INTERNATIONAL MIRE CONSERVATION GROUP

# NEWSLETTER

**issue 2009/2, August 2009**

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

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

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

## Editorial

A full IMCG Newsletter again! The Georgia/Armenia Field Symposium and Conference are ahead of us and will show us the mires of one of the biodiversity hotspots of the world. An area that was until recently largely overlooked by global peatland research and conservation that is characterized by a special mire type, unique for this region: the percolation bog. In this newsletter an extensive contribution on the type locality of this mire type, Ispani 2, a wonder of wilderness that until now survived in a heavily populated part of Georgia. Currently privatisation of the surrounding land and the construction of a major highway to connect Turkey with Georgia, Armenia and Azerbaijan are threatening the mire. The paper sketches the perspectives of conserving the area by using these developments for establishing a hopeful bufferzone. Ispani 2 will be visited the day before our Conference in Kobuleti (Georgia) to enable members that will only participate in the Conference to visit and see this special mire with their own eyes.

It might still be possible to participate in the full Georgia/Armenia Field Symposium and Conference. For details: see the IMCG website: www.imcg.net. For participation: rapidly contact Izolda Matchutadze and Hans Joosten.

Attention in this newsletter also for the recent developments around the Watervalvlei in South Africa that we visited during our 2004 Field Symposium, and for some badly known peatland regions in Russia.

The last half year of 2009 stands in the light of the preparation of the 2009 Climate Convention in Copenhagen in December, where a post-Kyoto framework for mitigating climate change have to be decided on. An intensive programme of meetings is scheduled to prepare “Copenhagen”. In this Newsletter the latest news on how peatlands are dealt with in Bonn III (August 2009). Drained peatlands are responsible for almost 10% of all anthropogenic greenhouse gas emissions, but the global community has not yet succeeded to include peatland rewetting/restoration effectively in the climate deals. The discussions will continue in Bangkok at the end of September / beginning of October.

We will report on that, and on everything you send us, in the next Newsletter scheduled for mid-October. So please send your contributions (news, reports, books, congress announcements etc.) before October 17. Furthermore keep an eye on that continuously refreshed and refreshing IMCG web-site: www.imcg.net. And don’t forget to take a frequent look at the website of our scientific journal Mires and Peat (www.mires-an-peat.net) with its new and interesting papers. And as always: for information, address changes, contributions and questions, contact us at the IMCG Secretariat.

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## A note from the Chair

This newsletter contains lots of information on upcoming events relating to climate change as well as the IMCG field symposium in Georgia and Armenia. Many of our members are involved in aspects of peatlands and climate change in their own countries and there are several major international meetings prior to the UN meeting in Copenhagen in December. These include the 2nd International Symposium on Peatlands in the Global Carbon Cycle (www.peatnet.siu.edu/CC09MainPage.html, the Bonn, Bangkok, Barcelona Climate talks of the United Nations Framework Convention on Climate Change (UNFCCC) and finally the UNFCCC Conference of Parties in Copennhagen where decisions will have to be taken on post-2012 climate policies and measures under the Convention.

It is extremely important that the role of peatlands in the global carbon cycle is acknowledged – it is our best chance to have these important ecosystems recognised for their ecosystem services and role as a carbon sink and store. Only then will there be global recognition of the value of pristine and functional peatlands – in the same way that old-growth forests and rainforests are currently valued.

Previous IMCG newsletters have detailed the case for including peatlands in the global carbon cycle – read them and be informed. Similarly, the newsletters have detailed why peat cannot be considered a renewable biofuel. The long-term fate of global peatlands will depend in large part on the outcomes of the international climate change meetings held this year. I encourage you to contribute where possible.

On a lighter note, on behalf of the IMCG, I take the opportunity to congratulate Dr Izolda Matchutadze for successfully completing her PhD. Izolda and her team are dealing with all the necessary arrangements for the Georgian component of the IMCG field symposium.

