat moss. Most people think of it as the brownish stuff that gardeners add to potting soil. But to one Duke-led team, peat moss plays a key role in slowing climate change by keeping 370 million metric tons of carbon dioxide a year out of the atmosphere -- equivalent to the emissions spewed by nearly half the car traffic in the U.S. Now, thanks to a three-year, $3.1 million grant from the U.S. Department of Energy, the researchers are poised to better understand how global warming could affect peatlands and their vast carbon stores in the future.

Though peatlands cover just 3% of the Earth's surface -- mostly in boreal regions such as Canada, northern Europe and Russia -- they store twice as much carbon as all the world's forests. Over hundreds or thousands of years, sphagnum moss and other peatland plants quietly pull carbon out of the air as they grow, trapping the carbon inside layers of partially decayed plant material up to 6 meter deep. But warming trends could put that carbon storage at risk. Rising temperatures could thaw or dry out peat wetlands, making them more prone to decay and wildfires. Decomposing or burning plants means the heat-trapping gas long locked up in peatlands could be

released, accelerating the global warming process. To better predict the impacts of warming on peatlands and the carbon they contain, the team is studying a set of players they say are largely overlooked: microbes. Their previous work suggests that under future warming, the community of microbes and other tiny organisms that grow in and around peat mosses could get out of balance, which could affect the ability of peatlands to sequester carbon. The leader of the project, which spans three institutions, is Jean Philippe Gibert, a food web expert and assistant professor of biology at Duke. Alongside a team of co-investigators including Jonathan Shaw of Duke, David Weston and Dale Pelletier of Oak Ridge National Laboratory, and Steven Wilhelm of the University of Tennessee, the team will study and model the effects of warming on the complex network of bacteria, protists and viruses that interact with peat moss. Ultimately, they hope to show how these interactions might collectively influence the cycling of nutrients such as nitrogen and carbon across different peatland sites. Understanding these interactions "is central to our ability to predict whether warming will beget further warming, through positive feedbacks on bacterial communities that release CO2, or whether warming impacts will be less important than we currently think," Gibert said.

- https://www.today.duke.edu/2019/08/duke-led-team-wins-3m-grant-study-peatlands-and-climate-change

South-America

Argentina

Tierra del Fuego, the province with the greatest potential for carbon capture through peat

Tierra del Fuego is the province in Argentina with the greatest potential for the capture of carbon. This is indicated by a report by the National Geographic Society and the United Nations World Conservation Monitoring Center. The international research identified that the Mitre Peninsula, in Tierra del Fuego, stores the equivalent of more than three years of carbon dioxide emissions from Argentina due to the particularity of its ecosystem, composed mostly of peatlands. Rodolfo Iturraspe, secretary of Science and Technology at the National University of Tierra del Fuego, explains that "in South America, the most important concentration of extra-tropical peatlands are those located in Patagonia. The Mitre Peninsula is the main concentration of peatlands in the country with 2400 km^2 of peat. In Argentina, 95% of the peatlands are found in the province of Tierra del Fuego, concentrated in the Mitre Peninsula, which evidences the need to conserve this territory."

Rodolfo Iturraspe exploring peatlands of the Mitre Peninsula. Photo: Hans Joosten.

The report will be presented at the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP25), to be held in Madrid in December.
The enactment of a law granting a legal framework for the conservation of the Mitre Peninsula as a provincial park would protect this valuable ecosystem and prevent the carbon stored in the soil and plant biomass from returning to the atmosphere, increasing the greenhouse effect. According to the environmental group Sin Azul, the protection of the area is sought for more than 17 years. In the current scenario of global climate crisis, carbon sequestration is considered a key mitigation measure against the overflow of global emissions of carbon dioxide and other greenhouse gases, the main causes of global warming. The protection of the peninsula will have repercussions for all Argentines. "The province of Tierra del Fuego has the privilege and the opportunity to contribute to the mitigation of a global problem by protecting the peninsula. It is a debt of more than 17 years that the province has with conservation," said Ángeles De La Peña, member of CLT and Sin Azul No Hay Verde. Peatlands play an important role in regulating the carbon cycle because they are able to capture carbon dioxide indefinitely, transforming it into organic matter, and grow indefinitely.

The extensive peatlands of Peninsula Mitre, Tierra del Fuego, Argentina. Photo: Hans Joosten.

Therefore, it is very important to take care in the management of peatlands, because in the case of generating an imbalance, such as draining all the water, the dry organic matter decomposes and when that happens, all the material that accumulated over thousands of years returns to the atmosphere increasing the greenhouse effect. Peatlands are a natural resource with economic value. Certain uses of peatlands, such as those related to recreation and tourism, allow them to conserve their environmental value if properly managed. But other uses, based on peat extraction, require the drainage of the wetland, which implies that it stops acting as such and the consequent loss of its ecosystem services.

- https://www.infobae.com/sociedad/2019/10/21/crisis-climatica-tierra-del-fuego-la-provincia-con-mayor-potencial-para-la-captura-de-carbono-a-traves-de-la-turba/
- http://infoblancosobrenegro.com/noticias/26114-reclaman-la-creacion-de-un-parque-en-tierra-del-fuego-para-proteger-una-turbera-vital-para-el-medioambiente

Chile

Regulation to protect *Sphagnum* mires in Chile becomes effective

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Finally, Decreto N°25 (2017), which regulates the *Sphagnum magellanicum* harvest in Chile became effective on the 3rd of August 2019. Even though the regulation looks on the first glimpse well designed, it lacks a reliable scientific foundation, because data about the regeneration of *Sphagnum magellanicum* along Chile's impressive climatic gradient literally not exist. In addition, it seem, as if the governmental institution SAG (Servicio Agrícola y Ganadero), which from now on is responsible for the supervision of the Sphagum harvest and the possible execution of sanctions, requested the Ministerio de Agricultura (who designed the regulation) to change the technical aspects for the moss extraction in favour of the *Sphagnum* harvesting enterprises (source: www.chilesustentable.net). Furthermore, it is unlikely the SAG will count with the necessary staff and financial means to supervise all the legal and illegal Sphagnum harvests in the vast and inaccessible southern Chile. On the other hand, and as a positive aspect, Decreto N°25 gives the possibility to concerned citizens to denounce illegal practices. As public awareness about the importance of peatlands and wetlands is slowly raising these days in Chile, and due to the experiences from other regions in the country where these ecosystems turned into a conservation subject for citizens, this seems to be an effective tool to stop the destruction of mires. Hopefully, this happens before most of these ecosystems become affected by the lack of supervision capacity on the side of the authorities. For further information on Decreto N°25 see IMCG Bulletin January 2018.

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Sphagnum magellanicum Brid. *and* Marsippospermum grandiflorum *in Tierra del Fuego. Photo: Hans Joosten.*

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