Ground truthing peatland occurrence along the Ethiopian-S.-Sudanse border near Gambela. Photo: Hans Joosten.

IMCG Bulletin 2019-04:
May – July 2019

INTERNATIONAL MIRE CONSERVATION GROUP

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IMCG issues

Word from the Secretary-General

Here is the new IMCG Bulletin covering part of May, June and July 2019. With a lot of news, including the very sad news abouth the death of Richard Payne…
Keep sending news, photographs, papers and other contributions to be included in the next Bulletin **by September 8, 2019** to Hans Joosten at joosten@uni-greifswald.de.

Tribute to Richard Payne

We are deeply saddened about the death of our long-standing IMCG member Dr Richard J. Payne, Environment Department, University of York, UK, active Associate Editor and Article Editor of Mires and Peat from 2009. Richard was killed on 26 May 2019 while attempting to climb Peak 6477, a previously unclimbed subsidiary peak of one of India's highest mountains, Nanda Devi (the 'Goddess of Joy' in Sanskrit).

Richard was an extremely talented scientist and lecturer in Environmental Geography at the University of York. He was a broad-ranging environmental scientist especially interested in peatlands and environmental change.
Professor Roland Gehrels, from the Department of Environment and Geography at the University of York characterized him as follows: “Richard was a passionate environmental scientist with a wide range of interests. He is best known as a world-class peatland scientist and has done important work on climate change and the management of peatlands, advocating their value as carbon stores in mitigating climate change. He has also published influential work on the impacts of air pollution on biodiversity. Richard was an outstanding colleague and a real team player. He was an inspirational mentor for students and young scientists, creating opportunities and driving their aspirations. People who knew him were always struck by his tremendous energy and his never-ending stream of ideas. He was still a young scientist himself, but was destined to become a world-leader in many aspects of environmental science. His career was tragically cut short by an avalanche in the Himalayas while pursuing his other passion: climbing. Richard’s passing is a huge loss to the scientific community, especially in the areas of peatlands and climate change. Students and colleagues will miss him tremendously."
View Richard's research and work on the York Research Database.
https://www.york.ac.uk/environment/our-staff/richard-payne/

Mires and Peat

Thomson Reuters Web of Science has published the **new 2018 Impact Factors**. And again the Impact Factor of Mires and Peat has substantially increased: from 0.806 in 2014, via 1.095 in 2015, 1.129 in 2016, and 1.326 in 2017 to **1.868** [two-year] and 1.802 [five-year] in 2018!!! A marvelous achievement! Thanks to all who contributed to this, and especially to Olivia! In May, June and July 2019 the following papers were published:

- Habitat and floristic peculiarities of an isolated mountain mire in the Hyrcanian region of northern Iran: a harbour for rare and endangered plant species [A. Naqinezhad, E. Ramezani, A.H. Khalili & H. Joosten] Volume 24: Article 21 http://mires-and-peat.net/pages/volumes/map24/map2421.php
- Mixed farming systems on peatlands in Jambi and Central Kalimantan provinces, Indonesia: should they be described as paludiculture? [H.L. Tata] Volume 25: Article 08 http://mires-and-peat.net/pages/volumes/map25/map2508.php
- Spring-season flooding is a primary control of vegetation succession trajectories in primary mires [A.M. Laine, S. Frolking, T. Tahvanainen, A. Tolvanen & E-S. Tuittila] Volume 24: Article 20 http://mires-and-peat.net/pages/volumes/map24/map2420.php
- Declaring success in *Sphagnum* peatland restoration: Identifying outcomes from readily measurable vegetation descriptors [E. Gonzalez & L. Rochefort] Volume 24: Article 19 http://mires-and-peat.net/pages/volumes/map24/map2419.php
- A synthesis of evidence for the effects of interventions to conserve peatland vegetation: overview and critical discussion [N.G. Taylor, P. Grillas, M.S. Fennessy, E. Goodyer, L.L.B. Graham, E. Karofeld, R.A. Lindsay, D.A. Locky, N. Ockendon, A. Rial, S. Ross, R.K. Smith, R. van Diggelen, J. Whinam & W.J. Sutherland] Volume 24: Article 18 http://mires-and-peat.net/pages/volumes/map24/map2418.php
- Framing the peat: the political ecology of Finnish mire policies and law [O. Ratamäki, P. Jokinen, E. Albrecht & A. Belinskij] Volume 24: Article 17 http://mires-and-peat.net/pages/volumes/map24/map2417.php
- Modelling time-integrated fluxes of CO_2 and CH_4 in peatlands: A review [A.J. Baird, S.M. Green, E. Brown & G.P. Dooling] (Volume 24: Article 16 http://mires-and-peat.net/pages/volumes/map24/map2416.php
- Quagmires around southern and southeastern Estonian lakes [J. Paal, P.-R. Pärnsalu & H. Mäemets] Volume 24: Article 15 http://mires-and-peat.net/pages/volumes/map24/map2415.php
- Application of terrestrial laser scanning to quantify surface changes in restored and degraded blanket bogs [G. Chico, B. Clutterbuck, N.G. Midgley & J. Labadz] Volume 24: Article 14 http://mires-and-peat.net/pages/volumes/map24/map2414.php
- The biocenotic value of Slitere National Park, Latvia, with special reference to inter-dune mires [L. Wolejko, A.P. Grootjans, M. Pakalne, L. Strazdina, O. Aleksans, S. Elshehawi & E. Grabowska] Volume 24: Article 13 http://mires-and-peat.net/pages/volumes/map24/map2413.php
- Potential for renewable use of biomass from reedbeds on the lower Prut, Danube and Dniester floodplains of Ukraine and Moldova. [P. Goriup, A. Haberl, O. Rubel, V. Ajder, I. Kulchytskyy, A. Smaliychuk & N. Goriup] Volume 25: Article 07 http://mires-and-peat.net/pages/volumes/map25/map2507.php
- The fate of nitrogen derived from mown wetland biomass in a swampy river valley landscape [A. Wysocka-Czubaszek, R. Czubaszek, S. Roj-Rojewski & P. Banaszuk] Volume 25: Article 06 http://mires-and-peat.net/pages/volumes/map25/map2506.php
- Greenhouse gas fluxes from soils fertilised with anaerobically digested biomass from wetlands [R. Czubaszek, A. Wysocka-Czubaszek, S. Roj-Rojewski & P. Banaszuk] Volume 25: Article 05 http://mires-and-peat.net/pages/volumes/map25/map2505.php
- The effects of harvest date and frequency on the yield, nutritional value and mineral content of the paludiculture crop cattail (*Typha latifolia* L.) in the first year after planting [J. Pijlman, J. Geurts, R. Vroom, M. Bestman, C. Fritz & N. van Eekeren] Volume 25: Article 04 http://mires-and-peat.net/pages/volumes/map25/map2504.php
- Finnish botanists in the mires of Olonets region in Russian Karelia during the Second World War [T. Lindholm, R. Heikkilä & O. Kuznetsov] Volume 24: Article 12 http://mires-and-peat.net/pages/volumes/map24/map2412.php
- South African peatlands: a review of Late Pleistocene-Holocene developments using radiocarbon dating [S. Elshehawi, P. Grundling, M. Gabriel, A.P. Grootjans & J. Van der Plicht] Volume 24: Article 11 http://mires-and-peat.net/pages/volumes/map24/map2411.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.

How ancient cultures perceived mires and wetlands (3000 BCE – 500 CE): an introduction

Pim de Klerk (Greifswald Mire Centre/State Museum of Natural History Karlsruhe, pimdeklerk@email.de) & Hans Joosten (Greifswald Mire Centre; joosten@uni-greifswald.de)

The reconstruction of the past development of peat- and wetlands is normally the task of a wide variety of biological and earth-scientific disciplines (Birks & Birks 1980; Berglund 1986). An important source is, however, often overlooked: contemporary written accounts of eye-witnesses of these landscape types. Written records are generally considered to belong to the realms of linguistics, literature, history and theology, which often prevents them to be interpreted using the most recent insights of biology, (palaeo)ecology and earth sciences. As a result, the full information hidden in the texts is often not disclosed.

Thorough evaluation of writings from Antiquity by Lordkipanidze (1996, 2000) helped us to interpret the cultural context of pollen and macrofossil data from a mire in west Georgia (Transcaucasia) (De Klerk et al. 2009). This inspired us to have a more systematic and comprehensive look at ancient texts with special attention to mires and wetlands. We currently focus on Mesopotamia (Sumer, Babylon, Akkad, Assyria and Elam) and the neighbouring realms of the Hittites, Hurrians and Persians, ancient Canaan (developing into Hebrew and Phoenician states), ancient Egypt, and the ancient Greek and Roman civilisations (Fig. 1). The time-slice covered runs from c. 3000 BCE to 500 CE.

In this paper we introduce the project and present various thematic aspects of the ancient literature.

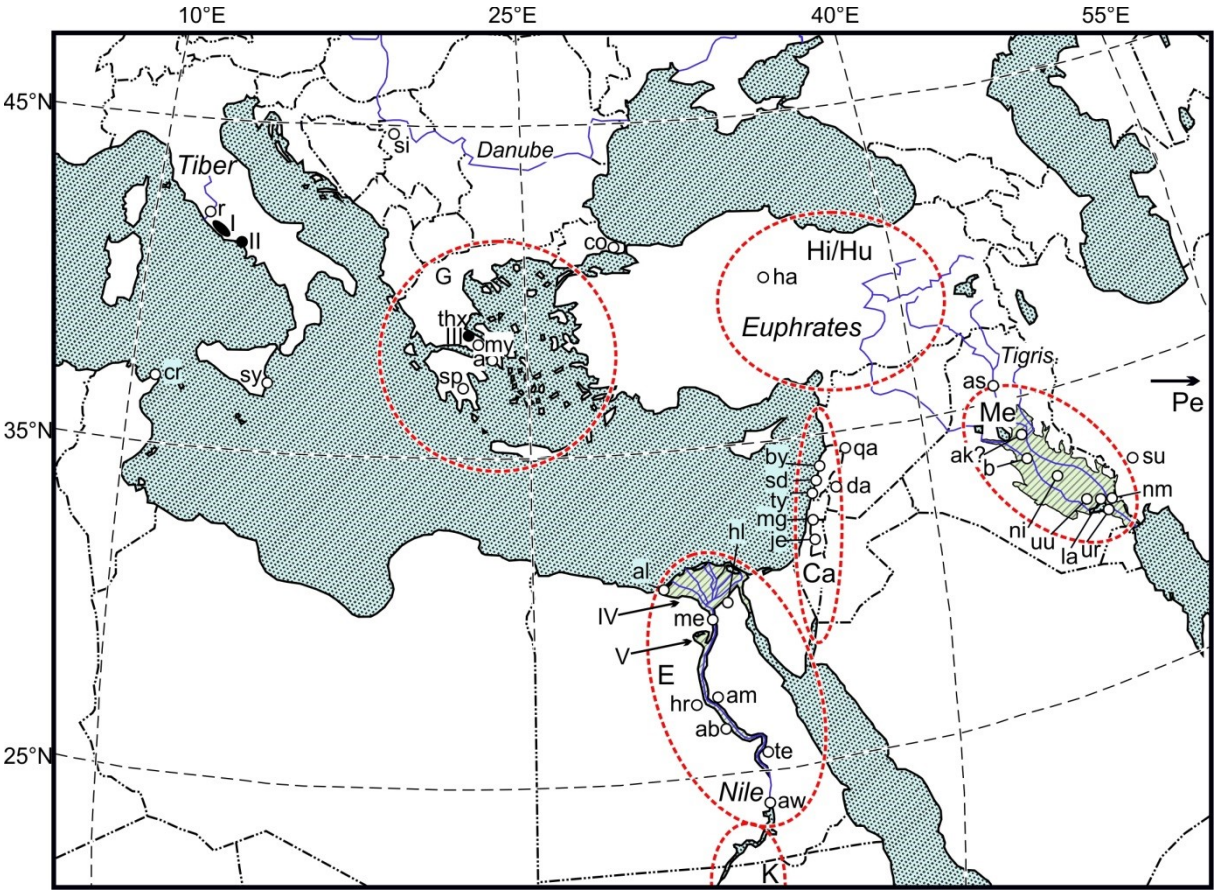

Figure 1: Map of the eastern Mediterranean and the Near East. Red circles*: core areas of ancient civilisations (extent changed regularly):* Ca*: Canaan (developing into various Hebrew and Phoenician states);* E*: Egypt;* G*: Minoan and Mycenaean realms (developing into the ancient Greek city states);* Hi/Hu*: Hittite and Hurrian realms (also including the state Mitani);* K*: Kush/Nubia;* Me*: Mesopotamia (Sumer, Babylonia, Akkad, Assyria, Elam; note that the coastline of the Persian Gulf by delta protrusion moved considerable to the southeast since Sumerian times, when Uruk was a coastal city);* Pe*: Persia.* O*: The most important cities from Antiquity, and other cities mentioned in the text:* a*: Athens;* ak*: Akkad;* as*: Assur;* aw*: Aswan;* b*: Babylon;* by*: Byblos;* co*: Constantinopel;* cr*: Carthage;* da*: Damascus;* hl*: Heliopolis;* hr*: Hermopolis;* je*: Jerusalem;* me*: Memphis;* r*: Rome;* si*: Sirmium;* sy*: Syracuse;* te*: Thebes;* ur*: Uruk.* x th*: Battlefield at Thermopylae.* • *Mires/wetlands mentioned in the text:* I*: Pontine marshes;* II*: Marshes near Minturnae;* III*: Former lake Copais and its mires;* green-striped areas*: floodplains (with marshes) of Mesopotamia and the Nile River:* IV*: Nile Delta;* V*: Faiyum.*

Terminology

Efficient communication requires that readers/listeners are able to understand what authors/speakers mean to say. This requires that all speak/write about the same objects using the same unambiguous and consistent vocabulary without making errors (Joosten & De Klerk 2002). At present, mire and peatland vocabulary greatly differs between languages, and different communities use identical or similar words with different connotations (Joosten et al. 2017).

Communication is even more complicated with texts of dead languages, stemming from times in which scientific knowledge on wetlands was merely rudimentary and authors used identical or similar terms and phrases with different intentions, or used different terms for identical elements. Even the primary audiences must have understood the original intentions differently.

The latter is illustrated by names of plants in texts from times when a standardized taxonomy did not exist (although the 4th century BCE Greek philosophers Aristotle and Theophrastus already went in that direction). A nice example from the 1st century CE is the phrase "Cyperos iuncus est" ("Cyperus is a rush") by Pliny the Elder ('Natural history' XXI:70). The plant named 'ιππουρις (hippuris) in Greek (Dioscorides, 'On medical matters' IV:46; 1st century CE) was according to Pliny the Elder identical with the plant named equisaetum in Latin ('Natural history' XXVI:83): both names derive from, respectively, the Greek and Latin words for horse, but the present-day *Hippuris* and *Equisetum* are completely different plant taxa. The descriptions of both authors allow an unambiguous identification of the taxon presently known as *Equisetum*, but in many cases ancient morphological/ecological descriptions, when present at all, are insufficient to unmistakably identify a plant taxon.

In different languages a great variety of names exists for reeds, but in many cases these terms do not indicate the species *Phragmites australis*, but reedbeds in general or other typical reedbed plants. Words for reed were also used synonymously for products made from reeds: e.g. (pan)flutes and reed-played musical instruments, arrows, writing pens, gluesticks for fowling, reedcrowns, weaving rods, and many more.

If one is unfamiliar with the language in question one has to rely on the interpretation of translators. Most translators of ancient texts originate from the disciplines of linguistics, literature, history, or theology, and are understandably not fully acquainted with terms, names and concepts from modern natural sciences.

Thus, translating ancient vocabulary into present-day terms is a great challenge that requires intensive multidisciplinary exchange to arrive at the best possible interpretation. The linguistic and etymological work of Joosten et al. (2017) provides a robust framework of peatland terms for such a task. Unclarities will, however, remain, especially with respect to the question whether the wetlands described were peat-forming or not, which would determine which modern term to use. In this paper we still use somewhat casual terms.

Topography and mire descriptions

Topography, a topic very well covered in works from Antiquity, includes the location of mires. Marshes occur already on rudimentary cartographic works from Mesopotamia dating back to the early/mid 2nd millennium BCE (cf. Wheat 2012). But the topic topography also covers the names of places or regions. According to Hilprecht (1896), the ancient Sumerian name Kengi for the Sumerian/Babylonian regions derives from the words ki for kingdom, e for canal, and gi for reeds, so the region was named something like 'The land of canals and reeds'. Well-known is the quote of Tacitus that Germania consisted of "desolate forests and pestilent marshes" ('Germania':5). Strabo stated in the 1st centuries BCE and CE that cities named Helos, Heleon and Helesion in Arcadia, Laconia and Boeotia (Greece) were named after the Greek word 'έλος (helos) meaning mire, which partly had already disappeared in his time ('Geography' VIII:3.25; VIII:5.2; IX:2.12). His assumption that peatlands must have existed there previously is a nice example of ancient palaeoecological thinking. As alternative explanation he posed that the original places had been abandoned and were rebuilt elsewhere while retaining their original names.

Detailed descriptions of mires and other wetlands from Antiquity are rare, first of all since these landscape types were not easily accessible, but also because in most writings wetlands were only a part of the scenery and not the main subject. Numerous travellers mentioned reedlands that they had seen along rivers and lake shores as prominent landscape elements, but precise descriptions are rare. A detailed description of the reedbeds of lake Copais (Fig. 1) is included in the botanical work 'Enquiry into plants' (IV:10-12) of Theophrastus from the 4th century BCE. The lake was drained in 1887 CE, after which during a warm and dry summer four meter thick peat

layers burned away (Christanis 2017). After the destruction of this palaeoecological archive, the texts of Theophrastus (and later Pliny the Elder) are the only remaining source on its vegetation in the past.
Information on the appearance of wetlands can be obtained from numerous other writings as well. Such descriptions enabled Ferrari et al. (2013) to provide a thorough ecological description of the marshes near Minturnae (Fig. 1) in Roman times.
Descriptions of wetlands do not only deal with their general appearance, but also with their flora and fauna. Especially the works on natural science of Theophrastus ('Enquiry into plants', 'On the causes of plants'), Aristotle ('History of animals', 'Parts of animals', 'On the generation of animals'), Dioscorides ('On medical matters'), and Pliny the Elder ('Natural history') are important in this respect. Sculptures and pictures of animals and plants provide additional information on the ancient views on flora and fauna (e.g. Arnold 1995; Kantor 1999; Pommerening et al. 2010).

War

Wars were elaborately depicted by many ancient historians. Mires and wetlands had three main functions: they were hide-outs, natural defences, or traps.
Depictions how people sheltered in marshes occur amply in the works of Caesar ('About the Gallic war'), Josephus ('War of the Jews'), Tacitus ('Agricola', 'Annals', 'Histories'), Plutarch ('Parallel lives'), and many more. The text on the 'First campaign of Sennacherib' (c. 700 BCE) tells how Assyrian troops searched for Chaldean enemies who sheltered in marshes, an endeavour also displayed on a relief (Fig. 2). Pliny the Elder wrote that Octavian, the emperor-to-be Augustus, hid three days in a marsh when he suffered from an oedema ('Natural history' VII:46).

Figure 2: Fragment of a relief displaying Chaldean people sheltering in the reedbeds during a campaign around 700 BCE; relief from 640-620 BCE. British Museum, London. ©Trustees of the British Museum. Shared under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) licence.

Various locations were protected by the natural barriers that mires provide. Caesar described how during his Gallic campaign in the 6th decade BCE the Menapii were protected by extensive marshes and woods ('About the Gallic war' VI:5). He also wrote how Vercingetorix had camped along a marsh at some distance to Avaricum ('About the Gallic war' VII:16). Thucydides wrote about marshes that partly encircled the city of Syracuse on Sicily (Fig. 1): during its siege (415-414 BCE) the Athenian army surrounded the city by using planks and wooden frames

to cross the marshes ('History of the Peloponnesian war' VI:101). Similarly, marshes were used as strategic landscape elements for battles. At Thermopylae, where in 480 BCE the Spartans under Leonidas battled the Persians lead by Xerxes (Fig. 1), the latter had to move via a narrow passage between high cliffs and large coastal marshes (Herodotus, 'Histories' VII:176).
In battle, marshes could readily become deadly traps. According to Plutarch, Sulla drove the armies of Archelaus into the mires during the 85 BCE battle of Orchomenus (Copais area; Fig. 1). Afterwards, "the marshes were filled with blood, and the lake was filled with dead bodies", and nearly 200 years later (i.e. in Plutarch's time) weapons and armours could still be found ('Parallel lives' Sulla:21). Tacitus ('Annals' I; 'Histories' V:15-17) reported how in the 1st century CE during campaigns in Germania the Romans were on many occasions lured into marshes where the Germanic armies had the advantage.