Jennie Whinam

**REGISTER**

**Please fill out the IMCG membership registration form.**

**Surf to http://www.imcg.net or contact the secretariat.**

# A future for Ispani 2 (Kolkheti, Georgia) and adjacent lands

*by Matthias Krebs, Andreas Kaffke, Pim de Klerk, Izolda Machutadze, Hans Joosten*

***Introduction***

The Kolkheti Lowlands constitute a region of global importance for biodiversity conservation, especially with respect to its mires and relict forests. It is the only warm-temperate region in the World where *Sphagnum* dominated rain-fed peatlands occur. This has led to the distinction of a special "Kolkheti Peatland Region" within Eurasia (Botch & Masing 1983, Succow & Joosten 2001), which is the smallest peatland region in the world.

The Kolkheti Lowlands has obtained this position because of the occurrence of a unique mire type: the *percolation bog* with special characteristics with respect to vegetation, micro-relief, hydrology, and peat stratigraphy. Until now, only two well-developed specimen of this type have been identified worldwide: the Ispani 2 bog near Kobuleti and the Imnati bog east of Lake Paleostomi. Ispani 2 was the first discovered percolation bog and has been intensively studied by the Department of Peatland Studies and Palaeoecology (Institute of Botany and Landscape Ecology, Greifswald University, Germany) and associated Georgian scientists (cf. Kaffke 2008, De Klerk et al. 2009). It may be considered as the "type locality" of this mire type worldwide.

Since its designation as Wetland of International Importance (Ramsar Site N°894 "Ispani II Marshes") in 1996 Ispani 2 is one of the two Ramsar sites of Georgia. Since 1999 the bog is protected in the Kobuleti Nature and Managed Reserve (KNR/KMR).

In the last years the condition of the reserve has substantially improved. The marginal zones that until some years ago were severely damaged by cow grazing have regained a full *Sphagnum* cover and invasive species are being suppressed. Also the rest of the mire is in good condition and shows even better the full characteristics of a percolation bog than when we 'discovered' it in 1999. These improvements are clearly attributable to the internal management of the last years, especially the exclusion of cow grazing. Also the tourist guiding provisions made in the framework of the ICZM project are a real benefit to the reserve.

Regretfully, the improvement of internal management has not been accompanied by a similar improvement in the external management. Directly outside the reserve some developments are being planned that may have a damaging impact on the bog: the privatisation and the intensification of land use in the agricultural area north and northeast of the bog, and the construction of a highway to the east of the reserve. Until recently the failing of adequate external management has not been so urgent because of economic collapse and consequent decreased environmental stress. But a country that is actively striving for economic recovery should have adequate instruments in place to safeguard its natural and cultural heritage. Only the establishment of a buffer zone with appropriate location and size to minimise possible damaging effects to the Ispani 2 bog from the outside can ensure its conservation on the long term (cf. Joosten 1997).

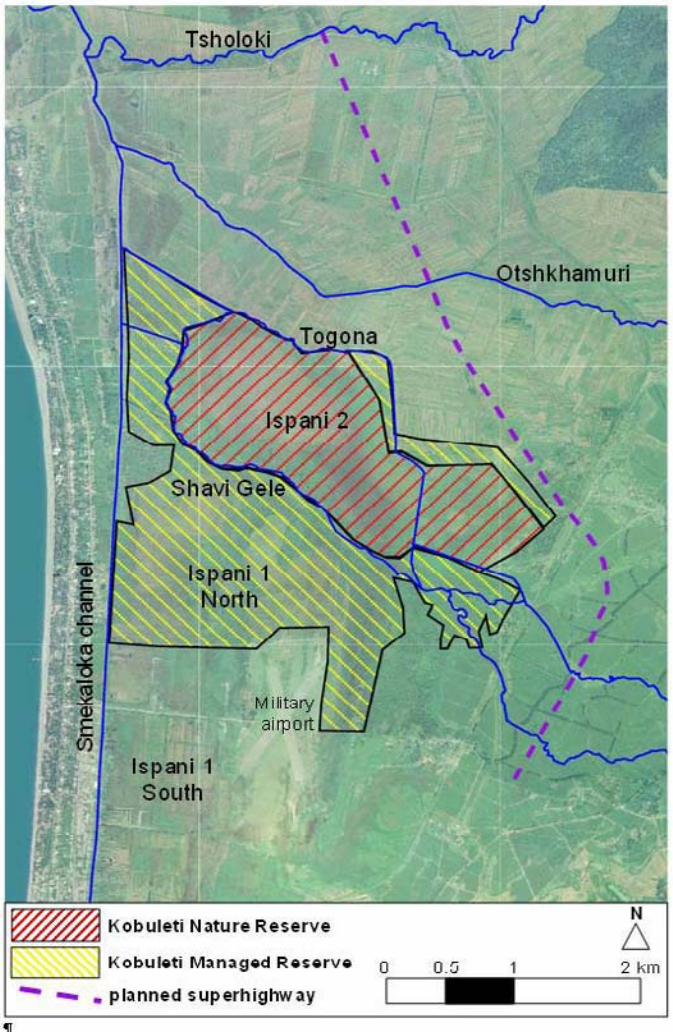


*Figure 1: The Ispani 2 bog, its location in the Kobuleti Nature and Managed Reserve and the adjacent cultural land, the main rivers and channels.*

This paper discusses the necessity and opportunities of establishing an ecologically effective buffer zone and combining its installation with strengthening eco-tourism in the region.

***Characteristics of bogs***

Water is the key component of mires and bogs (Ingram 1992) because only permanently high water levels enable peat accumulation. Bogs receive water and nutrients solely by atmospheric input (precipitation) (Proctor 1995) whereas their margins may additionally be fed by water from the mineral surroundings (Ingram 1995). Next to shallow water tables, little water level fluctuations are characteristic for the hydrology of bogs (Ingram 1992). As a bog is functioning as a hydraulic entity, disturbing the

hydrology of one part of the bog will have an effect everywhere else in the system (Ingram 1992).
A very close relationship exists between the hydrology, the peat and the vegetation of a bog (fig. 2) so that a change in one of the components will have an influence on the others. A change in vegetation by a higher nutrient supply, for example, will lead to other plant species accumulating another type of peat. This peat may – because of different mineralisation characteristics of the plant material – have a different porosity, a different permeability and a different storage coefficient, which again affects the hydrology (Succow & Joosten 2001).

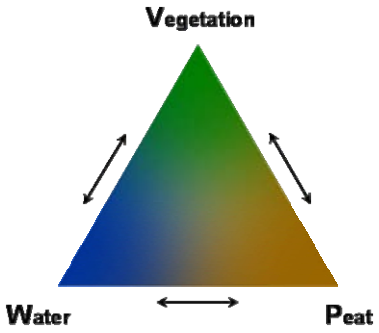


*Figure 2: Relationships between water, peat and vegetation in mires.*

Because a bog is only fed by precipitation, the nutrient concentrations of the bog water are generally very low. Bogs are acid and nutrient poor ecosystems, with nitrogen (N) or phosphorus (P) being the limiting nutrients for plant growth (Ingram 1992, Aerts et al. 2001, Bragazza et al. 2004, Malmer & Wallen 2005). The plant species in bogs are strongly adapted to these nutrient poor conditions and very sensitive to any increase in nutrient supply (Limpens et al. 2003).