Health

The relation between mires and health is twofold. First, there were the medicinal qualities of various plants, which were discussed elaborately by Theophrastus ('Enquiry into plants'), Dioscorides ('On medical matters') and Pliny the Elder ('Natural history'). On the other hand, it was thought that mires had a negative influence on human health, a thought which was widespread among the Romans but which already had emerged among ancient Greek authors.
In 'On airs, waters and places' – a text that has falsely been attributed to Hippocrates – ample text passages state that marshy places exhale foul vapours and smell terribly in summer. Cicero wrote in 'On the orator' (II:71.290) that the region of the Pontine marshes (Fig. 1) was neither pleasant nor healthy. Silius Italicus named that area the "pest-bringing Pontine" ('Punica' VIII:379). Strabo wrote how in the Nile delta "… cities, situated near lakes, have in the hot summer a heavy and suffocating atmosphere, and lakes shores become swampy… When a large quantity of moisture is emitted, a poisonous vapour rises that causes pestilential disorders" ('Geography' XVII:1.7). A remarkable passage in Varro ('On agriculture' I:12) seems to anticipate microbiology and epidemiology: "precautions must be taken near marshes… because certain minute creatures thrive there that are so small that they cannot be seen by eye, but that enter the body through the air inhaled by the mouth and nostrils, and cause dangerous diseases."
One of the – from a modern-day viewpoint - most bizarre passages on health comes from the Babylonian spell of the 'Worm and the tooth' (7th century BCE, but probably copied from a considerably older text). It was thought in ancient times that caries was caused by small worms gradually eating the teeth, a view that was widespread not only in Mesopotamia, but also in the Egyptian and Greek/Roman empires and far beyond from c. 4000 BCE up to the European Medieval (Paulissian 1993; Sabbatini & Fiorino 2016). The 'Worm and the tooth' explicitly states that the worm was created by marshes, i.e. a direct link was laid between wetlands and tooth decay. The reason for this link is unclear.

Human impact

Already in Antiquity marshes and wetlands were exploited by humans. This included the use of vegetation, especially of reedbed plants, as raw material for building, packaging, weaving, fodder, writing material, weapons, musical instruments and much more. The Sumerian god Enki greeted in 'Enki and the world order' the land of Meluḫa with the wish "may your reeds be great reeds". Similarly, the Sumerian proverb "where there are no reeds, it is the worst of all poverty" (Proverbs collection 3:106; collection 28:26) and the 'Song of Inana and Dumuzid (Dumuzid-Inana D1)' that wished for tall reedbeds illustrate that luxurious reeds were an aspect of wealth in ancient Sumer.
Aristotle ('Meteorology' II:3) wrote about the burning of salt marsh plants for the extraction of salt. He explained in the 'Rhetoric' (II:23.15) that the proverb "buying the marsh with the salt" referred to a situation that had both favourable and unfavourable aspects. Possibly this proverb relates to salt that contained impurities (such as clay or plant remains) from the marsh from where the salt was won.
The question arises whether peat extraction already took placed in ancient times. From the texts hitherto studied by us it appears that peat as a substance was neither known nor used, or at least nobody wrote about it. There is one exception: Pliny the Elder mentioned how the Chauci - a Germanic tribe in present-day north-western Germany that he had visited - used some kind of mud for cooking and heating: "they dried the mud collected with their hands more in the wind than in the sun, and the mud was burned for heating [i.e. cooking] food and [warming]

their bodies that were stiff from the northern cold" ('Natural history' 16:1.4). The fact that the mud was burnable, makes it most likely that it concerned peat. The use of the word "mud" by Pliny indicates that the substance was indeed unknown to the Romans and did not have its own name.

Reedlands were frequently used for hunting, primarily for food. Herodotus wrote in the 5th century BCE of people north of the Black Sea that hunted otters, beavers and some unidentified square-faced creatures in reedbeds along a large lake ('Histories' IV:109). Strabo ('Geography'VII:4.8) told in the 1st centuries BCE/CE about a neighbouring people that hunted deer and boars in marshes. Already in ancient Egypt hunting just for pleasure was common: an 'inscription of Sehetepibre' from the early 18th century BCE named this pharaoh the "overseer of pleasure-marshes". Many ancient Egyptian drawings and reliefs in temples and tombs display hunting scenes in papyrus thickets (see e.g. Simpson 1992; Herb 2001; Prisse d'Avennes 2018; Fig. 3). Ancient Egypts used papyrus reeds also for cattle herding, as told in e.g. the 'Fragment of a fantastic story' and 'The tale of the herdsman'.

Figure 3: Facsimile of an Ancient Egyptian fishing and fowling scene in papyrus reeds, depicting numerous different kinds of birds, fishes and some other animals, and stylised papyrus plants and water lilies/lotus. Whereas the men are fowling and fishing, the women collect lotus flowers. Tomb of Menna, Thebes (c. 1400-1350 BCE). Metropolitan Museum of Arts, New York.

Hydrological regulation of mires dates back to the beginnings of civilisation. According to Radner (2017) the earliest known constructions of dikes and canals in Mesopotamia stem from the seventh millennium BCE. The ancient Sumerian topographical name 'land of canals and reeds' (see above) indicates drainage, and also a text from the 'Royal inscriptions from Ur' states that marshlands of the town of Nina were reclaimed. Digging of ditches in reedlands played an important role in one of the Mesopotamian creation myths (see the next section). In ancient Egypt, agriculture was practised in the floodplains of the Nile after the river had deposited fertile silt during the annual inundations. The agriculture connected to this flooding required an ingenious irrigation system, a thorough understanding of hydrological processes, as well as a central authority to plan, implement and manage the hydrological projects (Noaman & El Quosy 2017). Already the famous c. 3100 BCE macehead of the Scorpion king – who was one of the last predynastic rulers or the early dynastic king(s) Narmer/Menes (possibly but not necessarily two names for the same person) – displayed the king digging a ditch (Oakes & Gaglin 2002).

The summit of hydrological intervention is the complete drainage or filling-up of peatlands. Plutarch described in his 'Parallel lives' (Cimon:13) how Cimon had around 450 BCE dumped vast quantities of gravel and stones into the marshes around the city of Athens to facilitate the building of city walls.

The city of Rome was built - in-between and outside the famous seven hills - in floodplains of the river Tiber (Fig. 4). Major wetlands in the original city included the Velabrum maius (where the Circus Maximus was built) and the Velabrum minus (with the Forum Romanum), but in later times city expansion also urbanised the palus caprae ("goat's mire") on the martian fields and several mires at the west bank of the Tiber. Initially the city was plagued

by floods and water surplus in the inundated valleys. Varro ('The latin language' V:43) and Plutarch ('Parallel lives' Romulus:5) even described a ferry commuting between the hills during wet seasons.

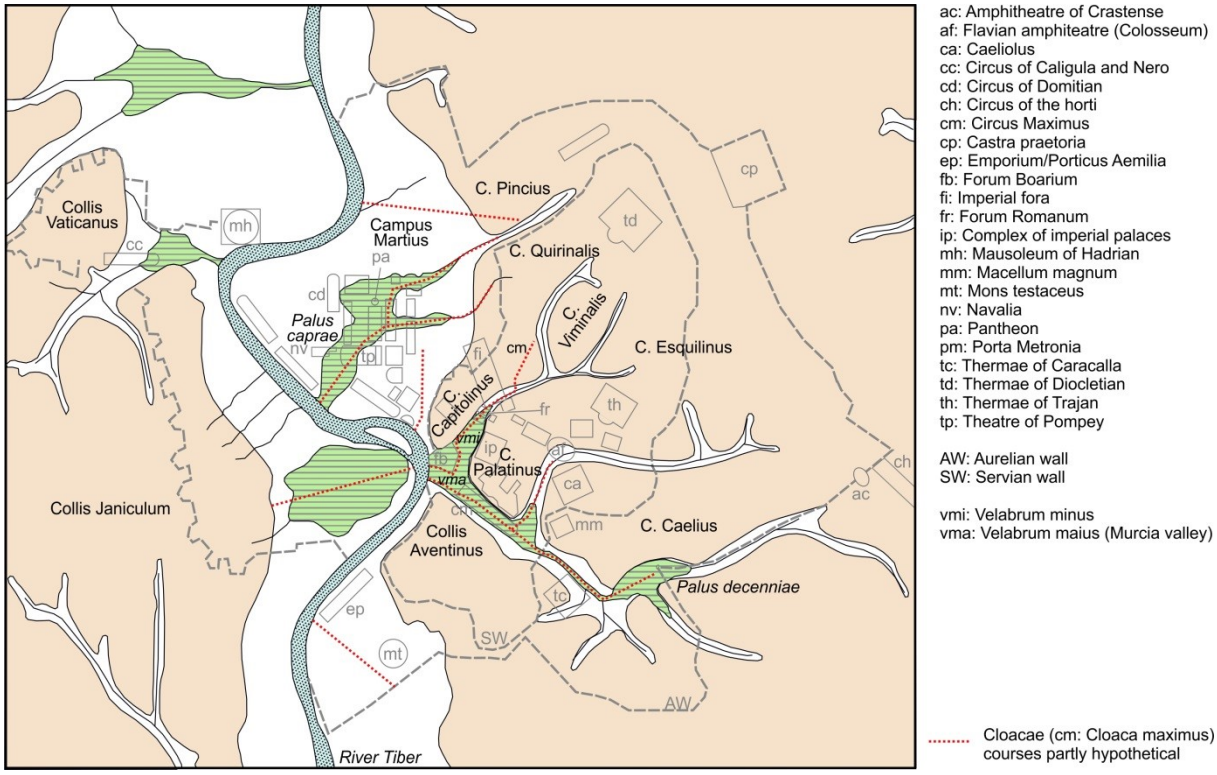

Figure 4: Map of ancient Rome, with higher elevated areas (yellowish brown), the river Tiber and its floodplains (white) and the floodplain wetlands (green-striped), after Corazza & Lombardi (1995); in grey (anachronistically) the main urban topography of ancient Rome (after Carandini & Carafa 2017); the locations of the cloacae are partly hypothetical.

According to Livy ('History of Rome' I:38), Lucius Tarquinius Priscus - the mythological 5th king of Rome – organised the construction of the cloaca maxima around 600 BCE to drain the forum and the Velabrum minus. In the course of time other cloacae were constructed to drain other parts of the city too (Fig. 4). The originally open cloacae were in later days overbuilt by randomly positioned buildings (Livy, 'History of Rome' V: 55), with as a result that nobody remembered the precise location of several of the cloacae anymore (Corazza & Lombardi 1995). The cloacae were primarily constructed for water discharge and were not used for sanitation purposes until the early imperial period (Corazza & Lombardi 1995). Despite these drains, floods regularly ravaged the city up to the times of the empire (Aldrete 2004). The marshy scenery that existed at the Forum Romanum prior to the construction of the cloacae was still remembered in early imperial time, when Ovid wrote in 'The festivals' (VI:395-418): "Here, where now the fora are located, once were wet swamps, and a ditch was dug to drain the superfluous water… once there was nothing except willows and hollow reeds… There was also a grove that was densely grown with rushes and reeds…".

A big frustration for the Romans were the Pontine marshes (pomptinae paludes; Fig. 1) south of Rome. These marshes cover a rather level plain and contain up to 60 m thick peat layers, which have accumulated over the last 20,000 years (Bragazza et al. 2017). Several Roman texts testify how numerous attempts to drain the region failed terribly. In the end, "draining the Pontine marshes" became a metaphor for a task impossible to accomplish (see e.g. Pliny the Elder: 'Natural history' XXVI:9; Quintilian: 'Institutes of Oratory' III:8.16).

In 282 CE the intention to drain a marsh became fatal for the Roman Emperor Probus. He did not want his soldiers to be idle and had already made them construct roads, bridges, canals, dikes and dams in Egypt ('Augustan history' Probus:9). When he ordered his men to drain and reclaim a marsh near Sirmium (Fig. 1), the soldiers - tired of doing civilian work - revolted and killed Probus.

Religious aspects

Black & Green (1992) prepared an overview of Mesopotamian deities, including various gods related to wetlands. Enki (Sumerian name, Ea in the Babylonian language) was a god of water and wetlands (Fig. 5), Gilimma (Sumerian name) or Marduk (Babylonian name) was a god of water and vegetation, Enkimdu (Sumerian name) the god of dikes and canals, and Ennugi (Sumerian name) was a lord of the dikes and canals as well as the divine canal inspector. Nanše (Sumerian name) was a goddess of marshes, fishes and birds. The great importance of marshes and reedlands for Mesopotamian societies is illustrated by the fact that creation myths stress that no marshes did exist before creation and that they belonged to the first landscapes to be created. The early 2nd millennium BCE Babylonian 'Another version of the creation of the world by Marduk' depicts how the god Marduk created dwelling places for humans by pouring soil on a bundle of reed. The Sumerian name Gilimma contains the word "gi" which means "reed", whereas the compound "gilim" may mean "foliage" or "rope of twined reeds" (see the 'The Pennsylvania Sumerian Dictionary'). In the Babylonian 17th century BCE 'Atrahasis' story that may have Sumerian roots, the minor gods Igigi (a name containing twice the word "gi"; the 'Pennsylvania Sumerian Dictionary' translates "igigi" as a not further specified "plant") had the task to dig canals in the reedlands. After doing this for numerous years they got so annoyed by this heavy burden that they rebelled against the higher gods. These subsequently created humans to take-over the tasks of the Igigi: i.e. humans were especially created for work in marshes.

Figure 5: Cylinder seal showing various Sumerian/Akkadian deities. The second figure from the right is the wetland god Enki, displayed with water streams and fishes along is shoulders and body. c. 2300 BCE. British Museum, London. ©Trustees of the British Museum. Shared under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) licence.

Ancient Egyptian religion was highly complex. Among others, Oakes & Gahlin (2002) and Wilkinson (2017) published overviews. Numerous deities were depicted as humans, animals or inanimate objects. The same god could appear in different shapes under the same or under different names with different personalities, and these different manifestations could occur simultaneously and interact with each-other (i.e. with themselves or their alter-egos). Furthermore, various collectives of deities acted as unities, not as individuals. The god Horus was connected to the marshlands in the northern Nile delta where the goddess Isis had given birth to him. Wadjet was the goddess of the Nile delta and served as a nurse for Horus after his birth. Her name meant something like "green/the green one", or "she of the papyrus", since the ancient Egyptian word for the colour green was derived from one of the words for papyrus (cf. Dickson 2006). Also the early ancient Egyptian goddess Neith was connected to the Nile delta. Hathor was not only depicted as a human, but frequently also as a cow that roamed papyrus thickets (Fig. 6). Sobek – which means crocodile - was displayed as a crocodile or more frequently as a man with a crocodile head and was the god of water, marshes and riverbanks. Hapy was worshipped as the god of the Nile floods - i.e. not the river itself but only its annual inundation - and was generally shown with water plants on his head. Whereas Hapy was the Nile flood itself, Khnum was the god who regulated this flood.
There was no definite Egyptian creation myth (Oakes & Gahlin 2002): various tales initially only had a regional distribution, but later spread all over Egypt mixing with other stories. The different regional population groups of ancient Egypt were very tolerant towards religious views of their neighbours, embraced these and integrated them in their own beliefs. Various creation tales were related to wetlands. One tale describes how from the primordial waters a mound arose on which an egg was placed from which the sun ascended. Another tale tells

how the self-created god Atum appeared on a mound of fertile silt that arose above the water, after which Atum created the other gods. In yet another story a lotus or water-lily emerged from the waters and the sun arose from its flower. The myths of the mounds were probably modelled on the fertile land in the Nile valley that arose when the Nile withdraw after the annual floods. The opening of the lotus relates to the conspicuous opening and closing of the flowers at dawn and sunset, respectively, which in Egypt was often seen as a symbol of the sun - navigated by the god Re - that arose every morning and went down below the horizon in the evening. The Ptolemaic/Roman period 'Book of the Faiyum', that postdates the earlier creation myths with around two millennia, relates how in the Faiyum region (Fig. 1) a lake was excavated by primal gods, from which the god Nun arose who created Amun who in turn overtook the rest of creation.

Figure 6: The ancient Egyptian goddess Hathor in the shape of a cow descending into the papyrus marshes from a stylised mountain, and a hippopotamus goddess with lotus/water lily offerings. From the Book of the Dead on the Papyrus of Ani, c. 1250 BCE. British Museum, London. ©Trustees of the British Museum. Shared under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) licence.

Also the ancient Egyptian views on afterlife were variable and changed over time. The final destination for the deceased was the sekhet aaru, which is difficult to translate. "Sekhet" can mean "field" or "marshland", "aaru" translates as "reeds" or "rushes" (cf. Budge 1920; Dickson 2006). Furthermore, there was the sekhet hetep, of which the latter word translates as "offering", "rest", or "peace", but also signifies the state of "being at peace", "being at rest", or "being satisfied" (Dickson 2002). The religious sources are inconsistent on whether sekhet aaru was part of sekhet hetep, sekhet hetep was part of sekhet aaru, or whether both were independent of each other. Drawings of both areas on coffins and papyri after the 2nd millennium BCE display ample interconnected water courses resembling the Nile delta within a predominantly cultural setting (see the quoted editions of the 'Coffin texts' and the 'Book of the dead'). Since there is a gap of 500-1000 years between the first use of the terms in the 'Pyramid texts' of the Old Kingdom (mid/late 3rd Millennium BCE) and the coffins and papyri of the Middle and New Kingdoms, an original religious concept of (partly) natural wetland may have changed into an agricultural setting when increasing population in Egypt caused a decrease of natural floodplain marshes along the Nile. Anyhow, the road to the afterlife realms was long and dangerous and led through many wetlands, and

the well-known 'Pyramid texts', 'Coffin texts' and 'Book of the dead' present ample instructions and spells how to pass them unharmed.
Greek and Roman mythology included many minor divinities (e.g. nymphs) of specific rivers or lakes/marshes, but deities exclusively dedicated to mires and peatlands as general landforms were obviously not worshipped. Yet the love goddess Aphrodite was incidentally named "the one of the rushes" and Dionysus was once designated "the lake dweller/marsh dweller" (Liddell & Scott 1961). Strabo mentioned temples of "Artemis in the swamps" and of "Artemis in the lake/marsh" ('Geography' VIII:3.5; VIII:4.9). Five rivers that connected to the Greek/Roman underworld were regularly named marshes rather than rivers: Styx, Acheron, Lethe, Phlegeton, Cocytus; the sixth underworld water was the world-surrounding Oceanus. The Romans detested their afterlife marshes: Ovid, for example, wrote how Jupiter had wished a nymph to the infernal marshes ('The festivals', II:610). Seneca the Younger wrote in 'The madness of Hercules' (verses 685/781) about the "awful motionless swamp of Cocytus" and the "farthest swamps of the Styx", and Virgil mentioned "the reeds of the terrible swamp of the Cocytus" ('Georgics' IV:478-480).

Mires and sexuality

A connection between wetlands and sexuality may initially appear somewhat strange, but there are various wetland-related stories with a highly erotic content. Especially Sumerian texts were often explicitly sexual (cf. Leick 1994).
A Sumerian proverb of 'collection 4' states that a non-erect hanging penis - after a full day of ejaculating – was nothing more than a "damp reed". In the Sumerian story of 'Enki and Ninḫursaĝ', the wetland god Enki sprayed his sperm in the marshes to fill them with water (note: there are translations in which he did not use his penis for masturbation, but for the digging of ditches and building of dikes), and subsequently had sex with Ninḫursaĝ and impregnated her. He seduced her with a phrase that translates like "lay down in the reeds, lay down in the reeds, we will enjoy it". Ninḫursaĝ gave birth to Ninmu, and Enki – while watching his daughter from out of his reed thickets – became aroused again and impregnated her also. Ninmu gave birth to Ninkurra, and the story repeated itself. The sequence of incestuous intercourses ended after the birth of Uttu, the daughter of Ninkurra and Enki, but Enki and Ninḫursaĝ got several other children in the remaining part of the tale, including the wetland goddess Nanše (mentioned above).
In one of the ancient Egyptian 'Songs from an orchard' it is stated that a girl would give the boy a day of "pleasure in the shelter of reeds". One of the 'Love poems on shards of a shattered vase' tells how a young man sighed that he missed his beloved and that "The reed had dried-out, the thistle had faded, and the marsh flowers grew in the bush", which seems to reflect the sexual organs of the boy and the girl that remained unused as long they were parted. In the 'tale of the herdsman' an unidentified goddess tried to seduce a cowherd in the reedbeds twice, but because the text has been preserved only fragmentarily the precise content of the text is unclear.
These examples demonstrate that the riverine reedlands of Mesopotamia and Egypt were regarded very erotic landscapes. This was also considered by the early Christian theologist Clement of Alexandria (2nd century CE), who, however, had a less positive attitude. He stated that the "exhalations of the earth and the marshes [that] gather into mists and clouds" were similar to "the vapours of the fleshy lust that brings an evil condition to the soul" ('Miscellanies', II:20). In this text, thus, a direct link was made between the sexual act - that was seen by him as something despicable - and marshes - that were appalling and unhealthy in Roman culture.