***The special character of Ispani 2***

The Ispani 2 bog (N 41°51.9' E 41°47.9', 1.5–6.5 m asl.) is located near the town of Kobuleti (Autonomous Republic of Adjara) in the south-western part of the Kolkheti Lowlands on 1–3 km distance from the Black Sea coast (fig. 1). The bog (approx. 250 ha) consists of a 160 ha large open part, surrounded by a margin of alder (*Alnus barbata)* shrubland.
The Ispani 2 bog is an extraordinary bog (fig. 1 & 3). It shares many characteristics with 'normal' raised bogs, including its dome shape, its ombrotrophic (solely rain-fed) water and nutrient supply, and its acid and nutrient poor site conditions (Kaffke 2008, De Klerk et al. 2009). In contrast to all other bogs, however, Ispani 2 does not show surficial water flow and – as a consequence - no explicit microtope patterning (Couwenberg & Joosten 2005). Percolation bogs have no acrotelm with horizontal water flow like other raised bogs, but a predominantly vertical water flow through the entire peat body. Ispani 2 is the type locality of percolation bogs (Kaffke et al. 2000), i.e. it was the first mire in the world identified as a 'percolation bog' (Couwenberg & Joosten 1999, 2005, Kaffke et al. 2000, Haberl et al. 2006). Only two well-developed bogs of this type are known to exist worldwide, both in the Kolkheti Lowlands. The Ispani 1 bog south of Ispani 2 has probably been a third, but is currently strongly damaged. The Grigoleti mire might be a percolation bog in statu nascendi
The Ispani 2 bog has been subject to modest human impact only. It holds the last remnant of the original vegetation of the Kolkheti bogs before intensive land reclamation started in the first decades of the 20th century. Dominating plant species are *Sphagnum papillosum, S. austinii*, and *S. palustre* (fig. 3) (Joosten et al. 2003, Kaffke 2008). The vegetation further comprises amazingly few species, including *Molinia litoralis, Rhynchospora alba, R. caucasica, Rhododendron ponticum, R. luteum, Vaccinium arctostaphyllos*, and *Drosera rotundifolia*. This monotony makes the Ispani 2 bog to a paradigm example of low internal (α-) diversity that contributes substantially to global ecosystem (β- and γ-) biodiversity (Joosten et al. 2003).
Furthermore the Ispani 2 bog harbours - next to Tertiary relict species like *Rhododendron ponticum* – (sub)mediterranean, temperate, and boreal relict species (cf. Denk et al. 2001). A considerable part of its plant species is included in the Red Data Book of Georgia. The regular occurrence of *Sphagnum austinii* in Ispani 2 is remarkable because the species is since decades nearly absent from North- and Northwest- European bogs (Green 1968, Overbeck 1975) and also does not occur in other Kolkheti bogs (beside few individuals in the Imnati bog, own observations).
The Kolkheti bogs with up to 12 m peat (Dokturowski 1931, 1936) belong to the thickest *Sphagnum* mires of the World (cf. Nejštadt et al. 1965). With up to 4 mm $yr^{-1}$ the Ispani 2 bog has an extraordinarily high peat accumulation rate (Kaffke et al. 2000, De Klerk et al. 2009).
All this illustrates the global significance of the Ispani 2 bog and the urgent need of its effective conservation.

***Human impact on the Ispani 2 bog***

Bogs are very sensitive to changes in water and nutrient supply. Recent research has shown that Ispani 2 had been substantially damaged in the 20$^{th}$ century by land use intensification in the surroundings of the bog (Kaffke 2008, De Klerk et al. 2009).
The synchronous presence of man and mires over many millennia, and the fact that archaeological settlements have been found adjoining large mire complexes (e.g. under the Ispani 1 bog) point at a possibly intense interaction of human cultures with the development of the Kolkheti mires (Joosten et al. 2003). Ispani 2 suffered its first large-scaled anthropogenic changes in the late 19$^{th}$ century by deforestation of its surroundings (Komakhidze 1996, Joosten et al. 2003). The wood, especially boxwood (*Buxus colchica*) and oak timber (*Quercus* spec.), was even exported to Germany, Great Britain and Belgium (Komakhidze 1996). This destructive land use is reflected in the name of the River Togona, which is bordering the Ispani 2 bog in the north. In Kobuletian dialect togona means "tree stump".

*Figure 3: Natural, nearly undisturbed vegetation in the Ispani 2 bog: a good example of the original Kolkheti bog vegetation.*

*Hydrology*

Huge impacts began with socialist agricultural development in Kolkheti since the 1920s (fig. 4). Wetlands were massively deforested, drained and converted to plantations of citrus, tea, and tung tree (Berg 1952, Kobulina 1974, Joosten et al. 2003).

The cutting down of forest in the close surroundings of Ispani 2 had a negative impact on the bog's hydrology, because it increased evapotranspiration from the bog (Edom & Wendel 1998). The forest had elevated the humidity of the air, lowered the regional temperature by evapotranspiration cooling, reduced the movement of airmasses and decreased wind velocity over the bog, and screened off radiation from the margins of the bog. The impact of forest removal on the hydrology of the bog can not be quantified, but the drier conditions probably promoted other damaging effects including fire and cow grazing.

The area north of Ispani 2 was in the 1920s for a short period used as a rice plantation, whereas the areas northeast of Ispani 2 were used for cultivating corn. North of the Otshkhamuri River vegetables like tomato were produced, partly in greenhouses.

In the middle of the 20$^{th}$ century the huge 'Kolchida' project started with reclaiming the Kolkheti Lowlands for agriculture (K. Kontselidze, Adjarian Department of Drainage, pers. comm.). In 1951 the first channels were excavated including the major South to North collector channel 'Smekaloka' west between Ispani 2 and the settlement of Kobuleti. The areas north of the Otshkhamuri River were drained in the 1960s. In the Ispani 1 bog (south of Ispani 2, fig. 1) a channel system was established at the end of the 1950s to enable peat extraction (Menagarišvili 1949) which in 1962 took place over an area of 37 ha (Report 2006 of the Adjarian Department of Geology and Mining).

Figure 4 shows that the meliorations and the intensive use of the areas surrounding Ispani 2 activities have resulted in an increased aeolian input of mineral materials into the bog. The lower boundary of the ash enriched top layer was dated to 1925–1929 AD, i.e. simultaneously with the start of the melioration works in the Kolkheti Lowlands (Berg 1952, Kobulina 1974) that made the vast opened-up agricultural lands to a source of dust input. The decrease in organic matter (fig. 4) and increase in the ash content in the peat (fig. 7) will have negatively affected the oscillation capacity of the mire, i.e. the major hydrologic self-regulation device of a percolation bog (cf. Haberl et al. 2006).

The establishment of the channel system draining into the Togona River (directly north of the Ispani 2 bog, fig. 1) also had a major direct impact on the Ispani 2 bog, in particular the excavation in 1956 of the channel through the eastern part of the Ispani 2 bog (fig. 1). The ineffective channels were deepened and broadened in 1974 (K. Kontselidze, Adjarian Department of Drainage, pers. comm.). The part east of the channel was totally destroyed by these and later meliorations and reclaimed for Bur Marigold (*Bidens tripartita*) cultivation (fig. 5).

Although a dam was erected to reduce direct drainage of the mire, the part west of the channel is up to the present day negatively affected by the channel. Up to a distance of several hundred meters from the channel (fig. 6) – i.e. over almost one quarter of the bog – conditions are too dry. This is not only apparent in the hydrology, but also in the vegetation and peat characteristics. The drier conditions lead to a higher incidence of fires. The affected area differs from the less disturbed parts by other and higher densities of vascular plant species, a lower peat moss cover, and the virtual absence of the rare and endangered peatmoss species *Sphagnum austinii*. The abundance of species indicating fire in the southeastern part of the Ispani 2 (fig. 6) shows that changes in the hydrological regime not only have local effects (Ingram 1992) but may affect huge parts of the mire and even the entire ecosystem (cf. Poelman & Joosten 1992).

It illustrates that changes in the hydrology of the surroundings of a bog (incl. melioration for agricultural purposes) may have a negative effect on the entire bog.

Despite these impacts the hydrology of the bog is still in a rather good condition (Kaffke 2008).