Outlook

At present, we have processed some 450 works from antiquity, and most likely the number will eventually be doubled. Main trends, however, are already apparent.
In ancient Mesopotamia the extensive wetlands of the rivers Euphrates and Tigris were seen as something beautiful, which relates to the fact that Mesopotamian societies were strongly dependent on the wetlands for raw material, food and daily life in general. However, the link between marshes and tooth decay shows that some negative connections were also perceived. In ancient Egypt, similarly, societal focus was completely on the river Nile and its floodplains. In the secular literature seen by us the wetlands were mainly part of the scenery and not something special. In Egyptian religion, however, wetlands were very dominant, culminating in the marshes of afterlife. Whereas ancient Greek literature seems to have had a rather neutral to slightly negative attitude towards wetlands, the Romans completely detested such landscapes. This may relate to the difficulties

the city of Rome had with the mires in the floodplain of the river Tiber, the failing drainage of the Pontine marshes, and later to the limited success in battle in the extensive peatland regions to the north of the empire. All societies developed the necessity for wetland management which resulted in ingenuous hydrologic technology. It is safe to assume that the mires and wetlands played an important – if not crucial – role in the technical, agricultural and social development of the various civilisations.

Next to the series of short papers we have started in the IMCG Bulletin (De Klerk 2019a/b; Joosten 2019), we plan to present the detailed referenced results of our studies in a collection of papers covering the various thematic aspects. It would be interesting and valuable to extend this kind of research to other areas where ancient literature or visual art may give information on the role of mires and wetlands in past societies, and we hope to encourage experts from all over the world to join our initiative. This will result in a diverse overview of the crossroads between nature and culture, will enrich both natural and social sciences/humanities, and will advance the appreciation of these fascinating landscapes.

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Peatland news

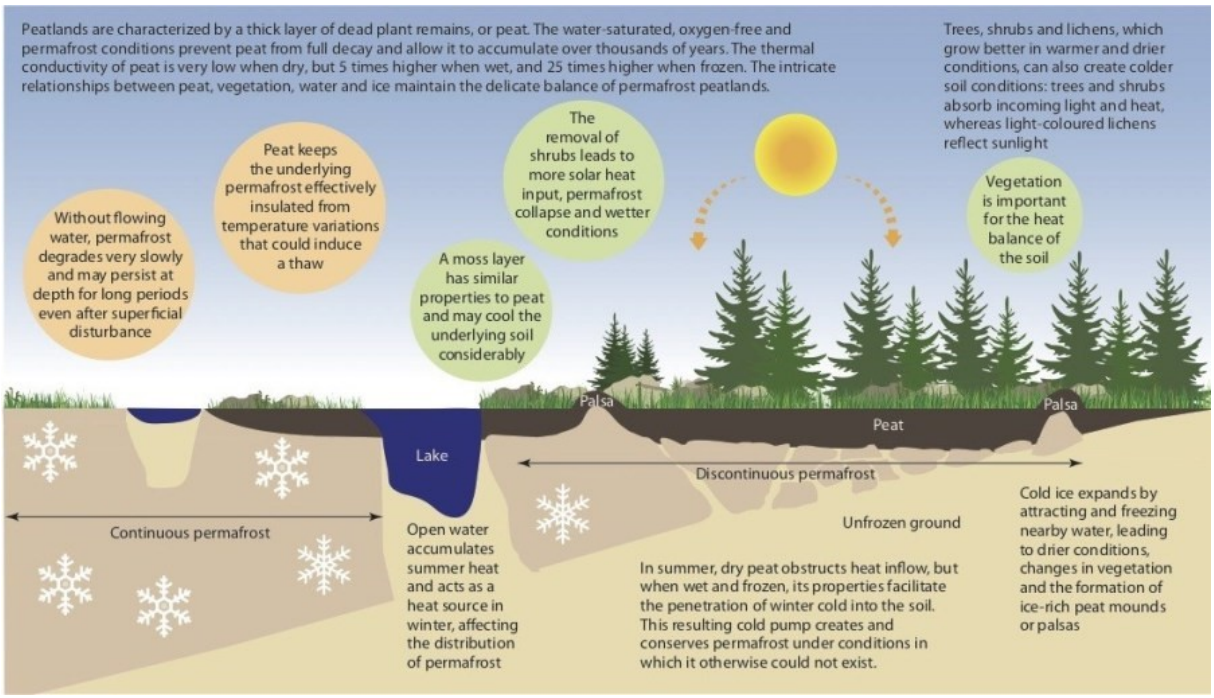
Global

Peatlands and permafrost

Peatlands and permafrost was the topic of an interactive session at the *Global Landscapes Forum Bonn 2019* on 22–23 June. The video of the side event is available here.

Across the northern and southern extremes of our planet, vast swathes of land amounting to around 30 percent of the Earth's service are frozen year-round in a substance known as permafrost: soil, rocks and sand bound together by ice. In many of these areas, a layer of peat sits on top of the permafrost and prevents it from melting. These landscapes might look bleak and unproductive to untrained eyes, but they're in fact crucial players in climate change mitigation due to their immense carbon storage. But these 'quiet heroes' of carbon sequestration are under threat. Temperatures in the Arctic are rising twice as fast as in the rest of the world, and the trend is projected to accelerate in the coming decades. That means permafrost soils are starting to thaw, which scientists believe could cause a runaway greenhouse effect if left unabated.

This makes the peat covering the permafrost even more precious, says Dianna Kopansky, a UN Environment expert on landscapes and biodiversity and the coordinator of the Global Peatlands Initiative. "They act like a blanket, keeping that earth cold," she explains. "They also act as a very unique kind of pump, sucking in the cold because of their wetness and the way the hydrology works." Scientists used to think that once permafrost thawed it was gone forever, but they have now found that peat can actually re-freeze it through this 'cold-pump' process.



Courtesy of Frontiers 2018/19 Emerging Issues of Environmental Concern, UN Environment

This is why it is vital to make sure that development does not disrupt these ecosystems, says Kopansky. But disturbances in such remote areas are not always monitored, and decisions about the landscapes are not necessarily made in holistic ways, she adds. What's more, the rising demand for natural resources and increased accessibility to frozen regions due to warming might lead to increased industrial and infrastructure activity in these areas, escalating disturbance to peatlands and permafrost.

But that doesn't necessarily mean we should cordon off these areas from any kind of human interaction, notes Kopansky. "There are a lot of ways that people have been using peatlands without disturbing them." So recognizing the rights of indigenous peoples to manage these landscapes is an important piece of the puzzle.

In Canada, the Ontario Far North Act recognizes the significant role of First Nations in protecting ecosystems like permafrost peatlands and promoting land-use planning that helps to up their sequestration potential further.

Yannick Beaudoin, director general of the Ontario/Northern Canada chapter of the Canadian environmental research non-profit David Suzuki Foundation, agrees. “It really is about recognizing the long-term knowledge of stewardship that Indigenous groups have,” he says. “There is 10,000 years of knowledge on how to adapt to climate change because they’ve had to do it before – but it’s still not fully recognized by Western science.”

Some of the regional governments with which Beaudoin works are beginning to take this experience into account. “There’s more recognition of where sound knowledge can come from, and rather than impose a centralized approach, there’s been much more conversation,” he says, “although there is still a lot left to be done.” However, it is also important to recognize that the current rate and extent of climate change is unprecedented, and Indigenous perspectives and Western science need to work together. “The Arctic is changing so quickly now,” says Beaudoin, “so on its own, First Nation knowledge is no longer necessarily able to meet that rapid rate of adaptation. That’s why these communities *do* also want to bridge to the latest available knowledge and science and the support that can come into play.”

In March of this year, the UN Environment Assembly passed a resolution that saw countries, stakeholders and partners commit to work toward the conservation and sustainable management of peatlands. Kopansky hopes that the global community of landscape management policymakers and practitioners will help to maintain momentum around the protection of these unique and often-ignored ecosystems.

Taking an interdisciplinary, multi-stakeholder landscape approach to peatland conservation will be critical, says Kopansky. “I think using a landscape approach for peatlands works phenomenally because we really can’t look at this ecosystem in bits. It can’t be divided by borders, fences or roads – it needs to be taken as a whole,” she says. “We need all of the partners at the table really trying to work together.” It’s complex work, but the rewards of quick action would be significant, Kopansky says. “Peatlands cover only 3 percent of the Earth’s surface, but they’re responsible for 5 to 10 percent of greenhouse gas emissions when they’re disturbed,” she adds. “So really this is a very low-hanging fruit. If we concentrated restoration, conservation and protection efforts on peatlands, we would have a significant impact in lowering emissions immediately.” “But we have to do it now.”

- https://news.globallandscapesforum.org/36470/peatlands-on-permafrost/
- https://www.globallandscapesforum.org/presentation/peatland-permafrost-a-cool-relationship/
- https://events.globallandscapesforum.org/agenda/bonn-2019/day-1/permafrost-and-peatlands-an-emerging-frontier-in-the-defence-against-climate-change/#

Tatiana Minayeva at the GLF Peatlands on Permafrost side event. Photo:Pilar Valbuena/GLF

Large swaths of the Arctic on fire

Vast stretches of Earth's northern latitudes have been on fire over the last months. Hot weather engulfed a huge portion of the Arctic, from Alaska to Greenland to Siberia and helped create conditions ripe for wildfires, including some truly massive ones burning in remote parts of the region that are being seen by satellites.

Pierre Markuse, a satellite imagery processing guru, has documented some of the blazes attacking the forests and peatlands of the Arctic. The imagery reveals the delicate landscapes with braided rivers, towering mountains, and vast swaths of forest, all under a thick blanket of smoke.

In Alaska, those images show some of the damage wrought by wildfires that have burned more than 1.6 million acres of land this year. Huge fires have sent smoke streaming cities in July, riding on the back of Anchorage's first 90 degree day ever recorded.

Burned peatland along the Dalton Highway, North of Fairbanks, Alaska, Summer 2019. Photo: Hans Joosten.

Intense hot conditions have also fanned flames in Siberia. The remote nature of many of the fires there means they're burning out of control, often, through swaths of peatland that's normally frozen or soggy. But as Thomas Smith, a fire expert at London School of Economics, noted on Twitter, there are ample signs the peat dried out due to the heat and is ablaze. That's worrisome since peat is rich in carbon, and fires can release it into the atmosphere as carbon dioxide. Peat fires can also burn underground into the winter and reignite in spring.

Then there's the weird fire that sparked up in Greenland. A landscape known more for its ice, this is the second time in the past three years a wildfire has ignited in western Greenland. There are very few historical precedents for these types of blazes, and though they're not on the scale of what's happening in Siberia and Alaska, they're yet another symptom of an Arctic transitioning into a more volatile state as the planet warms.

All told, northern fires released as much carbon dioxide in June as the entire country of Sweden does in a year, according to data crunched by the European Union's Copernicus program. The agency said the wildfire activity is "unprecedented" amidst what was, incidentally, the hottest June ever recorded for the planet with the Arctic particularly sweltering. All that carbon dioxide released by fires represents one of the scarier feedback loops of climate change as hot weather ensures more fires, which releases carbon dioxide and makes climate change worse. The boreal forest that rings the northern portion of the world is witnessing a period of wildfire activity unseen in at least 10,000 years, and this summer is another worrying datapoint.

- https://earther.gizmodo.com/satellite-images-show-vast-swaths-of-the-arctic-on-fire-1836500468
- https://www.dailykos.com/stories/2019/7/27/1874542/-Peat-the-world-s-largest-terrestrial-carbon-store-ignites-into-unprecedented-Arctic-firestorms
- https://www.wired.com/story/the-bizarre-peaty-science-of-arctic-wildfires/

Experts gather in Rome to share knowledge on the latest developments in peatland monitoring

Representing the most carbon-dense terrestrial ecosystem, peatlands can be found in all climatic zones across 169 countries worldwide. Their sustainable management, restoration and conservation play a crucial role in the process of tackling climate change, as drained and degraded peatlands represent a major source of greenhouse gas emissions, releasing an estimated 5 percent of anthropogenic greenhouse gas emissions globally. As more and more countries are joining the efforts to halt further conversion and restore this precious type of wetlands, the need for robust tools and integration of various tools into a holistic land use monitoring system has never been more obvious.

In recent years, the world has seen remarkable advances in both mapping of new peatland areas and the development of innovative approaches to monitor them. To step up peatland monitoring and strengthen partnerships between key actors in this field, Food and Agriculture Organization of the United Nations (FAO) organized a scientific and technical knowledge exchange at its headquarters in Rome. The event gathered country representatives and leading experts from multilateral and non-governmental organisations to share experiences and lessons learned in monitoring for sustainable management of peatlands.

Held on 22–23 May, the workshop offered a unique opportunity for the leading actors in the field of remote sensing and field-based peatland monitoring as well as experts from national agencies setting up monitoring systems, to exchange knowledge and lessons learned on the latest technical advancements. The participants reviewed state-of-the-art approaches to peatland monitoring and shared tools, approaches and challenges in assessing the status and change of peatlands cover. Specifically, the workshop focused on key indicators of greenhouse gas emissions in tropical regions: groundwater level and soil moisture, and subsidence of drained peatlands, and detection of land use change, such as the appearance of new drainage canals.

"*Peatland monitoring is a highly complex endeavour*," noted Mette Wilkie, FAO Forestry Policy and Resources Division's Director. "*The recent advances in the field of remote sensing and combining those data with field measurements have created new hope and perspective that peatlands could be better monitored and hence better managed in the future. This workshop is a great opportunity to all involved to learn from each other and jointly find solutions that countries can further tailor for their use*."

Full attention during the monitoring workshop. Photo: FAO.

35 participants discussed the crucial role that robust monitoring systems play in advising on decision-making and policies aimed at improving management of peatland landscapes and livelihood of communities who depend on them. The participant list included country representatives from numerous government entities responsible for peatland monitoring and restoration in Indonesia, Peru and Russia, as well as representatives from the Agency for the Assessment and Application of Technology (BPPT), the Center for International Forestry Research (CIFOR), the European Space Agency (ESA), the Greifswald Mire Centre (GMC), Hokkaido University, and the International Fund for Agricultural Development (IFAD).

One of the participants, Mr Albertus Sulaiman from the Agency for the Assessment and Application of Technology (BPPT) in Indonesia highlighted the complexity and cost of peatlands monitoring. "*To find efficient ways to monitor this precious resource, we should bring all the actors together to share experiences, ideas and discuss possible solutions to many challenges we face. It will be also crucial to keep the discussion going and stay connected even after the workshop,*" he added.

The workshop was organised under the framework of the Peatland Restoration Information and Monitoring System (PRIMS), an initiative to support information transparency on peatland restoration measures in

Indonesia, as well as the Global Peatland Initiative (GPI) project funded by the German International Climate Initiative (IKI). A workshop report is available from Maria Nuutinen Maria.Nuutinen@fao.org

- http://www.fao.org/redd/news/detail/en/c/1195808/

Video interviews given during the peatland monitoring workshop:

	Susan Page: Identifying and addressing existing gaps in global peatlands monitoring		Hans Joosten: The importance of monitoring and rewetting peatlands
	Muhammad Askary Masjkur: Using satellite monitoring to restore Indonesia's peatlands		Budi Wardhana: Remote sensing: cost-effective and innovative solutions for peatland
	Pedro Raúl Tinoco Rodríguez: Monitoreo de turberas en Perú		

Exploring Synergies for Peatlands – Workshop on the Isle of Vilm, 21th – 25th May 2019

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In response to various international resolutions and decisions, Germany (via its German Federal Agency for Nature Conservation) invited multilateral environmental agreements (MEAs), their contracting parties, international organisations and peatland experts for a workshop to explore synergies and opportunities for MEAs' joint activities on peatland conservation, restoration and wise use. Main objective was to sketch a road map for enhanced collaboration and creation of future synergies.

Participants recalled the conclusions of global assessments and communications, which confirm the exceptional importance of peatlands for the maintenance of global environmental functionality including climate change mitigation and adaptation. They urged to consider peatlands ecosystem services in decision making at all levels, and asked for increased synergies between MEAs and international organisations with respect to policy development and implementation, strategic planning, and on-ground activities for safeguarding and managing peatlands wisely.

Based on the experience and contributions of the participants, the workshop identified the following opportunities for synergies:

1. Peatland-related strategies and action plans at the regional, national and subnational level serve as effective, integrative tools for the implementation of MEAs' decisions. (Existing frameworks developed by MEAs and International Organisations are potential platforms for comprehensive generation and use of information, development and formulation of policies and their implementation at the global level.)
2. Existing global networks and initiatives can be effectively used for implementation of an integrative approach to peatland conservation and wise use at the global level.
3. The scope of information on peatlands used by IPCC and IPBES can be improved by contributions of specialised networks and organisations. The need to integrate indigenous knowledge on peatlands in a fair manner was highlighted. Specifically, the clear lack of expertise and information on hydrological aspects of peatlands in many thematic and geographical spheres was stressed.

4. Policies related to peatlands are contradictory at different levels and between sectors by either supporting or counteracting peatland conservation and restoration. The implementation of MEAs' policies at the local level requires awareness of stakeholders (for the natural capital value of peatlands) and especially engagement of civil society. The effectiveness of implementation of policy could be enhanced if realised through existing global territorial networks such as Ramsar sites, Biosphere reserves, WCPA networks.
5. Economic incentives for implementation of peatlands wise use policies are supported by existing schemes of certifications of peat products/operations. The involvement of the private sector remains insufficient and could be enhanced by the establishment of clear regulations to phase out drainage-based land use incl. peat extraction, support for adapted land use on wet peat soils and replacement of products derived from drained peatlands.
6. The representatives of MEAs confirmed their commitment to improve synergy at the global level through cooperation between Secretariats based on existing resolutions, MoUs and joint working plans. The Secretariats do not call for new formal agreements.
7. Synergies could be amplified by international organisations and the private sector (including business and NGOs) by including coordinated efforts focused on implementation of MEAs and involving stakeholders such as the World Health Organisation (WHO), UNESCO and the World Meteorological Organisation.
8. The Global Peatlands Initiative (GPI) was acknowledged as a good coordination body for partners focused on collating information and on-ground actions.

The workshop identified synergies in the fields of information, policies and implementation and elaborated a matrix of activities suitable for collaboration. It drew up a MEA synergy time plan 2019-21 with the following events as major opportunities for Parties to act jointly for peatlands: CBD post-2020 framework workshop in Bern (June 2019), Ramsar SC57 in Gland (June 2019), biodiversity conference in Trondheim (July 2019), nature-based solutions session of the UN Climate Summit in New York (September 2019) – Heads of State to engage, Climate COP in Chile (December 2019), CMS COP in India (February 2020), IUCN congress (July 2020), and CBD COP in China (October 2020). Peatland input to be provided to the joint IPCC-IBPES report in the making, the new round of NDC declarations, and the Global Biodiversity and Wetland Outlooks.

Participants of the Vilm workshop. Photo: Olesya Petrovich.

The Workshop was held 21-24 May 2019 at the International Academy for Nature Conservation, Isle of Vilm, Germany and attended by representatives of Secretariats of the Multilateral Environment Agreements (Ramsar Convention on Wetlands, UNFCCC, UNCBD, CMS/AEWA (remotely), Water Convention and UNCCD (by correspondence), representatives of international organisations (UN Environment/Global Peatlands Initiative, FAO, IPBES, Ramsar STRP and RRI for the Nile Basin, Wetlands International, IUCN UK Peatland Programme, International Mire Conservation Group, International Peatland Society, Greifswald Mire Centre), representatives of National and Subnational governments (Ukraine, South Africa, Germany, Sweden (remotely), Denmark (remotely), Canada) and International experts from Austria, Germany, United Kingdom, Ireland.