*Nutrient input*

The agricultural use of the surrounding areas had a major impact on the nutrient conditions of the Ispani 2 bog. The increase in ash content is accompanied by higher nitrogen (N) contents (fig. 7) and lower C/N values in the peat (fig. 4 and 7), indicating that the agricultural use of the surrounding areas also led to an increased nutrient supply to the sensitive Ispani 2 bog. The additional input of nitrogen and phosphorous from the adjacent fields lead, amongst others, to a substantial decrease of the rare and special *Sphagnum austinii* (a species almost extinct in Europe, Van Geel & Middeldorp 1988, Lee et al. 1993) and its replacement by more common *Sphagnum* species. The macrofossil diagram (fig. 4) shows how in the bog centre 4 m of *Sphagnum austinii* peat has accumulated over the last 1000 years, but that the top layer of the peat is dominated

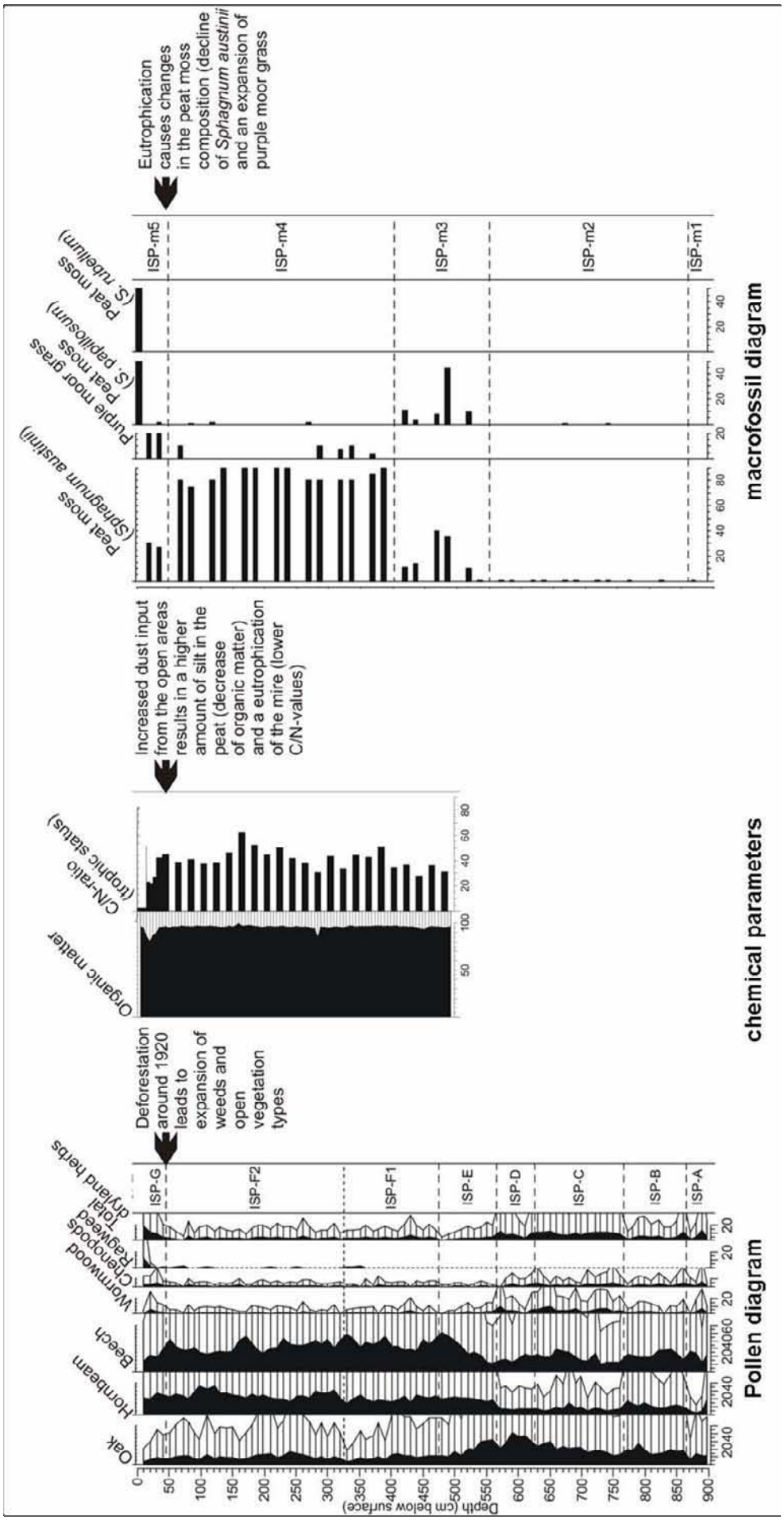


*Figure 4: Pollen diagram of selected species compared with chemical parameters of the peat section and macrofossil diagram, with special attention to the time after 1920 (changed after De Klerk et al. 2009).*

*Figure 5: View of the destroyed eastern part of Ispani 2 with the invasive Miscanthus sinensis and without any peatmoss.*

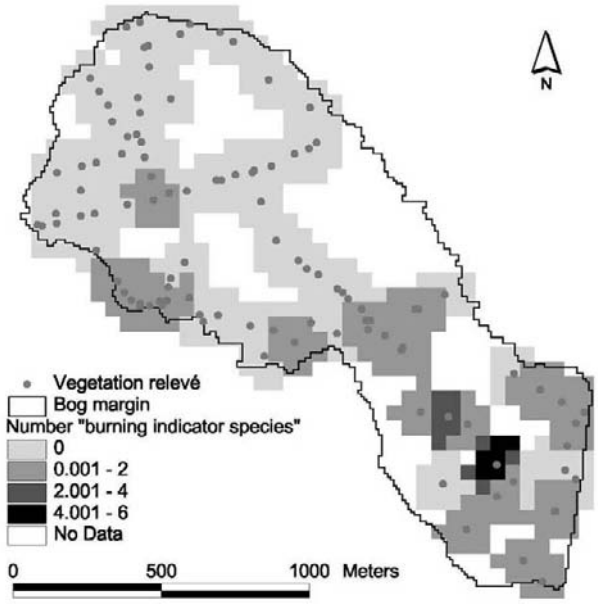


*Figure 6: Distribution (50 x 50 m grid) of „burning indicator species" in Ispani 2. Species were counted within a 100 m radius around each grid cell. White grid cells lack relevés within the 100 m radius (Kaffke 2008).*

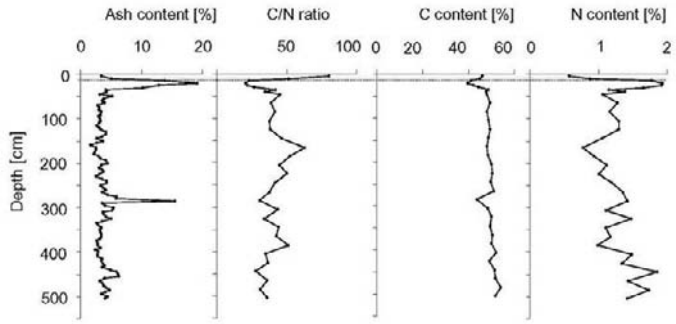


*Figure 7: C/N ratio, ash-, C-, and N- content of a peat profile from the centre of Ispani 2 bog. The dotted line indicates the soil surface. The uppermost two samples originate from living vegetation (Kaffke 2008).*

by *Sphagnum papillosum* (De Klerk et al. 2009). Furthermore the diagram shows increasing remains of purple moor-grass (*Molinia litoralis*) in the upper 50 cm. Purple moor-grass is promoted by higher nutrient availability (Limpens et al. 2003, Tomassen et al. 2004). Its higher densities again cause higher susceptibility to fires in the Ispani 2 bog (fig. 6, see chapter fire) and increased evapotranspiration (Schouwenaars 1990, Dierssen 1992).

Since the 1990s the situation has become better again as a result of decreased agricultural activities and improved management. Both a superhighway along the northeastern part and resumed agricultural land use north of the Ispani 2 bog after privatisation will, however, again deteriorate the nutrient conditions in the bog by the increased input of nitrogen from vehicle exhaust fumes and land fertilization.