Ramsar Convention

The 57th meeting of Ramsar's Standing Committee took place in the last week of June in Switzerland. As highest priority tasks in the Workplan 2019-2022 the following issues were identified:

- Global Wetland Outlook: special edition for the 50th anniversary of the Ramsar Convention
- Compiling and reviewing positive and negative impacts of agricultural practises on wetlands including extent of changes in area from agricultural land conversion since 1970s, and how adverse impacts can be avoided in the future
- Elaborating on practical experiences of restoration methods for tropical peatlands
- Desktop study of coastal blue carbon ecosystems in Ramsar Sites (consistent with relevant IPCC guidelines)

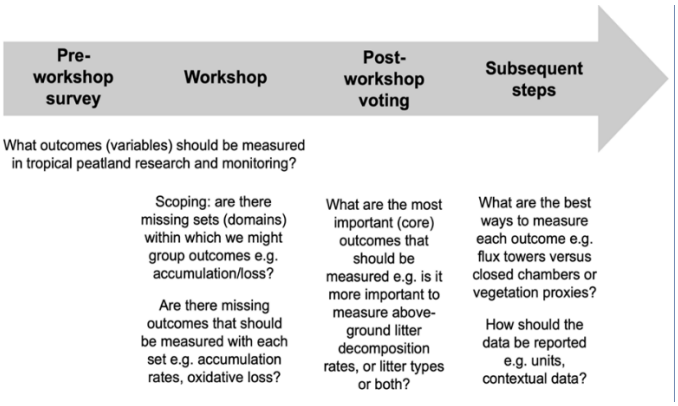
Workshop 'Developing core common outcomes and collaborations for peatland research and monitoring

Mark Reed (mark.reed@newcastle.ac.uk), Dylan Young and Gavin Stewart

Tropical peatland experts from around the world gathered in Bogor, Indonesia on 10 - 11 Jul 2019 for a workshop to discuss how the scientific and practitioner community might be able to collect data to better support evidence-based policy. Their aim was to find a way to standardise the collection of environmental data so that the outputs of multiple studies can be combined into useful syntheses. After testing the approach for peatlands in the UK, the workshop focussed on tropical peatlands as part of the UN Global Peatlands Initiative.

A pre-workshop survey was used to identify the groups of important measures (i.e. what do we want to know about?), and their associated variables (i.e. what do we want to measure?). The groups are known as the outcome sets and the variables as outcome measures. During workshop deliberation the sets and their associated outcome measures were reviewed and amended to provide a comprehensive list of outcomes that could be measured in tropical peatlands across carbon, biodiversity and hydrology (the proposed core areas). Workshop participants also identified three policy objectives relevant to tropical peatlands (1. climate mitigation, 2. social and economic, and sustainable management, and 3. protection and restoration). These will be used in a post-workshop multi-criteria analysis to identify the most important (core) outcome sets and their related outcome measures.

The ultimate goal is to extend the approach across all types of peatland internationally to identify the outcome sets and measures, along with associated best practice methods and reporting standards. It is hoped that researchers and monitoring initiatives will increasingly choose to collect data on these core outcomes, increasing the proportion of data that can be integrated in evidence syntheses and meta-analyses. In this way, it should be possible to generate more robust evidence to guide peatland policy and practice internationally.



The event was a follow-up of a similar conference in Newcastle in March (see under United Kingdom in this Bulletin) and was jointly organized and hosted by the Research, Development and Innovation Agency (FOERDIA), Indonesian Ministry of Environment and Forestry and International Tropical Peatlands Center (ITPC), CIFOR, Newcastle University, and UN Environment. It has been conceptualized with core partners of the Food and Agriculture Organization of the United Nations and the Global Peatlands Initiative (GPI).

New paludiculture newsletter

Wendelin Wichtmann (wichtmann@succow-stiftung.de)

The first issue of the paludiculture newsletter has appeared. With this newsletter the Greifswald Mire Centre aims to keep a growing community informed on peatlands and paludiculture. You will find news from research,

practice, politics, as well as announcements of conferences and other events and recommended publications. The newsletter is issued at irregular intervals in German and English.If you wish to subscribe, please write an e-mail to communication@greifswaldmoor.de. It's sufficient to put ‚Subscription for paludiculture newsletter' in the mail's subject header. Please forward this announcement to interested people.
The newsletter is currently provided by the BOnaMoor project coordinated by the Greifswald Mire Centre and financed by the Federal Ministry of Food and Agriculture through the Agency for Renewable Resources (FNR).

Promoting sustainable sugarcane production, processing and trade

The Bonsucro Production Standard, which includes HCV requirements, sets out a definition of what sustainable cane production should look like. The latest revision of the Standard has been launched:
http://www.bonsucro.com/production-standard/

New RSPO Best Practice Manuals

RSPO has published substantially revised Best Management Practice Manuals for peatlands:
RSPO BMP for Existing Oil Palm Cultivation on Peat Volume 1: https://rspo.org/resources/peat/rspo-bmp-for-existing-oil-palm-cultivation-on-peat-volume-1-2018-
RSPO BMP for Management & Rehabilitation of Peatlands Volume 2: https://rspo.org/resources/peat/rspo-bmp-for-management-rehabilitation-of-peatlands-volume-2-2018-

Curbing emissions and maximising food production in peatlands

The International Tropical Peatlands Centre (ITPC) along with Center for International Forestry Research (CIFOR) on May 13, 2019 hosted an event at the Global Landscapes Forum (GLF) in Kyoto, Japan, to discuss the various pressures on tropical peatlands. GLF Kyoto 2019 was focused on sustainable landscapes as a critical part of the climate solution. Agus Justianto, representative of the government of Indonesia and ex-officio member of CIFOR's Board of Trustees, explained that the objective of the session was "to share new knowledge and

experiences around the implementation of peatland conservation and restoration." Among the five resolutions proposed by Indonesia, at the fourth session of the United Nations Environment Assembly in Nairobi March 2019, was the adoption of an important resolution on peatlands: 'conservation and sustainable management of peatlands'. "The resolution urges member states and other stakeholders to give greater emphasis to the conservation, sustainable management and restoration of peatlands worldwide in support of sustainable practice of peatland management," said Justianto.

Kristell Hergoualc'h, Haris Gunawan, Nyoman Iswarayoga, Mitsuru Osaki, and Daniel Murdiyarso at the workshop. Photo: ITPC.

Speakers included representatives from the private sector, research community and government and they discussed the progress and challenges of restoring degraded peatlands; technology for the assessment of peatland GHG emissions; peat hydrology, fire risk and provision of ecosystem services.

The ITPC was jointly established by the Democratic Republic of Congo, Republic of Congo, and Republic of Indonesia in 2018. The centre serves as a centre of excellence for tropical peatland research to support policy development and provide capacity building, research and technical services. Indonesia currently hosts the ITPC.

CIFOR scientist Kristell Hergoualc'h explained that "in their natural state peatlands are flooded most of the year, so their anaerobic conditions slow down the decomposition. As a result most peat soils are CO_2 sinks, but they are also large sources of methane and small sources nitrous oxides." "Human intervention for agriculture or forestry modifies the balance of this greenhouse gases and often results in significant increases of CO_2 emissions and changes in methane and nitrous oxide fluxes that will depend on the activities and practices that are implemented," she said. Drainage of peat soils for agriculture and livestock promote gradual decomposition of peat and releases large amounts of greenhouse gases emissions into the atmosphere. Therefore, keeping peatlands flooded is critical in preventing fires and reducing greenhouse gases emissions. "In general, total greenhouse gas emissions are likely will be higher as drainage deepens," said Hergoualc'h. "Raising the water level in crop forest land may decrease the greenhouse gases emissions, but this measure is only going to delay the process of peat decomposition. On the other hand, raising the water level may constitute an effective way to reduce fire risk."

Sustainable cultivation of peatlands by continually rewetting it is known as paludiculture. FAO peatlands forestry officer Maria Nuutinen said the key word is “wet”. “Paludiculture products need to be wet, this means raising the water table closer to 30 cm, which is the sweet spot where in most cases GHG emissions are optimized,” she said. Nuutinen said that the paludiculture also needs to be sustainable. “Paludiculture systems using wetland species can bring back high biodiversity and reduce greenhouse gases emissions.” She said that the system, that is currently implemented in temperate zones, has triggered considerable innovation in order to overcome the challenges it posed. Nuutinen said that peatland is also important for food production, but “not all species naturally that can be used in paludiculture are suitable for food production.” Apart from producing fruit, berries, nuts and honey, peatland’s potential for sustainable fish production has been “one important area that had been overlooked. … This has been practiced in some areas in Indonesia. The same applies in the Congo where fish has a very high value.” “Water security is part of food security, and the usage of the very water hungry plantation species on drained peatlands have been very detrimental to many landscapes,” said Nuutinen.

Professor Mitsuru Osaki from Hokkaido University, who has done extensive research in Indonesia’s peatlands has developed a semi real-time data transfer system to monitor groundwater levels. The system, SESAME, an acronym of ‘Sensory data transmission service assisted by Midori Engineering Lab’, monitors in almost real time using mobile phone network. “We have for a long time studied peatlands in Indonesia, and collaborate with many institutions in Indonesia. We are focusing all the parameters in peatland monitoring and we concluded that water is the most important element in peatlands,” said Osaki.

Large peat fires and the haze in Indonesia has been a recurring event for almost two decades. “Fire is the cheapest method for land clearing and also temporarily improves soil fertility and controls pests and weeds. Nonetheless, land clearing by fire as commonly practiced in Indonesia is extremely harmful to the climate, by releasing large amounts of CO_2 and methane into the atmosphere,” said Hergoualc’h. “One single fire burns about 10 cm of peat, that is 100 years of accumulated peat. … Fires are detrimental to the environment, and also present critical public health and economic risks,” she said.

As a native of peat-rich area of Riau, Indonesia, Haris Gunawan, the Deputy of Research and Development of Indonesia’s Peatland Restoration Agency, said that he has experienced first-hand many of the haze disasters over the past 17 years. Tasked with the restoration of around two million hectares of peatlands in Indonesia, Gunawan believes that “peat hydrological units is important in sustaining peatlands, because 80% of peatlands consist of water.” Although he said that “in the true sense of restoration it is impossible to restore peatlands to its original state, … it is important to start peat restoration by restoring peat hydrological units.”

Restorasi Ekosistem Riau (RER) is a private ecosystem restoration project to restore and conserve peat forest areas on the Kampar Peninsula in Indonesia’s Riau province. “The total area we are managing is around 150,000 ha, that is more than double the size of Singapore,” said Nyoman Iswarayoga, RER’s Director of external affairs, adding that “more than 50% of the forest cover in the area we are managing is still in medium to good forest cover with natural species of forest of Riau.” The company managed the land in a holistic landscape approach, engaging local community, and have so far made progress. “We have closed about 38% of total length of canal we have in our land, that is over 65km of canals,” Iswarayoga said. “From 2015 we are relatively free of fire,” he said, adding that although they find it challenging, “restoration is possible with the right model.”

- https://www.tropicalpeatlands.org/article/finding-the-balance-curbing-emissions-and-maximising-food-production-in-peatlands/

Africa

Republic of Congo

Congo government opens Nouabalé-Ndoki National Park to oil exploration

The government of the Republic of Congo has opened up new areas for oil exploration in sections of the world’s largest peatlands and Nouabalé-Ndoki National Park, a celebrated rainforest. In 2018, the country tendered blocks for bidding by oil companies “right over what’s often called one of the most important protected areas in Africa,” Simon Counsell, executive director of the Rainforest Foundation UK, said in an interview. “It’s bizarre. The government does this kind of thing without even recognizing that it’s an internationally protected area.”.

Nouabalé-Ndoki National Park sits in the northern tip of the country, where its abundant forest elephants (*Loxodonta cyclotis*), western lowland gorillas (*Gorilla gorilla gorilla*) and other wildlife benefit from cross-border

protection in parks in the neighboring Central African Republic as well as Cameroon further to the east. According to the maps from the Republic of Congo's Ministry of Hydrocarbons, the French oil company Total has secured the rights to the Koli sector, which appears to overlap with Nouabalé-Ndoki. Louis Andzouono, a database manager for oil exploration and production with the National Congolese Petroleum Company (SNCP), confirmed that the Koli block overlaps with the park, in an email to Mongabay. But he said that the rights for exploration did not belong to any company as of early June 2019. The maps online, however, show Total as the concession holder. Based on this document, Total also controls the Mokelé-Mbembé block, which sits on part of the peatlands of the Cuvette Centrale. Only in 2017 did scientists discover that this swampy forest covering 145,500 km^2 in the Republic of Congo and the neighboring Democratic Republic of Congo holds more carbon-rich peatland that anywhere else on Earth. Total did not respond to requests for comment from Mongabay.

The environmental group Greenpeace Africa first noted this overlap in November 2018. Its analysis revealed that more than 90 percent of the Republic of Congo's peatlands — a Kuwait-size area covering nearly 18,000 km^2 fall with the tendered blocks. "It is shocking to see how the Congolese regime is playing the international community on peatlands," Victorine Che Thöner, who leads Greenpeace Africa's Congo Basin Project, said in a statement at the time. "The same regime that claims to champion peatland protection at big media events is now showing the world its real intentions."

Victorine che Thöner presents "wishes" from Congo Basin people to Ruben Rashidi Bukanga (Min. of Env., DRC, l.) and Tim Christophersen (UN Environment, r.) at UNFCCC-GPI side event Bonn, Nov. 2017. Photo: Hans Joosten.

The country's president, Denis Sassou-Nguesso, asked for Russia's help in protecting the peatlands in a May 2019 visit to Moscow. According to a government statement, Arlette Soudan-Nonault, the minister of tourism and environment, later met with the Russian ambassador to the Republic of Congo. In addition to Sassou-Nguesso's request for protection help, they also discussed the construction of a pipeline that would shuttle oil from the northern part of the country — not far from where the Koli and Mokelé-Mbembé blocks sit — to Pointe-Noire, a port city on the country's Atlantic coast. "Going on about peatlands while looking for pipeline money to embezzle is perfectly consistent with the ecocidal Sassou regime's modus operandi," Thöner said.

The Republic of Congo's economy relies heavily on oil, and it's one of the top petroleum producers in Africa, according to the Oil and Gas Year. But as oil prices have dropped in recent years, the country's leaders have looked to expand production and to other sources of income, issuing mining permits inside another national park and within Forest Stewardship Council-certified timber concessions.

For Thöner, opening up a place like Nouabalé-Ndoki National Park to exploration for oil fits with that trend. "[T]he Sassou regime has never respected the borders of national parks," she said, "and donors could care less."
Researchers from CIRAD, a French agricultural research center for development, have been advising the Total Foundation, the oil company's nonprofit arm, on its pivot toward forest conservation and restoration. They've proposed that Total could leave undeveloped the Koli and Mokelé-Mbembé blocks, which overlap with Nouabalé-Ndoki National Park and the Cuvette peatlands, respectively. As part of Total's corporate social responsibility initiatives, the company could, under this plan, even encourage the designation of further protected areas in that part of the Republic of Congo as a way to lock away the carbon contained in the swampy peatland soils.
Such a move may dovetail with for-profit investments in "carbon sink businesses" by Total. According to a presentation slide obtained by Mongabay, the company plans to plow $100 million a year starting in 2020 in the "preservation of forests, mangroves and degraded lands." Additionally, such set-asides could help the Republic of Congo curb its greenhouse gas emissions in line with a 54 percent reduction pledge by 2035 that Congolese leaders made at the 2015 U.N. climate conference in Paris. Proponents of such a move say it would be viewed favorably by international donors, such as the supporters of the Central African Forest Initiative, an international partnership aimed at protecting forests in Central Africa that draws on support from countries in Europe and Asia, as well as from the United Nations and the World Bank. However, the Republic of Congo has reportedly continued to urge Total to proceed with the exploration of the blocks for oil production.
Rainforest Foundation UK's Counsell pointed out that the groups that have been involved with Nouabalé-Ndoki National Park — some since its inception — haven't said anything about the licenses so far.
The Wildlife Conservation Society played a critical role in creating the national park in 1993 and continues to be involved in its management. "The development of such a transparent framework for all major strategic and management decisions has ensured a high degree of accountability for all stakeholders, and has facilitated a notable increase in the effectiveness of on-the-ground conservation activities," Mark Gately, who directs WCS's Republic of Congo program, said in a statement celebrating the park's 25th anniversary. And WCS has been only one of the most visible of a cadre of international partners bolstering the protection of Nouabalé-Ndoki National Park and the forests and species it safeguards. "I'm just staggered that the international community hasn't said or done something about it," Rainforest Foundation UK's Counsell said. "They've literally poured tens of millions into that protected area over the years."

- https://news.mongabay.com/2019/07/congolese-government-opens-nouabale-ndoki-national-park-to-oil-exploration/

2018: the birth of the Brazzzaville Declaration for the protection of the Congo Basin peatland. Photo Hans Joosten.

South-Africa

The quest "King of Wetlands" on SER 2019

Darya Ryazantseva (Darya.Ryazantseva@ethnoexpert.com)

The annual World Conference on Ecological Restoration SER 2019 will be held in September 2019 in Cape Town, South Africa. The theme of this year's conference is Restoring Land, Water & Community Resilience. The key objective of the event is to show the inextricable link between ecosystems and human society. Conference sessions will foster knowledge sharing and debate around big-picture issues and trends, as well as specific tools, techniques, challenges, and strategies for ecological restoration around the world.

Among the conference events will be presented a training course on decision-making in projects for the sustainable development of territories “King of Wetlands: Quest for successful restoration projects” that require the involvement of various stakeholders in the process. This training involves a role-playing exercise, in the form of a quest that EthnoExpert company team will conduct. The EthnoExpert company has over 10 years of experience in project management and stakeholder management. Including experience and information accumulated on how wetland restoration allows us to simultaneously achieve various Sustainable Development Goals. During this course participants will learn how to effectively design and implement peatland restoration projects to achieve desired goals and maximize outcomes within each of these three areas. During the game, experts will describe the key characteristics of a hypothetical project site from an ecological, economic and social perspective and then guide course participants in making their own choices about how to prioritize project goals. Participants will design a roadmap of project steps in all three areas and determine methods for stakeholder interaction. The course will also cover basic stakeholder management and communication skills (e.g. identifying and mapping stakeholders, mapping communities and assessing their influence and dependency, communicating effectively with different stakeholder groups, etc.). Upon completion of the course, participants will be able to independently plan and implement a wetland restoration project taking a holistic, inclusive approach that effectively manages trade-offs between competing goals and sets the project up for long-term success.

- https://ser2019.org/program/training-courses/

Asia

China

Symposium "Peat for food production and quality of life"

The first International Symposium on "Peat for food production and quality of life" and "China International Peat Product and Technology Expo" will be held in Qingdao from 16 to 21 September 2019. China is proceeding with the adjustment of its agricultural industry structure and the reform of supply. The progress of agricultural science and technology and the accelerated development of environmental rehabilitation have put forward a demand for peat-based products and technologies. The import volume of peat and coir increases at a rate of 40-50% per year. There are 680 enterprises that import peat, coir and wood fibre, as registered by the Customs and Commodity Inspection Department of China. The symposium will provide keynote speeches, session workshops, posters, product and technology exhibition, and field trips in both English and Chinese. Simultaneous interpretation with head-sets will be provided. Register by the end of August. Further information at www.ips-cnc.com.

Indonesia

Highlighting haze diplomacy

On the 52nd anniversary of ASEAN’s founding on Thursday August 8, President Joko “Jokowi” Widodo unveiled the towering new building of the ASEAN Secretariat in Jakarta. His message was clear: The new building was there to help empower ASEAN to become more responsive to the swift pace of change, so that it can remain relevant in meeting the aspirations of its peoples and work more effectively toward its goals. Jokowi’s message, conveyed ahead of a high-profile trip to Malaysia and Singapore, was timely given the geopolitical nuances of regional peace and security; but it risks ringing hollow in the face of a reemerging transboundary haze crisis that looks to be emanating from the archipelago. Officials in Aceh and Riau provinces have warned of deteriorating public health and increasing haze-induced respiratory ailments. Six provinces have declared wildfire emergencies, including those bordering on Malaysia and Singapore, raising the specter of the devastating forest and land fires of 2015. Just two days before, the President rightly expressed embarrassment about his upcoming visit to the neighboring ASEAN countries, demanding vigilance from his Cabinet, the security apparatus and regional administration leaders in addressing the recurring haze problem.

In 2013, on the back of complaints by our neighbors about the uncontrollable forest and peatland fires in Riau, then-president Susilo Bambang Yudhoyono offered an apology and took it upon himself to personally oversee the preparations of a dedicated task force and discussed contingencies with the Malaysian and Singaporean

sides. He had to apologize again in 2015. Jokowi himself had to cut short his maiden visit to the United States when the 2015 haze crisis erupted, flying in to South Sumatra to attend to deteriorating circumstances on the ground. The fires had raged through 2.6 million hectares of land in Sumatra and Kalimantan, with a study blaming the fires for the premature death of 100,000 people. The Supreme Court found Jokowi among those liable for the fires costing the country more than US$16 billion.

Since then, Indonesia has garnered praise for its handling of the haze problem, setting up tougher rules and protections to prevent disasters of the 2015 magnitude. And while some experts have dismissed the notion that Indonesia is responsible for the creeping haze that has reportedly blanketed Singapore and parts of Malaysia in recent weeks, a diplomatic gesture by the President during his visits there would help alleviate public pressure.

Ultimately, decision makers must be wary of complacency setting in following prior success of mitigation campaigns, and refocus efforts to ensure that people in areas affected by haze experience as little as possible disruption to their lives.

One ASEAN foreign minister has said that Indonesian officials should always remember that the haze most heavily impacts those who live right under their noses, and worry less about those that are noisy across the pond.

- https://www.thejakartapost.com/academia/2019/08/09/highlighting-haze-diplomacy.html

Environment and Forestry Ministry data show that 42,640 hectares of land burned across the country between January and May this year, which was nearly double the 23,745 ha burned in the corresponding period last year.

Logged and burned peat swamp forest in Central Kalimantan. Photo: Hans Joosten.

Indonesia fights fires in palm-growing regions to prevent deadly haze

Indonesia is stepping up efforts to prevent a repeat of haze that blanketed much of Southeast Asia four years ago by deploying thousands of firefighters and emergency response teams in its main palm oil- and rubber-producing regions. Authorities have declared a state of emergency in some provinces after detecting 84 hot spots. More than 9,000 personnel from the National Disaster Mitigation Agency, the military, police, environmental groups and private companies, including Asia Pulp & Paper Co. have been deployed to combat the fires so far this season. An estimated 11.8 million hectares of land across the archipelago is having a long and unusually dry season this year with the livelihoods of 48.5 million people at risk, according to Coordinating Ministry of Human Development and Culture. That's revived memories of the 2015 haze, when stinging smoke from the illegal burning to clear land for palm oil and paper plantations blanketed Singapore, parts of Indonesia, Malaysia and Thailand for over a month. Provincial governments of of Riau, South Sumatra, West, South and

Central Kalimantan, the main palm oil and rubber producing areas, have declared a state of emergency to deal with the fires. The government has already warned of risk to its rice crop from the long dry spell that's expected to last until October.

Forest fires from illegal burning to clear land for palm oil and paper plantations are a recurrent event in Southeast Asia's biggest economy. Their frequent occurrence prompted President Joko Widodo to order a moratorium on new permits to clear forest and peat land for palm oil cultivation. Riau, one of the country's main palm oil-growing region, is the worst affected province this year with fires scorching about 28,000 hectares of land already, the disaster mitigation agency said in a statement on July 30. The agency detected 27 hot spots in Riau, 26 in Jambi, 14 in Central Kalimantan, 12 in West Kalimantan and 5 in South Sumatra as of July 29. It has deployed 33 helicopters for water bombing in Riau, South Sumatra, West and Central Kalimantan.

- https://www.bloomberg.com/news/articles/2019-07-30/indonesia-fights-fires-in-palm-growing-regions-as-drought-looms

Jokowi warns on danger of hotspots as dry season hits

President Joko "Jokowi" Widodo has lectured the authorities on the basics of preventing forest and land fires in anticipation of a long dry spell amid threats of a reoccurring haze crisis that hits neighbors Malaysia and Singapore. Speaking at a coordination meeting on forest and land fires on August 6, Jokowi, who in the 1980s worked as an employee of state-owned paper producer PT Kertas Kraft Aceh, ordered the authorities to prioritize preventive actions in vulnerable provinces as the dry spell is expected to persist until October. "Do not underestimate the presence of hotspots. If fires break out, immediately put them out and do not wait until it spreads," Jokowi said in the State Palace meeting. "We'll be ashamed of facing other countries if we cannot solve the smoke problem." The President called on regional administrations, Indonesian Military (TNI), National Police, National Disaster Mitigation Agency (BNPB) and Peatland Restoration Agency (BRG) to work together cooperatively. More than 9,000 personnel from the government as well as environmental groups and private companies have been deployed to combat fires.

The government has assigned an emergency alert status to six out of 18 provinces prone to forest and land fires, namely in Riau, South Sumatra, Jambi, West Kalimantan, Central Kalimantan and South Kalimantan, effectively activating the deployment of special task forces in the respective provinces to deal with forest and land fires.

Jokowi also emphasized preventive measures such as daily hotspots and peatland ecosystem monitoring as key actions in tackling forest and land fires, urging the use of drones to detect fires early and private companies to adopt modern technology for risk mitigation. The Terra Aqua Modis satellite detected 2,070 hotspots between January and July this year, up 54.71 percent from 1,338 hotspots recorded over the same period last year.

Coordinating Political, Legal and Security Minister Wiranto said the risk of forest and land fires will persist until the peak of the dry season in September this year, hence the ministry will focus on public dissemination targeted to all related stakeholders from growers to local authorities on prevention efforts.

"Prevention efforts are prioritized rather than handling," Wiranto said, additionally reporting that "the air quality had already dropped in several regions but is still in the mild category, not to the extent of disrupting the livelihoods of the people."

- https://www.thejakartapost.com/news/2019/08/07/jokowi-warns-on-danger-of-hotspots-as-dry-season-hits.html

'Dangerous' new regulation puts Indonesia's peatlands at risk

A new Indonesian government regulation that restricts the types of peat landscapes that must be protected has raised concerns among environmentalists about a backslide in forest protection policies. Existing regulations, issued in the wake of devastating fires in 2015, require that plantation companies and other concession holders whose land includes areas with peat layers 3 meters or deeper must restore and conserve those areas. Subsequent policies and restrictions have tended to support this prohibition on clearing deep peat. However, a new regulation issued by the Ministry of Environment and Forestry redefines the area that must be protected, essentially opening up large areas of peatlands to exploitation.

Under the regulation, concession holders are now only required to only peat domes, landscapes where the peat layer is so thick that the center is topographically higher than the edges. Areas beyond these domes will once again be open for exploitation, even if they meet the 3-meter peat layer requirement that would have qualified them for protection under the previous regulations. "If the new regulation is used by concession owners to keep operating, then it's going to be dangerous," Irwansyah Reza Lubis, the program coordinator for community, biodiversity and climate change at Wetlands International Indonesia, told Mongabay. "Local governments can also use this as a weapon to legitimize [continued peat clearing]." To ensure peatlands are protected and the

carbon dioxide they hold isn't released into the atmosphere, entire peat landscapes must be conserved and not drained, Reza said, especially if they're bounded by rivers. "The general understanding in the scientific world is that peat [protection] has to have a scope of an entire landscape," he added. Protecting only the domes of these landscapes isn't enough to prevent the entire peat hydrological areas from being drained, Reza said. He called this new policy a recipe for disaster. It's also a recipe that appears to have been cooked up in part by the very plantation and pulpwood companies that hold concessions in peat areas.

For emissions and the climate it makes no difference whether you cultivate drained peatlands for oil palm, pulp wood or small holder subsistence and whether these peatlands are 2, 5 or 10 m thick… Photo: Hans Joosten.

The government's rationale for protecting only the tops of the peat domes is that they will act as natural "water towers" to help keep water levels in lower-lying plantations from falling too low during the dry season. An identical approach known as "eko-hidro" is already in use by companies such as Asia Pacific Resources International Limited (APRIL), Indonesia's second-largest pulp and paper firm. The idea behind eko-hidro is that companies can still drain peatlands as long as they protect the top of the peat dome in their concession and manage the water level using a controlled drainage system to minimize peat loss and reduce carbon emissions and land subsidence. "It looks like [the new regulation] is drawn from the eko-hidro approach, which says that as long as there's [sustainable] water management, then [draining peatlands] can still be tolerated," Reza said.
The expert view, however, is that an approach like eko-hidro can't prevent the long-term impacts of peatland drainage. Wetlands International has likened the policy to "allowing smoking in the left side of a plane and forbidding it on the right side." A 2016 report by Wetlands International and Tropenbos International assessing the effectiveness of the approach finds that draining peatlands will always lead to land subsidence, even if the water table is managed at a level deemed "sustainable." At best, it only slows down the process of subsidence and partially reduces emissions from peat oxidation and the risk of fires, according to the report. "Subsidence is an inevitability of peatland drainage regardless of whether the water table is managed at 40cm" — the Indonesian government's definition of a sustainable level — "or 50-80cm," the report says. "The only truly sustainable peatland water management and production system is one that is based on undrained or rewetted peat where water levels will be close to the surface and subsidence will be close to zero." The report says the eko-hidro approach is flawed from the outset because it's based on the assumption that protecting the top of the peat dome will be enough to ensure the whole peatland hydrological area remains wet and less prone to fires. In reality, the groundwater flow from the top of peat dome yields less than 5 percent of the water volume required to significantly mitigate the fall in dry season water levels in surrounding plantations. A much larger

area than the government-mandated 30 percent of the peat hydrological area centered around the dome "must be protected in order to meet the goal of this approach," the report says.

The new regulation marks a regression from even the eko-hidro approach, by allowing companies to continue to exploit the peat dome in their concessions if there's more than one "top" or peak. This will be offset through the conservation of any other peaks or tops within the same peat hydrological area to ensure the entire domes remains moist, according to an environment ministry official. For Reza, though, this looks "really bad because it looks like it's requested or sponsored." It comes off, he said, like "a compromise with plantation and pulpwood industries so that they still have extra room to keep exploiting concessions within protected areas." He questioned the science behind the ministry's rationale that the hydrological function of a peat dome top could be replaced with that of another.

Azwar Maas, a soil scientist and swampland specialist at Gadjah Mada University, said there was no science to back the government's reasoning. "A top or a peat dome is independent and thus can't be replaced by another. The water table has to be based on each peat dome or its top if a peat dome has more than one top," he said.

The government, though, is sticking to its guns. Environment and Forestry Minister Siti Nurbaya Bakar said the new peat regulation didn't weaken peat protection in the country. "There's no such thing as weaker [peat protection]," she told Mongabay, adding that this was likely a misperception. "The core [of peat protection] still exists. There won't be loosening peat protection and the monitoring will continue." Bambang Hendroyono, the ministry's secretary-general, said that even if peat areas with protected status were opened for exploitation, the entire peat landscape could still be protected and restored as long as the water table was properly managed.

Among measures the government will require companies to take to ensure this are the construction of spillways to control the release of groundwater flows from peat domes, and the monitoring and reporting of groundwater and rainfall levels. "The spillways will be closed [during rainy season] to store rainwater," Bambang told reporters in Jakarta. "That's an instrument to restore [degraded peatlands]. So during dry season, [rainwater] will be distributed [to wet the entire landscape]."

Yet that mechanism goes against existing government policy on draining peatlands, said Anggalia Putri, a researcher at the environmental NGO Yayasan Madani Berkelanjutan. She pointed to a 2016 presidential regulation that states that if there are drainage canals in protected peat areas, then the peat there is considered to be damaged. That makes it impossible for companies to drain protected peat areas to make way for plantations without rendering them degraded, by the government's own definition, Anggalia said.

Twenty-four companies have reportedly revised their concession maps as part of the process to start exploiting areas of protected deep peat on their land. But the administrative process has been far from transparent, with NGOs and even the presidentially appointed Peatland Restoration Agency (BRG) unable to access the documents despite multiple requests. That leaves activists without a way to independently verify whether the companies are meeting their obligations. For its part, the government is preparing guidelines for the BRG and NGOs to monitor the companies' activities.

The government has framed the new peat regulation as an improvement over previous regulations. It says that carbon-rich peatlands, including those on peat domes, were actually left unprotected following a 2017 court ruling that overturned a ban on forestry companies from cultivating protected peat areas. Following that ruling, according to Karliansyah, the environment ministry's director-general for environmental degradation mitigation and control, the remaining regulations technically allowed the exploitation of peat areas, depending on the kind of industry — whether timber (pulpwood) or oil palm. But Reza of Wetlands International disputed this interpretation of the prevailing legal framework, saying the new regulation constituted a blatant violation of the existing peat regulations. He said those regulations defined protected peat areas under several categories — such as deep peat, those that contain high biodiversity, and peat domes — but make no distinctions with regard to the kinds of concessions granted.

Activists say any weakening of peat protection efforts could encourage concession holders to drain even more peatland, raising the risk of intensifying peat fires across Indonesia. During the disastrous 2015 season, fires raged across 26,100 km^2 of land, much of it peat forest that had been drained for agriculture and rendered highly combustible. The resultant haze sickened hundreds of thousands of people, shut down airports, and spread to neighboring countries, inflaming long-running diplomatic spats. At the height of the disaster, the daily emissions of carbon dioxide as a result of the burning exceeded those from all U.S. economic activity. According to a study by Indonesia's planning ministry, peat fires accounted for 23 percent of the country's total greenhouse gas emissions in 2010, releasing up to 1.1 gigatons of carbon dioxide equivalent, or double the emissions from the energy sector that same year.

The central role of water in the persistence and management of peatlands often remains insufficiently appreciated. Sebangau National Park, Central Kalimantan. Photo: Hans Joosten.

Giving concession holders the leeway to exploit peatlands, as the new regulation does, makes it increasingly likely that Indonesia will see further degradation of peatlands and severe fire episodes ahead, according to Muhammad Teguh Surya, the executive director of Yayasan Madani Berkelanjutan. This will make it even more difficult for Indonesia to meet its emissions reduction target, he said. Environmentalists are also concerned the new regulation will hamper the Peatland Restoration Agency's goal of restoring 24,000 km^2 of peat forest across the country by the end of 2020. Under the peat-restoration initiative, companies whose concessions include peatlands are responsible for restoring those areas, which amount to 14,000 km^2 of the total 24,000 km^2. That means the success of the initiative depends heavily on whether companies hold up their end of the bargain — a vanishingly unlikely prospect, activists say, in the wake of the new regulation.

Another challenge posed by the new regulation will be how to ensure that a peat hydrological area is fully protected and restored, given that it might straddle multiple concessions and/or community areas. This will call for restoration work outside concessions carried out by the BRG and NGOs to be complemented by and linked to the work done by concession holders, according to Reza. But this will be difficult to achieve under the government's current approach, he said, which requires companies to map only their own concessions and limits the BRG's work to areas outside those concessions.

- https://news.mongabay.com/2019/07/dangerous-new-regulation-puts-indonesias-carbon-rich-peatlands-at-risk/

Ministry: 11 provinces should declare emergency alert status for fire

The Coordinating Ministry for Political, Legal, and Security Affairs has appealed to 11 provincial administrations prone to land and forest fires to impose emergency alert status in their respective regions."Regions must soon declare an emergency alert status, because of the total 16 provinces (prone to forest fires), only five have imposed the status," the ministry's Deputy for Public Order and Security Coordination Insp. Gen Carlo B. Tewu remarked during a coordination meeting to evaluate and take precautionary measures against land and forest fires in Pekanbaru, Riau, on July 18. The meeting was attended by representatives from 16 provinces prone to land and forest fires, officials of the Environment and Forestry Ministry, Meteorology, Climatology, and Geophysics Agency (BMKG), and Peatland Restoration Agency (BRG). Tewu noted that President Joko Widodo had instructed regions to prevent land and forest fires at the earliest. He noted that governors could declare an emergency alert status based on BMKG's forecast, the number of hotspots, and coverage of potential land and forest fires. "Regional administrations that have declared (the status) can easily acquire the budget from the

government. We prioritize prevention since based on BMKG's information, especially the southern part of Indonesia will experience drier weather until December," he stated.So far, only the five provinces of Riau, West Sumatra, Central Kalimantan, South Kalimantan, and West Kalimantan have declared an emergency alert status. Riau has experience in tackling forest fires, he stated. "We know that Riau has a well-trained task force for land and forest fires. Its governor led the task force. This is remarkable. Local governments have paid significant attention to the fight against land and forest fires," he pointed out. Spokesman of the National Disaster Mitigation Agency (BNPB) Agus Wibowo remarked that until July 17, land and forest fires in the country had covered 42,740.42 hectares of land in 24 provinces.

- https://en.antaranews.com/news/129201/11-provinces-should-declare-alert-status-for-forest-fire-ministry

Fires still threaten peatlands, even in restoration areas

The threat of fire continues to hang over peatlands, even in areas dedicated for restoration purposes. A warning about the imminent danger in fire-prone peatland areas was raised early July by Jakarta-based Madani Berkelanjutan, an environmental nongovernmental organization focusing on forest and land management.

A study by Madani Berkelanjutan of peatland areas in Riau province between January and March found 737 hot spots in the province, some 96 percent of which were located within prioritized areas for peatland restoration. Results of the study were obtained through spatial data analysis, which was combined with field investigation into hot spots in the province. The Peatland Restoration Agency (BRG), which has been tasked with carrying out restoration projects in peatland areas across the country since 2015, has identified 814,000 hectares (over 80 percent of which is in plantation concessions) of burned peatland in Riau that need to be restored. A forestry professor at the Bogor Agricultural University (IPB), Bambang Hero Saharjo, said the most important thing to do in preventing fires and restoring the peatland areas was to ensure plantation companies complied with the government-sanctioned peatland restoration projects and followed the available standardized procedures. “If those concession areas have been included in prioritized areas for restoration, they [the companies] should have restored them by the fourth year [since the restoration project began],” Bambang said at the publication of the study on July 2. “In fact, these concession areas have remained a problem in the peatland restoration projects,” he added, while citing plots that are effectively unproductive and abandoned but still with operational permits. He lamented the government’s failure to take serious action against such irregularities and its tendency to ignore them when the problems arose.

BRG chairman Nazir Foead said progress in restoration in Riau was hindered by many targeted areas being inaccessible and still in conflict. An estimated 30 percent of burned peatland is in concession areas and conflicts over land ownership between companies and local people have not been settled. “It is a complex problem as it involves many stakeholders. It could take years to settle,” Nazir told *The Jakarta Post* by phone. “Also, there are irresponsible persons apparently burning the land on purpose. But, it is hard to identify whether they represent companies or act as individuals,” he said. Nazir also blamed the dry season for contributing to this year’s fires. “Land without irrigation could dry in 10 days, while irrigated land only dries in one month.” In anticipation, the BRG has developed an online platform – PRIMS (Peatland Restoration Information Management System) – to monitor peatland restoration activities and prevent wildfires. The BRG also involves local residents in restoring peatland by facilitating them in rewetting the land. In all, the BRG said it aimed to restore 2.7 million ha of peatlands in Indonesia by 2020. At least 1.7 million of which is concession land with the rest belonging to the public and the state. As of June, an estimated 929,000 ha of peatland had been restored.

- https://www.thejakartapost.com/news/2019/07/05/fires-still-threaten-peatlands-even-in-restoration-areas.html

Indonesia to restore 200,000 hectares of peatland this year

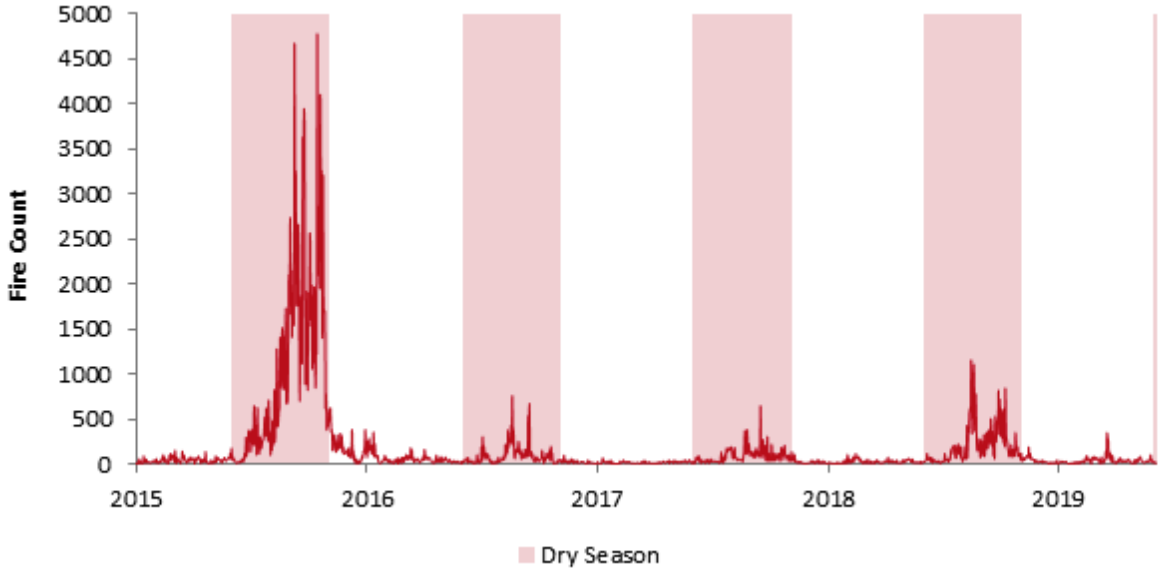
Indonesia's Peatland Restoration Agency said on June 19 that it aims to restore 200,000 hectares of peatland in 2019, as it races to reach a 1 million hectare restoration target by the end of next year. The agency was set up in 2016 to restore carbon-rich peatland damaged by fires in seven provinces on Sumatra, Kalimantan and Papua islands in 2015. Indonesia was subsequently blamed for one of the worst ever peat and forest fire crises that blanketed much of Southeast Asia in thick haze and caused billions of dollars of economic losses. Up to 2018, the agency had restored around 679,000 hectares of peatland, Nazir Foead, head of the Peat Restoration Agency, said. "If we can improve the peat condition during the rainy season the risk of flooding can be reduced, and in the dry season, the peat can release water which will reduce the risk of forest fire," he said. In addition to its own restoration target, the agency is also supervising the restoration of up to 1.6 million hectares of degraded peatland, a project being undertaken by plantation and forestry companies on the orders of the government,

Foead said. By the end of May, those companies had restored 258,695 hectares of peat area and are expected to restore another 150,000 hectares by December, Foead said

- http://news.trust.org//item/20190619121015-l43bz/

El Niño conditions to put Indonesian government regulations to the test this fire season

This year's dry season will determine whether the Indonesian Government can continue its streak of record-low fire counts since MODIS C6 began recording data in 2000. As seen in the figure below, following the 2015 South-East Asian haze crisis, each of the following dry seasons saw fire levels drop dramatically. Those record lows coincided with increased efforts from the Indonesian government to restore dried out and degraded peatlands and improve laws and regulations to dissuade the use of the farming practices responsible for the fires. As noted in a previous *Strategic Weekly Analysis*, however, there is a strong correlation between rainfall during the dry season (within Riau, West Kalimantan and Central Kalimantan, where most fires occur) and the severity of that year's fire season. The past three years have seen, on average, higher levels of rainfall, which has probably contributed to the low fire counts for those years.



There are concerns that this year could see considerably more haze than the previous three years. According to a recent haze outlook report by the Singapore Institute of International Affairs (SIIA), the risk of a transboundary haze event, similar to 1997 and 2015, is moderately-likely for this year. That is primarily due to weak El Niño weather conditions that are expected to continue into the third quarter of this year. Despite those expected conditions, Indonesian officials have assured their neighbours that they will bring the haze under control. In December 2018, Nazir Foead, chief of Indonesia's Peatland Restoration Agency, told the *Straits Times* that 'We can handle this… We cannot say that there will not be fires, but there will be fewer incidents, and they will be put out much quicker'.

It is unclear whether the current efforts from the Indonesian Government will be enough during the El Niño conditions. In early March, due to those dryer conditions, there was a flare up of fires, primarily in the Riau province in Sumatra. Compared to previous years, that was the largest recorded spike in fires during the wet season since 2016, when the Indonesian government introduced stronger measures to suppress those peatland fires. According to some commentators, the recent flare-up shows that the government is still focussed on a reactive approach to the issue; only responding to fires after they've broken out. If that is the case, the Indonesian Government risks becoming overwhelmed this fire season and may struggle to prevent the haze from reaching across the archipelago to its neighbours. After being congratulated by regional governments for its efforts to reduce the haze in previous years, Indonesia could again face diplomatic pressure to step up its efforts. The upcoming dry season, therefore, with its expected, albeit weak, El Niño conditions, will be the real test of whether the efforts by the Indonesian Government will be enough to suppress the fires.

- http://www.futuredirections.org.au/publication/el-nino-conditions-to-put-indonesian-government-regulations-to-the-test-this-fire-season/

Four development projects receive 37 million euros funding

Indonesia and Germany inked a cooperation agreement under which four development projects will receive funding of 37 million euros in areas of effective governance, technical and vocational education and training, and environment and biodiversity protection. Indonesian Finance Ministry's Director General of Finance and Risk Management Luky Alfirman and German Ambassador to Indonesia Peter Schoof were present during the signing ceremony held at the Finance Ministry's office in Jakarta on May 15. The German Federal Ministry for Economic Cooperation and Development (BMZ) will finance the total 37 million euros in grant funding for the four development projects in Indonesia. To address environment and climate change issues, Indonesia and Germany have collaborated in a project on "Peatland Rehabilitation and Management" involving the North Kalimantan provincial government for ensuring the sustainable management of the peatland ecosystem in the Kayan Sembakung Delta by getting representatives of the private sector, villages, and the civil societies involved in this endeavor. The funding will further help in financing the joint collaboration project on "Sustainable Agricultural Value Chains in Indonesia" to recognize alternative sources of income to timber and palm oil for smallholders that are both domestically and internationally profitable and that can avert further deforestation in Indonesia. Germany's contributions for the four projects will be implemented by the National Development Planning Agency (BAPPENAS) and the relevant Indonesian ministries and sub-national institutions, supported by GIZ, a major German development agency. Director General of Finance and Risk Management Luky Alfirman remarked that the agreement mirrors the close and deep relations between both nations.

- https://en.antaranews.com/news/125515/four-development-projects-receive-37-million-euros-funding

Drained, logged and burned peatswamp forest in Cenral Kalimantan. Photo: Hans Joosten.

Indonesia moratorium on new forest clearance now permanent

Indonesia's moratorium on new forest clearing for palm plantations or logging operations, which has been regularly extended since 2011, will become permanent, the Environment Minister said on June 12. Indonesia has one of the highest rates of deforestation in the world, with more than 74 million ha of rainforest - an area nearly twice the size of Japan - logged, burned or degraded in the last half century, according to Greenpeace. The moratorium covering more than 60 million ha of primary forest and peatland was introduced in 2011 in an effort to reduce emissions from fires caused by deforestation. "I have decided to keep the moratorium instead of renewing it every two years," Environment and Forestry Minister Siti Nurbaya Bakar told reporters.

The moratorium prohibits the conversion of primary natural forests and peatlands for oil palm, pulpwood and logging concessions, and was introduced in 2011 by then-president Susilo Bambang Yudhoyono as part of wider

efforts to reduce greenhouse gas emissions from deforestation. It was initially slated to run for two years, but has been extended three times since then, most recently in July 2017 by Yudhoyono's successor, President Joko Widodo. Minister Siti Nurbaya Bakar told Mongabay that when it comes up for renewal again this July, the policy will be made permanent. "[The proposal] is in the final stage now, signed by other ministers," Siti said. An official in her ministry added that the proposal was now awaiting the president's approval. Abetnego Tarigan, an environmental adviser in the office of the president's chief of staff, confirmed that the ministry had proposed making the moratorium permanent.

The move dovetails with the current administration's development model of reining in agricultural and forestry expansion and boosting productivity from existing concessions. "Massive expansion isn't our priority anymore," Abetnego told reporters in Jakarta. "It's different from in the 1980s, when industrial [logging and pulpwood] plantations wanted to expand, and in the 1990s and the 2000s, when palm oil plantations wanted to expand as well."

In addition, the government also wants to shift away from a heavy reliance on exports of raw commodities, to developing downstream industries that process those commodities to add value, he said. "We know that if we only rely on producing raw materials, there won't be any significant benefit," Abetnego said.

Ultimately, having a permanent licensing ban in place will provide better protection for the environment while also maintaining economic growth, he added. Indonesia is home to the third-largest expanse of tropical rainforest left on Earth, after Brazil and the Democratic Republic of Congo. However, huge swaths of those forests have been cleared on the islands of Sumatra and Borneo to make way for industrial-scale extractive industries — primarily oil palm and pulpwood plantations, but also logging concessions and coal mines.

When the ban was introduced, it elicited a backlash from these industries, with the palm oil lobby warning of economic disruptions. That hasn't been the case, Abetnego said. "We've seen that the current moratorium, with all of its criticisms, has contributed to reducing deforestation, which means it shows a positive trend," he said. "And the fact is that our economy didn't collapse. Before, people thought the moratorium would make the economy [decline], but that didn't happen."

Activists and environmentalists have welcomed the plan to make the moratorium permanent as a key step toward reducing deforestation and helping Indonesia meet its emissions reductions goals. The country has pledged to slash carbon dioxide emissions by at least 29 percent over the business-as-usual projection by 2030. Indonesia is currently one of the top emitters in the world, but unlike industrialized nations, the bulk of its emissions come from deforestation and drained peatland rather than burning of fossil fuels.

Imposing a permanent moratorium would at the very least cement the protection of the 660,000 km^2 of primary and peat forests covered at present, according to Arief Wijaya, a senior manager for climate and forests at the World Resources Institute (WRI) Indonesia. "That means the government can focus on how to strengthen the ongoing moratorium … and peat protection policies," he told Mongabay.

Enforcement of the moratorium remained lax for the first five years after it came into force. Data on tree cover loss from the Global Land Analysis & Discovery (GLAD) lab at the University of Maryland (UMD) reflect a high rate of deforestation during this period, ranging from 9,280 km^2 in 2012, to 7,350 km^2 in 2015 — including within areas ostensibly covered by the moratorium. Those figures declined significantly from 2016 onward. The catalyst for that change wasn't stronger enforcement of the moratorium, however, but new government regulations adopted in response to a particularly disastrous season of forest fires in 2015 that destroyed extensive swaths of peatlands. In 2018, Indonesia lost a relatively small amount of forest cover, at 3,400 km^2, according to UMD data — the lowest rate since 2003, and a 40 percent lower than the annual average from 2002 to 2016.

Mikaela Weisse, the Global Forest Watch manager at the WRI, attributed this drop to the peat protection policies implemented after the 2015 fires. While the 2011 moratorium banned new permits for concessions on peatlands, it still allowed companies with existing permits to continue clearing their land. It wasn't until 2016 that a nationwide ban on clearing carbon-rich deep peatlands was introduced. "We've seen even larger drops [in deforestation] on peatlands and areas covered by Indonesia's forest moratorium," Weisse said. "It seems that Indonesia's forest policies at the aftermath of the fire season a few years ago are having an effect."

Arief concurred that the licensing moratorium was initially ineffective in protecting primary and peat forests because it wasn't coupled with strong enforcement. The 2015 fires, he said, had gone some way toward addressing that shortcoming by spurring government action. "It shows that the government has truly been enforcing its policies since 2015, which then showed the impact of the forest moratorium," he said. "The policies themselves are good, but the devil is in the implementation."

Logged and burned peatswamp forest in Cenral Kalimantan. Photo: Hans Joosten.

The current moratorium allows exemptions for conversion of primary and peat forests under certain conditions. These include concessions for geothermal and oil exploitation, and agricultural activity deemed to be of strategic national importance. The latter initially covered the cultivation of rice and sugarcane, but now also includes corn, sago and soybeans. In all, 35,000 km^2 of carbon-rich primary and peat forests are exempted from protection under the moratorium, according to a 2014 analysis by the WRI. Nearly a third of that figure, 10,000 km^2, is in Indonesia's easternmost region of Papua, home to the largest remaining contiguous stretches of pristine rainforest. A major government initiative there is the Merauke Integrated Food and Energy Estate (MIFEE), earmarked for rice and sugarcane plantations to shore up national food security. The problem is that developers operating in the area are going beyond that scope, according to Madani's Anggalia. She said some permits had been issued for sugarcane plantations in the MIFEE, but the developers had planted oil palms instead — a crop that doesn't qualify for an exemption to the licensing moratorium. Anggalia said cases like these showed that the exemption could be easily abused, especially in remote regions like Papua, whose remoteness and poor infrastructure make it difficult for civil society and government to monitor forestry activity. Experiences from Sumatran and Borneo suggest that once Papua's primary forests are cleared, further deforestation is inevitable, Anggalia said. "Numerous studies done by WRI clearly show the steps of deforestation in Indonesia, starting with selective logging," she said. "Big trees are cut first to get huge profits, such as merbau trees. Once there's no more big trees, the land is degraded and thus it's easier to justify future deforestation there." She said the government couldn't use food security to justify issuing new permits for the conversion of primary and peat forests, adding that there was plenty of idle land available for agriculture. "Why does [the government] still target primary forests for agriculture?" Anggalia said. "It means there are short-term interests to extract timber. But that's not necessary if we see how much abandoned land is available."

There are 243,000 km^2 of degraded lands across Indonesia that can be used for this purpose, government data show, with 155,000 km^2 of them located within forest areas. Anggalia said there were also non-forested areas within areas designated by the government as forest, amounting to 312,000 km^2, which could be used for agricultural purposes. "The government should maximize the utilization of non-forested lands or use abandoned concessions to secure food sovereignty, and thus minimize forest degradation," she said.

Arief said the problem was that businesses were reluctant to cultivate such land because of their fragmented spread and the likelihood that they're already subject to conflicting claims by local communities. But this is a problem that could be cleared up if the government was more transparent about disclosing its land-bank data, Anggalia said. "We don't know whether these abandoned lands can be used or not because many of them are

owned by private companies," she said. "But who are they? Their identities have never been disclosed. Why doesn't the government target these abandoned lands owned by companies?" If the data was publicly available, civil-society groups could work with the government to come up with a unified and trustworthy map for land use, Anggalia added. "It's not that there's no land, but that these lands are controlled by just a small number of people," she said. "No one should go hungry, because there's a lot of food being wasted and a lot of unethical use of space."

- https://news.mongabay.com/2019/06/indonesian-ban-on-clearing-new-swaths-of-forest-to-be-made-permanent/
- https://www.tnp.sg/news/world/indonesia-moratorium-new-forest-clearance-now-permanent
- https://news.yahoo.com/indonesia-plans-permanent-moratorium-forest-110528980.html

How Indonesia turned over new leaf in forest protection

Sonny Mumbunan & Edward Davey

The most recent global survey of tree cover, released by Global Forest Watch, revealed a worrying panorama: the world lost 3.6 million hectares of old-growth rainforest in 2018, an area the size of Belgium. But one country stood out as a success story: Indonesia reported a notable reduction in forest loss for the second year in a row. While absolute forest loss remains high (340,000 hectares in 2018), the direction of travel appears unmistakable. Indonesia's success is in part due to the robust measures President Joko "Jokowi" Widodo's government has put in place, including temporary bans on further expansion of oil palm plantations into forests and peatlands.

The government of Indonesia's Low Carbon Development Initiative (LCDI) – led by National Development Planning Minister Bambang Brodjonegoro – recently found that the country could reduce its greenhouse gas emissions 43 per cent by 2030, while still growing its gross domestic product (GDP) 6 per cent per year until 2045. Indonesia cannot reach this low-carbon future without a commitment to its forests: Forest loss and land use change account for as much as 55 per cent of the country's greenhouse gas emissions. To achieve the ambitious scenario laid out by the LCDI, Indonesia needs to restore 1 million hectares of degraded land to forest every year until 2024. The LCDI sets out five paths by which the forests of Indonesia might be protected and restored over time:

Recent (2018) oil palm plantation in Central Kalimantan. Photo: Hans Joosten.

First, the Indonesian government can permanently extend its moratoriums, or bans, on oil palm and other agricultural expansion into areas of primary forest and peatland. These moratoriums are an essential and proven

first step to ensuring the LCDI's emission-reduction goals are met. Between 2016 and 2017, primary forest loss in protected peatlands went down by 88 per cent, to the lowest level ever recorded.

Second, the LCDI references Indonesia's ongoing One Map effort, which reconciles competing claims and demands on the land and sea between communities and mining, agriculture, fisheries and forestry concessions. The successful conclusion of the One Map policy could help meet the LCDI's ambitious forest restoration targets by resolving disputes with communities and identifying areas most apt for restoration.

Third, finance needs to flow to the provinces and districts where forests most need to be protected and restored. In part, this could be achieved through an "ecological fiscal transfer" scheme, such as one pioneered in India. There, the national government rewards states with high forest cover for maintaining their forests. Dozens of forest-rich districts in Indonesia called on the government last year to establish a similar mechanism. Redirected or repurposed agricultural subsidies could also play a role here, by being more explicitly tied to public goods outcomes such as areas of forest protected or under restoration.

Fourth, Indonesian agricultural value chains can be made more productive and equitable by improving infrastructure and farmers' access to markets. This can lead to better incomes for smallholder farmers and reduce food loss and waste. More productive and well-trained farmers are also more likely to pursue more sustainable and resilient farming practices, thereby positioning Indonesia as a supplier of sustainable commodities, legal timber and emissions reductions.

Fifth, and finally, these efforts need to be undertaken within a broader national effort to provide a healthier, more diverse diet to Indonesia's people, capable of addressing high rates of malnutrition and obesity. About 37 per cent of Indonesian children under the age of 5 are stunted. Forests' role in delivering sustainable and nutritious food production is vital and often overlooked. Intact forests help ensure rainfall in agricultural landscapes, while agroforestry systems provide nutritious foods such as beans and pineapples for human consumption.

Indonesia has an excellent opportunity to build on its considerable progress in reducing deforestation, restoring degraded forests, and delivering a more sustainable food and land use system. The Food and Land Use Coalition, a global initiative to transform the world's food and land use systems, already recognises Indonesia as a pioneer country. And as a result of the LCDI, these five recommendations are expected to inform the government's food and land use policy as part of the forthcoming national and sub-national development planning process.

With further commitment and action on these five steps, there is still a bright future for Indonesia's forests – and for all Indonesia's people who depend on them.

Sonny Mumbunan is senior economist at World Resources Institute Indonesia.

Edward Davey is director of the Geographic Deep Dives of the Food and Land Use Coalition.

- http://www.nationmultimedia.com/detail/opinion/30370864

Malaysia

Podcast on palm oil and peatland problems with Faizal Parish

Palm oil is the most widely used vegetable oil in the world, and this ubiquitous ingredient is found in almost everything, from ice cream and toothpaste to feedstock for biofuel. A highly profitable industry, the ever-growing demand for palm oil has however also drawn scrutiny and ire for among other things, the destruction of peat swamp forests in Indonesia and Malaysia to support its expansion. So what's the solution? Would a palm oil ban do more harm than good? A discussion on this and more with Faizal Parish, the Director of the Global Environment Centre and IMCG Main Board member.

- https://www.bfm.my/podcast/the-bigger-picture/earth-matters/the-problems-of-palm-oil

SPARK Foundation spearheads reforestation efforts

As part of SPARK Foundation's second year Water Stewardship Agenda 2018-2020, the foundation will be supporting the Global Environment Centre (GEC) in its work with the Selangor Forestry Department. This will involve two high-impact initiatives at the Raja Musa Forest Reserve in Batang Berjuntai, Selangor; reforesting one hectare of degraded peatland and constructing a 300-meter clay dyke. These measures are expected to help store up to 200 million litres of water annually. As the Raja Musa peat swamp forest doubles as a water storage and supply for surrounding communities, and as a conservation area and source of livelihood for the same communities, Selangor State Forestry Department Director Datuk Haji Dr Mohd Puat B. Dahlan stressed the importance of preserving peat swamp forests. "Protection and rehabilitation of peatland will sustain our water

supply in the long run, besides functioning as an efficient carbon storage to regulate earth temperature. Reforesting one hectare of peatland offsets 2,000 tonnes of soil carbon, which is equivalent to the annual emissions from 1,400 cars" he said. SPARK Foundation Trustee Renuka Indrarajah pointed out the urgent need for all stakeholders to step-up efforts in protecting water resources to ensure availability and accessibility of clean water, as it is in line with the 2030 United Nations Sustainable Development Goals.

During the tree-planting programme, SPARK Foundation additionally introduced the proposed clay dyke that will be constructed in the Raja Musa Forest Reserve in the third quarter of 2019. Clay dyke is an innovative method to reduce surface and subsurface water seepages that will support water retention and rehabilitation efforts.

Director of the Global Environment Centre and board member of the National Water Services Commission (SPAN) Faizal Parish said corporates must take more seriously the recent warning by the United Nations-linked International Resource Panel (IRP) that up to 50% of the global population will live in water stressed areas by 2030, if current levels of water consumption and pollution growth rate continues. "They must start managing their environmental performance through high-impact projects like the SPARK Foundation Water Stewardship Agenda. 2030 is only 11 years away and urgent action is needed to address and prevent these impacts," he said.

- https://www.thesundaily.my/media-marketing/spark-foundation-spearheads-reforestation-efforts-NI857168

Jaanus Paal and Vera Luthardt planting trees in Raja Musa, Selangor, during the 2016 IMCG Field Symposium. Photo: Karin Keßler.

Europe

European Union

European Commission's Natura 2000 Award

The European Commission's Natura 2000 Award, which honours leading nature conservation achievements, is now starting its fifth edition. The call for applications will be open until 30th September 2019. The Award is open to any entity involved in activities related to Natura 2000. Local, regional and national authorities, businesses, land owners/users, NGOs, educational institutions and individuals from all EU Member States are eligible to apply for the five award categories. The Natura 2000 Award is dedicated to rewarding excellence in the management and promotion of the network and its objectives, and to raising awareness about Natura 2000 and its benefits to

European citizens. The winners will be announced by the future Commissioner for Environment at a high level ceremony in Brussels in May 2020. For more information:

- http://ec.europa.eu/environment/nature/natura2000/awards/promotional-material/index_en.htm.
- http://ec.europa.eu/environment/nature/natura2000/awards/index_en.htm
- http://ec.europa.eu/environment/nature/natura2000/awards/how-to-apply/index_en.htm
- http://ec.europa.eu/environment/nature/natura2000/awards/previous-editions/index_en.htm

Impressive protected peatlands in Belarus. Photo: Hans Joosten.

Belarus

Belarus shares success in peatland restoration

Peatlands occupy around 2.5 million ha in Belarus, only 900,000 of which still retain their natural state. Massive peat excavation, started during the Soviet period, resulted in about 300,000 ha drained to extract peat for fuel. Between 3 and 5 milion tons of peat are excavated each year, mainly for export.

Kostyukovichi is a small town in eastern Belarus, Mogilev Region, with about 16,000 inhabitants. In 1986, the town was considerably affected by Chernobyl disaster which led to massive migration. Today the region continues to face serious ecological problems – drained peatlands pose a high risk of fires which can carry radioactive contaminated soil, water and biomass to other locations. "In 2002, there was a strong fire which we were fighting for almost a year to prevent adjacent forest fires and stop radioactive contaminated smog" explained a representative of Mogilevvodstroy, a regional water design company. In 2018, the company participated in a pilot project implemented in collaboration with the UNCCD and the Environment Ministry of Belarus with the support of the Changwon Initiative. Mogilevvodstroy carried out an environmental feasibility study and constructed cascaded dams on old drainage channels to prevent water loss from the mire to adjacent river. As the result of the project, water level was raised about two meters. It will take hundreds of years to restore the peat levels, but rewetting of drained mires stops further mineralization of open dried peatlands and locks in carbon, preventing fires and allowing wetland biodiversity to come back. At the end of the project, experts will evaluate the benefits of restoration for carbon storage and biodiversity conservation.

The growing awareness of multiple benefits that wetlands provide for regulating micro-climate, biodiversity, human health and alternative sources of income for local populations, Belarus has been investing in restoration of degraded areas, building on proven positive experience and creating new legislation focused on protection and sustainable use of peatlands. A draft of the new law of peatlands will be submitted for parliamentarian

hearing in the summer of 2019. According to Mr. Korbut of the Ministry of Natural Resources and Environmental Protection of Belarus, the new law will regulate peat extraction and make rehabilitation of disturbed areas mandatory for peat producers. “We would like to demonstrate and share our national experience with other countries that face the problem of peatland restoration and the whole world,” added Mr. Korbut.

Restoration of at least 60 000 ha depleted peatlands and disturbed bogs by 2030 is a part of the national voluntary target that the government of Belarus has set up to achieve land degradation neutrality (LDN). Joint national and international peatland restoration efforts in Belarus are expected to cut about three million tonnes of CO_2 emissions over the 20 years period.

The Global Environmental Facility together with UNDP and the Ministry of Natural Resources and Environmental Protection has been supporting peatland restoration on 55 thousand ha in Belarus since 2006. A national database of peatlands has been established during of the project which also serves as a testing ground for using phytoamelioration methods to accelerate formation of mire type of biotope.

- Peatland restoration project in the news
- The LDN programme
- https://www.unccd.int/news-events/belarus-shares-success-peatland-restoration

Germany

Life+ Eggemoore final conference 26-27 September 2019, Paderborn, Germany

This conference marks the end of the 6 year EU LIFE funded peatbog restoration project „Eggemoore“ which has been taking place in the nature conservation areas „Eselsbett und Schwarzes Bruch“ and „Sauerbachtal Bülheim“ in North-West Germany. During the first day presentations will inform about challenges and lessons learnt at each of these sites as well as other project areas in Germany and Latvia. The overall condition of peatbogs in Germany will be presented and the possibilities of using drones in bog protection will be explored. Another element of the programme will be the examination of bog maintenance after Life, for example by using sheep.

Other projects can be presented on posters in the neighboring discussion forum. The second day offers the possibility to join an excursion to the project areas.

- https://www.life-eggemoore.de/en/eggemoors/news/programme-of-our-final-eggemoore-conference-is-now-available.html

Life+ Eggemoore project site. Photo: Franz Hasse.

Future use of peat and substitutes in horticulture

The International Peatland Society held this year's annual convention in cooperation with the German Peatland Society (DGMT) in Bremen from 13 to 15 May (see report in IMCG-Bulletin April 2019). More than 120 participants from 18 countries came to the northern German city to listen to presentations from invited speakers on "Future Use of Peat and Substitutes in Horticulture". The IPS magazine Peatlands International 2019-2 devotes a long report to the meeting, mentions the challenges of the motto of the meeting "Economy meets Environment and Society", but refrains from presenting even a first impulse to finding solutions. Instead of discussing integrative, future-orientated solutions, most invited speakers repeated in a mantra-like fashion their outdated arguments in favour of the use of fossil peat, an example is given below.

IPS defends its substandard performance in replacing peat by climate-neutral alternatives with arguments that would sound ridiculous when other fossil resource proponents would use them…:
IPS: "However, it must be kept in mind that peat … is extracted on only 4,000 km^2 worldwide, about 0.1% of the total peatland area (4 million km^2). This is not much, compared to the area of degraded peatlands, …, and to the share of pristine peatlands (80%)." (Peatlands International 2019-2, p. 8)
Cf. "However, it must be kept in mind that coal … is extracted with only 8 billion tons per year worldwide, about 0.8% of the total coal reserves (1055 billion tons). This is not much, compared to the volume of 450 billion tons of coal already consumed, and to the share of unexploited coal (70%)."

The vast majority of horticultural substrates is still produced from fossil peat. Efforts of the industry to find and apply climate-neutral alternatives are still pathetically insignificant. Photo: Hans Joosten.

Latvia

Records and informative materials available from LIFE REstore International Conference

On June 13-14, 2019 the LIFE REstore International Conference "Sustainable management of degraded peatlands and climate change mitigation" took place at the Academic Centre for Natural Sciences of the University of Latvia. The conference was visited by 159 participants and viewed by 998 persons online, with streeming services provided by the University of Latvia and National News Agency LETA. The goal of the conference was to raise awareness of peatlands' role in climate change mitigation. Themes of the conference included:

- The influence of differently managed peatlands on climate change mitigation; development of national GHG emission factors;

- After-use of peatlands affected by peat extraction; recommendations for their sustainable management;
- Inclusion of assessment of ecosystem services in the planning of future use of degraded peatlands.

Video records, Book of Abstracts, presentations of the conference and restoration manual and films downloadable under: https://restore.daba.gov.lv/public/eng/news/105/

Netherlands

National Congress Land Subsidence 21 November

On 21 November, the Platform 'Slappe Bodem' ("soft soil") will once again organise a full day on tackling subsidence in the Netherlands. The Platform will present its new strategic agenda for the next four years with clear spearheads. The Nationaal Kennisprogramma Bodemdaling will share presentations on wet crops (paludiculture), underwater drainage, innovative land raising techniques, governance and geodata. The conference will take place at a historic location of the Nieuwe Hollandse Waterlinie, on the edge of peat meadows and the Utrechtse Heuvelrug near Utrecht; Fort Voordorp. The full programme will be online after the summer. Until then, you can come up with ideas and suggestions via info@slappebodem.nl . You can also use this e-mail address if you want to promote your company on the knowledge market. You can already register for the conference via this link.

One of the more innocent consequences of peatland subsidence in the Netherlands. On the bench: IMCG treasurer Francis Muller. Photo: Hans Joosten.

More than 500 million people currently live in river deltas around the world. These areas are used intensively and becoming ever-more densely populated, but they are also characterised by their loose ground. This subsoil is gradually subsiding due to depletion of underground water sources, heavy buildings, and surface water drainage, which results in damage to crops, buildings, and infrastructure. Draining peatlands also contributes to global warming, as the drained peat releases greenhouse gases. As the soil subsides, it becomes ever more difficult to keep out the water as sea levels rise. The effects of soil subsidence are clearly visible in the densely populated Dutch river delta. If we wish to continue living in our delta, we will have to come up with a thorough solution to this problem.

5 million for ground-breaking research into soil subsidence in the Netherlands

A broad national consortium led by Utrecht University has received a 5 million euro grant to study soil subsidence in the Netherlands. The continued sinking of the ground level and subsoil has major consequences for society and impact on the economy. A wide range of disciplines, including physical geography, satellite geodesy, biology, soil chemistry, agricultural economics, civil engineering, environmental governance and law have joined forces to make the Netherlands more future-proof. The programme's ultimate goal is to integrate the research into fundamental causes of soil subsidence with other research into policy decisions. This is because soil subsidence has many causes, which together explain the total level of subsidence. The effect of all of these causes can differ from place to place, as does the best approach to use. The main question is how we can reverse our current approach to soil subsidence when the damage becomes too great. In order to answer that question, the causes will have to be broken down to their component parts in a scientifically sound manner. "In order to achieve all of that, we first want to have more accurate data", explains Dr. Esther Stouthamer, physical geographer and the project's founder and leader. "We'll collect the data from a variety of sources, then we'll use several different methods to determine how quickly the soil is subsiding in the Netherlands. By combining soil subsidence measurements by satellites with ground measurements on test fields and 3D maps of the sub-surface strata, we'll be able to analyse the causes of soil subsidence for the entire country using computer models. This is necessary in order to identify the precise causes per location – both natural and human-made – and to find out which combinations currently lead to rapid, long-lasting soil subsidence. Using the same computer models, we'll also be able to predict how the soil will subside in the future, and what it will cost. We can do that for a number of future scenarios, with and without changes in land use and water management. This will form the foundation of a new policy, and will serve as inspiration for new solutions to help society deal with the problem."

The research programme's trans-disciplinary nature demands intensive cooperation between social partners and knowledge institutions. Utrecht University's other academic partners are Delft University of Technology and Wageningen University & Research. Together, they will cover the fundamental knowledge in the fields of satellite geodesy and civil engineering (Delft), spatial cost-benefit analyses and soil physical and biochemical processes (WUR), and physical geography, biology, spatial planning, and legal aspects (Utrecht University). Other partners include the knowledge institutes Deltares Research Institute, TNO Netherlands Geological Service, and Wageningen Environmental Research. They will play a vital role in managing the national data, advising governments, and applying the knowledge of soil subsidence in real life. Ministries, provinces, municipalities, and water boards represent the programme's social partners. Other stakeholders include the business community, such as engineering and consulting bureaus.

- https://www.uu.nl/en/news/5-million-for-ground-breaking-research-into-soil-subsidence-in-the-netherlands

Climate law sails effortlessly through the Senate

On May 28, the Climate Act has passed the Upper House of the Netherlands with flying colours. The Senate has with 62 of the 75 votes adopted the law in which the Dutch climate targets are laid down. Special attention is paid to the role of the peat meadows.

The objective for the peat meadows in the Netherlands is a 1 Mton CO_2-eq reduction in 2030. Governments, farmers and social parties feel this is a joint responsibility that can be achieved at area level through an adaptive approach. The Dutch peat meadow area is a vulnerable and valuable area with the important characteristic that a large part is used for dairy farming. We want to be the first in the world to come up with a climate-oriented approach to peat soils. By developing knowledge through long-term research, the world-class controlled experiment can make the Netherlands a frontrunner and make a substantial contribution to the prevention of climate change, partly by disseminating this knowledge further.

Measures must be geared to the farmers' future prospects, the hydrological possibilities and the type of peat soil. This will also create more room for meadow birds and strengthen biodiversity. This requires a tailor-made rather than a uniform approach. The farmer's business perspective is the starting point, whereby existing economic models can only be thrown overboard when alternative earning models are available.

An impulse will be given to the peat meadow area, looking at where the most urgent problems arise. In some situations it may be a question of supporting farmers with relocation, less intensive management (with compensation for loss of income) or voluntarily giving up farming. In other situations, the emphasis will be more on technical adjustments, such as drainage techniques. Various instruments are needed for this: land development, compulsory land consolidation and voluntary land exchange (in which national land can also be

involved), tax support, land revaluation with financial compensation and suchlike. A financing system in which farmers are paid for the storage of CO_2 is essential and must be developed.
Roll-out of the approach from 2021/2023 for approx. 90,000 ha of peat meadow consisting of: a mix of measures with a substantial contribution of approx. 10,000 ha conversion to agricultural nature (including peatmoss growth), transition to wet cultivation, raising the summer water level in favour of meadow birds and techniques for underwater drainage. The Cabinet will make € 100 million available for the voluntary exit scheme (including the purchase of rights), the Cabinet will enter into discussions with provinces, water boards and municipalities about additional funding for the accompanying policy, and the Cabinet will make a total of € 176 million available until 2030 for the other measures.

- https://www.klimaatakkoord.nl/documenten/publicaties/2018/12/21/ontwerp-klimaatakkoord

Many peatland reserves in the Netherands can only be maintained as elevated blocks amidst subsiding surroundings and with help of artificial water supply. Photo: Hans Joosten.

Towards an optimal combination of soil, water and land use

Turn the Green Heart into a varied landscape, where the type of peat soil determines the water level and the type of land use. This was the central message of the advisors for 'spatial quality' of the provinces of Utrecht, Noord-Holland and Zuid-Holland in their plea for tackling soil subsidence in the Green Heart of the Netherlands. Their plea is the opposite of the current approach in which we adapt the water level to the agricultural function. On 10 July, the advisors handed over the requested advice to the Green Heart Steering Committee.
Commissioner Esther Rommel: "In recent years, the provinces of Utrecht, Zuid-Holland and Noord-Holland have made every effort to put the future of the Veenweiden high on the political agenda. That is why we are pleased with this independent advice, which maps out the possible future prospects for the peat meadow area. This will help us to enter into dialogue with all stakeholders and to make the right choices in the future."
The soil in the Green Heart drops as a result of peat oxidation at low groundwater levels, resulting in the emission of CO_2. Nearly 3,500 farms are active in the Green Heart, 70% in dairy farming, 10% in arable farming. The remaining 20% is nature. In the dairy farming sector, farmers try to cope with rising costs and low milk prices by inlarging their enterprises. Water boards facilitate farmers with water levels between 30-60 cm below ground level. Climate change and increasing drought also play a role in the oxidation of the peat. During dry periods, if policy remains unchanged, soil subsidence will continue more intensively, resulting in damage to homes and infrastructure.

The Green Heart now has predominantly a uniform water management, despite large differences in the subsoil. The provincial advisors Harm Veenenbos (South Holland), Paul Roncken (Utrecht) and Steven Slabbers (North Holland) distinguish seven different types of subsoil (with respect to peat type and clay content). Depending on the focus of the policy (agricultural production, biodiversity or CO_2 reduction), they outline three possible levels of ambition for subsidence (slowing down, stopping or growing). The key lies in water management. A new insight is that large-scale wetting is a too simple approach. The core of the advice is to adapt the water level to the subsoil and to follow the use of the soil to the water level. In short: 'water level follows soil and use follows water level'. In their advice, the provincial advisors argue that tailor-made solutions for each type of peat soil and new business models can produce a varied and natural peat landscape. Social benefits such as CO_2 reduction, water storage, nature development and energy production play a role in new business models. The advisors envisage a 'mosaic' landscape with still traditional dairy farms and green meadows, but also alternative forms of agriculture such as wet crops and various types of nature. In doing so, they distance themselves from the image of the Green Heart as a homogeneous area dominated by agriculture.

- http://stuurgroepgroenehart.nl/ontwerpend-onderzoek/optimale-combinaties-bodem-water-landgebruik/

Part of the 'Green Heart of Holland' is brown because of agri- and horticulture on peat soil. Photo: Hans Joosten.

Russian Federation

Russia prepares ratification of Paris Agreement

Alexey Vasiliyevich Gordeyev, Deputy Prime Minister of Russia, has instructed the Ministry of Natural Resources and Environment and the Ministry of Foreign Affairs of the Russian Federation to submit a draft federal law "On the ratification of the Paris Agreement on Climate" to the Government by September 1. The relevant departments have been instructed to speed up the development and approval of the strategy to reduce greenhouse gas emissions until 2050. Gordeyev stressed that Russia has repeatedly indicated its position on reducing greenhouse gas emissions by 2030 to the level of no more than 75% compared to 1990, including taking into account the absorption capacity of forests. Now it is necessary to actively engage in work to implement the political decision to support the Paris Climate Agreement and to launch the process of its ratification before the World Climate Summit scheduled for September 2019.

- http://government.ru/news/37270/

Beautifull drone imagery from Russian peatlands from Tima Orlov under:

- https://www.youtube.com/watch?v=iQBM_evoymo&list=PL16jNZbwXEYvhRgJPVKD2w3hF3cFDPOzV

Activists block the Moscow Beltway, protesting the construction of unwanted garbage dump

In the town of Likino-Dulyovo, outside Moscow, local residents in June blocked off the Moscow Beltway (Route A108) to stop forest clearing in preparation for a new landfill site. Protests and clashes with the police in Likino-Dulyovo have continued since the spring. Residents oppose the construction of a waste treatment and incineration plant at a local wet peatland forest, which is home to endangered species and feeds several nearby rivers. According to the newspaper *Novaya Gazeta*, local deputies approved the construction project on May 23, though the plan was not approved by Russia's Natural Resources Ministry or Federal Forestry Agency. The construction of new garbage dumps and pollution from existing waste treatment centres has been one of the main drivers of protests outside Moscow and in non-metropolitan areas across Russia.

- https://meduza.io/en/news/2019/06/13/activists-block-the-moscow-beltway-protesting-the-construction-of-another-unwanted-garbage-dump

Slovakia

The book Šeffer, J. & Stanová V. (eds.) 1999. Morava River Floodplain Meadows - Importance, Restoration and Management (cf. IMCG Field Symposium 2010) is now downloadable under

- https://www.researchgate.net/profile/Jan_Seffer/publication/334030960_Morava_River_Floodplain_Meadows_-_Importance_Restoration_and_Management/links/5d133efe458515c11cf8e43d/Morava-River-Floodplain-Meadows-Importance-Restoration-and-Management.pdf

United Kingdom

New edition of CONSERVING BOGS THE MANAGEMENT HANDBOOK now available online

Thanks to the efforts of Tim Thom, Astrid Hanlon, Richard Lindsay, Joanna Richards, Rob Stoneman and Stuart Brooks a fully updated version of the classical "Conserving bogs – The management handbook" is now available online. The original book was prepared under the auspices of the Scottish Raised Bog Conservation Project. Extensive updates and edits in the production of the 2nd Edition have been undertaken by Astrid Hanlon and Tim Thom from the Yorkshire Peat Partnership at Yorkshire Wildlife Trust, and Joanna Richards of the IUCN UK Peatland Programme. Support in producing these edits was gratefully received from experts in the field including Richard Lindsay (University of East London) and from one of the original authors, Rob Stoneman (Yorkshire Wildlife Trust). Thanks must also go to members of the peatland community outwith Yorkshire Peat Partnership, including North Pennines AONB Partnership's Peatland Programme, Moors for the Future Partnership and Micropropagation Services Ltd for sharing their expertise in updating the methods and techniques section. Funding to assist in the completion of these updates was provided by the IUCN UK Peatland Programme.

- https://repository.uel.ac.uk/item/86v7v

New initiative to combine data across studies and sites to better inform peatland policy and practice

Researchers, practitioners and policy-makers from across Europe, whose goal is to understand better how peatlands respond to climate change, land use and restoration took part in a workshop in Newcastle in March. Their aim was to begin the process of standardising the collection of environmental data from multiple studies and sites to better inform policy and practice. Starting with UK peatlands, the group hopes to replicate the process across other peatlands as part of the Global Peatlands Initiative, before exploring the potential to extend the approach to other areas of environmental science.

As post-Brexit agricultural policy moves towards paying for public goods there is growing interest in peatlands as the UK's largest terrestrial carbon store. Disagreements over policies and practices to sustain healthy peatlands have often led to calls for more research. However, much of the existing research cannot be used to guide policy and practice because of variation in the approaches taken to collect data. As a result, research often leads to confusing and conflicting recommendations with no way for decision makers to assess apparently contradictory findings.

To tackle this problem, the workshop began the development of a set of core (essential) variables or "outcomes" that can be measured and reported in standardised ways for UK peatlands. The group was inspired by the medical community who developed this approach and now routinely collects data based on a set of agreed core outcomes. These data are then combined with all studies in a discipline and used to inform policy and practice. Whilst there is growing recognition that sets of essential variables are required in peatland science, the workshop in Newcastle was one of the first occasions that the approach had been applied to the natural sciences. Consensus on core outcomes enables researchers and practitioners to collect their data so that they can be integrated with other datasets. As a result of the workshop, several working groups have been formed to define how outcomes will be grouped into sets (e.g., based on climate change mitigation); and to define the outcomes themselves (e.g., water-table depth).

The workshop was organised and facilitated by Newcastle University and IUCN UK Peatland Programme, funded by the Economic and Social Research Council as part of the NERC Valuing Nature Programme Peatland Tipping Points project, and co-designed with Defra, the Food and Agriculture Organisation of the United Nations and UN Environment.

- https://www.iucn-uk-peatlandprogramme.org/news/new-initiative-combine-data-across-studies-and-sites-better-inform-peatland-policy-and

Rain helps bring Highland wild fires under control

- https://www.bbc.com/news/uk-scotland-48321589
- https://www.bbc.com/news/uk-scotland-highlands-islands-48308196
- https://www.bbc.com/news/uk-scotland-highlands-islands-48372260

Over 125,000 people are calling for Yorkshire Water to ban grouse shooting - here's what the company thinks

Over 125,000 people have signed a petition calling on Yorkshire Water to ban grouse shooting on moorland. Petition organiser Ban Bloodsports on Yorkshire's Moors says wildlife is being eradicated and peatland damaged by burning on the company's land to boost red grouse populations for shooting. Yorkshire Water leases 11 sections of moorland for grouse shooting including Wessenden Head and Digley Moors, near Holmfirth. Campaigners say native wildlife such as stoats, weasels and birds of prey are being killed through traps, snares

and guns to increase red grouse populations for shooting. In March Yorkshire Water announced a review of the future of grouse shooting on Baitings, Turley Holes and Higher House Moors, between Todmorden and Ripponden, following the death of a tenant who leased the sporting rights. Now the utility company is facing increased pressure to broaden its review to including other grouse shooting leases. Luke Steele, spokesman for Ban Bloodsports on Yorkshire's Moors, said: "Wild animals are being eradicated and sensitive peatland damaged on Yorkshire Water's moors to ensure red grouse make it up into the air to be used as feathered targets. With over 125,000 people asking Yorkshire Water to protect - not persecute - wildlife and habitat, it's time for the company to pull the plug on grouse shooting. If Yorkshire Water wants to be recognised as taking its environmental responsibilities seriously then ending its grouse shooting leases is the only course of action which will suffice. Only by removing the negative impact allowing grouse shooting has on wildlife and the environment will Yorkshire Water truly become the environmental champion it espouses to be."

In response to the petition, a Yorkshire Water spokesman referred to a lengthy statement published on the company's website. The statement says: "Our view is that taking a confrontational approach by ending shooting where we have the power to do so would be counter-productive at this current time. The existing agreements that are in place around shooting rights mean that ending shooting in the areas where we own rights would take until 2033. This means that there would initially be very little impact from a decision to ban shooting and taking such a confrontational approach would damage our relationships with a range of stakeholders who we need to work with in other areas." The statement added: "There are 3,530 ha of Yorkshire Water owned land where shooting rights are owned by third parties and where banning shooting is therefore not an option. Our current collaborative approach means we have been able to achieve a great deal for the environment by working in partnership in these areas to improve biodiversity, peatland and water quality. There are also significant areas of land owned by third parties where our current approach has enabled us to build relationships and carry out substantial environmental restoration projects that simply would not have been possible without a constructive relationship between us and the key stakeholders in the area. Our approach also enabled us to make significant progress in bringing people together to initiate the development of the government's blanket bog strategy, which is helping to have a positive environmental impact beyond the Yorkshire region. A decision to ban shooting would put all this progress at risk by damaging relationships with key stakeholders, without having any real impact in the short and medium term in the areas where shooting was banned. Our ultimate aim is to ensure that we deliver the best possible environmental outcomes on our land. At the current time we believe this aim is best served by working together with all stakeholders in partnership. However, we do constantly evaluate the situation to ensure that our approach is continuing to deliver for the environment."

- https://www.examinerlive.co.uk/news/west-yorkshire-news/over-125000-people-calling-yorkshire-16302763

Ugie Peatland Partnership (UPP) to restore 1,500 hectares of peatland in Aberdeenshire

Scottish Water is working as part of The Ugie Peatland Partnership (UPP), a consortium of eight different organisations, to restore 1500 hectares of peatland within the River Ugie catchment area in Aberdeenshire. Deteriorated over time, the carbon-rich peat soil has seen areas suffering from significant levels of degradation due to the combined impacts of drainage, forestry and historic peat extraction. In total around 20 priority sites have been identified for restoration. The drying of the peatlands leads to the release of greenhouse gases into the atmosphere and erosion of the peat soil into watercourses. With more organic matter making its way into the river that provides the area's drinking water supply, Scottish Water's treatment process has to work harder to ensure the water that reaches customers' taps is always of the highest quality. Other impacts include the deterioration of habitat for a wealth of wildlife that call the peatlands home, including wading birds such as golden plover and butterflies such as the Large Heath Butterfly, which Butterfly Conservation has identified as a priority species due to its declining numbers across the UK.

Of the 20 priority sites identified, restoration of the first area, Moss of Kinmundy situated in the River Ugie catchment just over 5km south-west of Peterhead, is the first to be completed. Covering approximately 50 hectares, restoration focused on increasing the amount of water held on the bog to reverse the drying that has taken place. To do this, approximately 700km of ditches were blocked, two hectares of poor- growing plantation were removed and just under 2km of peat hags – eroding banks of peat – were reshaped and vegetated.

The eight organisations within the UPP, Scottish Natural Heritage, RSPB Scotland, Aberdeenshire Council, IUCN Peatland Programme, SEPA, Forestry & Land Scotland, Peatland Action and Scottish Water, are working collaboratively to contribute expert knowledge and advice to progress these vital restorations.

Scottish Water's catchment management technical lead, Jared Stewart, said: "The Ugie catchment has been identified as an important area for peatland restoration by Scottish Water and other stakeholders. The Ugie Peatland Partnership was formed to identify specific restoration projects within the catchment that would positively impact on source drinking water quality and biodiversity. We are committed to working closely with our stakeholders to restore and protect strategically important peatland for the delivery of multiple ecosystem services." The diversity of the partnership's member organisations highlights the diverse interest in the Ugie peatlands and the importance of its restoration to positively impact on climate change, safeguard this important natural habitat and protect drinking water quality.

- https://wwtonline.co.uk/news/project-to-restore-peatland-in-scotland-gets-underway
- https://www.waterbriefing.org/home/biodiversity-and-ecoservices/item/16206-scottish-water-collaborates-in-major-peat-bog-restoration-initiative

Community feedback on Flow Country Unesco status

A public consultation was held on plans to secure Unesco World Heritage status for Europe's biggest blanket bog. The area, called the Flow Country, stretches across Caithness and Sutherland over 200,000 ha. Details on the sessions are available on the project's website. A wide range of organisations are involved in the Peatland Partnership, including Scottish Natural Heritage, University of Highlands and Islands (UHI), Highlands and Islands Enterprise, Highland Council, RSPB Scotland and the Federation of Small Businesses.

Project co-ordinator Joe Perry said: "A Flow Country World Heritage Site would not only be an enormous accolade for the area and the many organisations, land managers, crofters and farmers who have maintained this land for generations, but it could also bring many positive development opportunities and undoubtedly some challenges too. "The purpose of the consultation is to find out what our local communities think about this idea and to see if we can help meet some of their aspirations through developing a World Heritage Site that meets their needs as well as recognising the global importance of this vast peatland."

https://www.bbc.com/news/uk-scotland-highlands-islands-48132908

The Flow Country. Photo: Hans Joosten.

The Flow Country 2019 Peatlands Conference, Eden Court, Inverness, 12th September 2019

The Peatlands Partnership will be holding a major conference on The Flow Country of Caithness and Sutherland on Thursday 12th September 2019. The conference will mark the end of the major National Lottery Heritage Fund supported "Flows to the Future" Project and both take stock of its achievements to date and look forward

to future peatland developments, including the possible inscription of The Flow Country as a World Heritage Site. With speakers including Professor Des Thompson (Principal Adviser on Biodiversity at SNH) and Dr Roxane Andersen (Peatland Scientist at ERI-UHI and Chair of SNH's National Peatland Research & Monitoring Group), the conference will be held in Inverness at Eden Court. Speakers will cover topics such as the economic impact of recent restoration and people engagement work, and the benefits of using art as a means of engaging people with the Flow Country. There will also be field trips on the Wednesday.

- https://www.theflowcountry.org.uk/calendar/the-flow-country-conference/

Drama hit the Flow Country this spring. Following a dry and relatively hot spell in May 2019, a large wildfire affected nearly 6000 ha of peatlands between Strathy and the Uair, part of RSPB Forsinard Flows NNR. The fire started near Strathy on the 12th of May and lasted several days. On Wednesday the 15th of May, a strong wind blew the fire increasingly close to the north end of Dyke and the Uair, part of Forsinard Flows NNR. As well as the many firefighting crews, two helicopters were deployed to drop water bombs at the fire front as it started getting into felled areas of forestry in Dyke. Staff from ERI, RSPB and Big House estate as well as gamekeepers from the neighbouring estates also supported the firefighters in their effort to bring the blaze under control. After nearly a week, most of the fire was contained, but continued to smoulder for many days.

Flow Country set to host Britain's first spaceport

Sutherland site may be integral to the future of Britain's forays into space. But conservationists fear the cost may be too great. Read more under

- https://www.nationalgeographic.co.uk/space201907why-remote-scottish-landscape-set-host-britains-first-spaceport

Tackling climate change: Additional £11 million for peatland restoration.

The Scottish Government has committed significant funding to help repair and restore Scotland's peatland areas, which store around 1600 million tonnes of carbon. In light of the global climate emergency, an extra £11 million has been allocated to fund projects to restore degraded peatlands, following an initial commitment of £3 million earlier this year. Restoration work includes improving areas of wetlands by reducing drainage and slowing water flow on peatland, as well as covering areas of peat exposed to the elements, helping to lock in carbon and reduce potentially harmful CO_2 emissions. Environment Secretary Roseanna Cunningham said: "The impact of peatland degradation on climate change cannot be overstated – particularly in Scotland, where around 25% of the country is covered in peat soil. If all of the CO_2 from that peatland were released then it would be the equivalent of more than 120 years of Scotland's emissions being produced at once. Restoring peatland has an important part to play in delivering the Scottish Government's climate change ambitions. By doing this we're also providing an important habitat for plants and wildlife, improving water quality, and mitigating flood risk."

Welcoming the funding, Scottish Natural Heritage (SNH) Chief Executive Francesca Osowska said: "Peatlands in good health have many benefits for people and nature. "Nature-based solutions - like the work Peatland Action is undertaking to restore and lock-in Scotland's peatland carbon stores – are integral to solving the climate emergency we are all facing. As Scotland aims to move to a low carbon economy and meet its ambitious climate change agenda, it is important that we continue to build on the excellent work already completed."

- https://www.gov.scot/news/tackling-climate-change-7/

Biggest ever year for Moors for the Future Partnership

From September 2018 to March 2019 the Partnership's teams worked tirelessly in all weathers to conduct their vital work restoring the peatlands of the Peak District National Park and South Pennines and conclude their biggest work season to date. In the 2018–19 season, Moors for the Future Partnership:

- spread a total of 17,728 bags of heather brash
- re-vegetated 86.9 hectares
- installed 4015 grips or gully blocks
- cut 96.6 hectares of dominant vegetation
- planted 837.2 hectares of sphagnum moss
- conducted 1092.5 hectares of invasive species control

- https://www.moorsforthefuture.org.uk/the-latest/recent-news/moorlife-2020/the-biggest-conservation-works-season-to-date

YPP turns 10

Yorkshire Peat Partnership turned 10 in July. Over the last decade, we have:

- surveyed 40,281ha of the estimated 70,000ha of peatland in North Yorkshire
- completed restoration works on 27,223ha of blanket bog
- blocked 1844km of eroding grips
- re-profiled and re-vegetatied 1682km of grips and 1497km of gully edges and hags.
- re-vegetatied 108ha of bare peat & micro-erosion.
- restored 58ha of dendritic gullying

Record year for peat restoration in the North Pennines

This has been the busiest year for the North Pennines AONB Partnership since their restoration projects began in 2006. The Partnership is currently leading an £8 million project with Yorkshire Wildlife Trust and Forest of Bowland AONB Partnership, Pennine PeatLIFE. The restoration of 2,250 hectares of North Pennines blanket bog has included:

- 8,000 bags of brash cut, airlifted and spread over the land by hand;
- 1,800 tonnes of stone have been used to construct leaky dams;
- 3,400 sediment traps have been built using 2,000 coir rolls;
- 21km of eroding hags or gullies have been re-profiled;
- 100km of grips or moorland drains blocked to restore the hydrology of the blanket bog; and
- 120,000 plug plants of sphagnum and cotton grass have been planted.

- http://www.northpennines.org.uk/2019/06/04/a-record-year-for-north-pennines-peatland-conservation/

Drone image of work on damaged peatlands. Photo: North Pennines AONB Partnership

New short film describes the Cumbrian BogsLIFE restoration

A 10 minute film now on youtube provides an informative overview of the restoration process at Bolton Fell Moss, Wedholme Flow and Roudsea Wood and Mosses. Its panoramic views of Bolton Fell Moss show the vast scale of the restoration. See https://youtu.be/YTEjlaUT_sA

Cumbria receives a new national nature reserve

Natural England has July 9 announced the declaration of a new National Nature Reserve in Cumbria – Bolton Fell and Walton Mosses National Nature Reserve, home to one of Western Europe's rarest and most threatened habitats, the lowland raised bog. Located near Carlisle, the new reserve encompasses the recently restored Bolton Fell Moss Site of Special Scientific Interest (SSSI) and the pristine condition Walton Fell Moss SSSI.

The restoration of Bolton Fell by Natural England follows 50 years of extensive damage from the removal of peat and peat-forming vegetation for horticulture, which created unsuitable conditions for specialist bog plants and wildlife such as curlews and redshanks to thrive. Now restored, Bolton Fell Moss is recovering and is on track to develop important peat forming vegetation which can be already found at Walton Moss. In time, the site will become an active carbon sink, capturing and storing carbon to reduce the amount of greenhouse gases emitted into the earth's atmosphere. Speaking at Bolton Fell, Tony Juniper, Chair of Natural England says: 'Since the ice age, our active lowland raised bogs have been storing large amounts of carbon and now play a vital role in combatting the impacts of climate change. I am therefore delighted to officially declare Bolton Fell and Walton Moss a National Nature Reserve, set to serve the local community and wildlife for future generations to come.

Cumbria, home to almost half England's lowland raised bogs, has seen over 500 hectares of lowland raised bogs restored under Natural England's Cumbrian BogLIFE+ Project and funding from the Department for Environment, Food and Rural Affairs. In the UK, 95% of lowland raised bogs are classified as threatened habitat due to centuries of drainage, peat-cutting, tree planting and agricultural practises. Six years of extensive restoration of Bolton Fell Moss has led to the establishment of important bog forming plants, with sphagnum mosses, sundew, cranberry, bog rosemary and cotton grass in full bloom. Bolton Fell Moss is also seeing the return of a number of rare British plants and animals such as curlews, redshank and snipe, in addition to black darters, raft spiders, adders, lizards and the nationally significant large heath.

The restoration of the lowland bog and declaration of the site as a National Nature Reserve contributes to the delivery of the government's 25 Year Environment Plan and Natural England's Conservation Strategy for the 21st Century, 'Conservation 21'. Peatland restoration will be at the heart of the government's England Peat Strategy, set to launch later this year. This strategy will set out how Natural England will support the restoration and sustainable management of England's peatlands. The England Peat Strategy will help set the UK on a course towards the new target for net zero greenhouse gas emissions by 2050 and contribute to mitigating climate change.

- https://www.miragenews.com/cumbria-receives-a-new-national-nature-reserve/

North- and Central-America

United States of America

SWS Baltimore 2019

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The Peatlands Section organized a symposium at the last Annual Meeting of the Society of Wetland Scientists, entitled "Coastal Peatlands in a Changing World" (co-chaired by Curtis Richardson and myself). Over the 13 talks of the symposium, we learned about the characteristics of coastal peatlands and other carbon-rich coastal wetlands, the threats they face, and opportunities for their restoration. While many talks addressed peatlands located on the Atlantic coast, our speakers also introduced us to systems from around the Americas (from Cape Horn all to way to New Brunswick and James Bay in Canada, with a stop in Peru along the way), the UK, and to coastal wetlands in China.

We have learned about the Holocene vegetation and fire dynamics of the Great Dismal Swamp in Virginia and North Carolina (USA), as well as the impact of 200 years of drainage on its strength as a carbon sink in talks by Miriam Jones and Judith Drexler. Both perspectives help informing conservation practices aiming at stabilizing the swamp's hydrology and role as a carbon sink. Not too far in North Carolina, Curtis Richardson introduced us to an experiment in large-scale degraded coastal peatlands restoration ("carbon farms") that is showing promises of rapid C accumulation and financial profitability on the carbon credits market. Many factors have to be taken into account to measure the effectiveness of restoration practices, including how to properly measure soil respiration, which can be highly spatially variable according to results presented by Hongjun Wang. Coastal

peatlands restoration has also been addressed by Line Rochefort for sites located in New Brunswick (Canada), where we learned that restoring ecosystems to previous conditions is not always possible, especially in the case of salt water intrusions, but that promising techniques may help in the establishment of salt marsh plant communities.

Peatland degradation can result from various disturbances that go beyond direct human intervention. Brian Benscoter talked about a marsh in Florida where reduced fire frequency and willow encroachment may lead to reduced carbon accumulation. Neal Flanagan also addressed fires, and gave us clues on how fire alters the chemistry of surface organic matter in peatlands, leading to reduced microbial respiration and hence offsetting organic matter losses from combustion. The impact of climate change on natural peatlands biogeochemistry was addressed in Genevieve Noyce's talk on the Salt Marsh Accretion Response to Temperature eXperiment in Maryland, where results show a shift in biomass allocation between roots and shoots with higher temperatures and CO2 levels. Julien Arsenault gave hints on the biogeochemical functions of the poorly studied open-water pools found in coastal peatlands of Patagonia (Chile), James Bay (Canada), Maritime Quebec (Canada) and the UK, and the potential impacts of climate change on these functions.

Finally, we also had talks on coastal systems that may not be peatlands, but that have a high carbon density. According to Christopher Craft, tidal freshwater forests and marshes of southeastern Georgia (USA) have a carbon-rich substrate with high accretion rates, making them an important carbon reservoir regionally. Some carbon- and biodiversity-rich coastal wetlands such as the Los Pantanos de Villa site in Peru face conservation issues as reported by Héctor Aponte. The rates of carbon and nutrients in the Yellow river delta coastal wetlands were addressed by Ding Xigui, while Hongming Yuan linked heavy metal in coastal wetlands with ecological risk in coastal wetlands located north of Shanghai.

Peatland conservation relevant papers May - July 2019

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

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