*Fire*

One of the most important threats to the Ispani 2 bog is fire. It could destroy the last remnants of original vegetation and stimulates the expansion of untypical (non-Colchidean) bog species (Kaffke 2008).

Fires are caused by accidental/deliberate burning by hunters in spring and by spreading of fire from neighbouring fields where litter is burned after harvest. It destroys the dense peatmoss cover and harms the other natural vegetation (fig. 8). Less competition by the affected peatmosses and higher nutrient availability after fire promote the expansion of purple moor-grass (*Molinia litoralis*). Its higher coverage produces more inflammable litter and increases the water losses from the bog by higher transpiration (Dierssen 1992); a positive feedback resulting in higher susceptibility to fire. Furthermore, its increased biomass outcompetes the peatmosses by shadowing. As a result the main peat builder *Sphagnum* is affected, which will change the new accumulating peat and again affects the hydrology (cf. fig. 2).

Fires are frequent in the eastern part of Ispani 2 (where drier conditions prevail due to the adjacent channel) and furthermore everywhere in the bog where additional man-made nutrient supply has lead to higher densities of purple moor-grass (fig. 6).

The peatmoss species *Sphagnum austinii* is not only harmed by higher nutrient supply but is also sensitive to frequent fires (Daniels & Eddy 1985, Kaffke 2008). It consequently has nearly disappeared from the fire affected parts of the bog (cf. Kaffke 2008).

*Wood cutting*

Our research has shown that the stands of alder (*Alnus barbata*) at the margins of the Ispani 2 bog have been frequently cut since the 1980s (Kaffke 2008, De Klerk et al. 2009) (fig. 9). The removal of this forest 'filter' will have promoted the input of nutrients and the spreading of fire from neighbouring fields.

*Grazing*

A main threat to the mire also has been cattle grazing at the bog's edges (Krebs & Resagk 2002, Kaffke 2008). Especially in dry summers cows entered deeply into the bog. The most important effect of grazing is the trampling, which leads to peat compaction, increased surface water run-off, larger water level fluctuations, and consequently to a disturbance of peat accumulation. The strong influence of grazing on microtopography becomes apparent when comparing an intensively grazed with a non-grazed area (fig. 10). In intensively grazed areas the vegetation may be destroyed completely and "muddy ground areas" appear. This leads on the sloping margin to superficial run-off after heavy rains. In non-grazed areas surface run-off was never observed, even not after heavy rains (Kaffke 2008).

*Recent situation*

In the last years we have observed a substantial improvement in the condition of the Ispani 2 bog. This is attributable to the less intensive land use in the surroundings after the collapse of the Soviet Union and to the good management of the Kobuleti Nature and Managed Reserve. After cattle grazing was excluded in 2006, the margins of the bog have recovered spectacularly and luxurious *Sphagnum* growth is driving back the dominance of *Juncus effusus* and the invasive *Polygonum thunbergii* (Joosten 2007). The Protected Areas management has also stopped alder cutting at the margins and the bushes are becoming trees again. After re-growth of the marginal forest its filter function will help lowering the input of harmful nutrients. The lower incidence of fires is probably attributable to the fact that hunting is recently strictly prohibited in the Nature Reserve. Also the destroyed eastern part of the Ispani 2 bog has recently been included in the Kobuleti Nature and Managed Reserve (R. Moistrapishvili, Director of the KNR/KMR, pers. comm.). This opens the possibility of its restoration.

The Ispani 2 bog has thus benefited from the collapse of the Soviet Union and the consequent lowered intensity of agricultural land use. It is crucial to guarantee that the transition to market economy and the re-organisation of agricultural land use, including a privatisation of areas north and northeast of the Ispani 2 bog, will not again lead to unacceptable changes to the ecological functioning of the bog. A renewed intensified use of the lands directly bordering and hydrologically connected to Ispani 2 may bring again large threats to the unique mire, by impacts on its hydrology (the lands cannot be hydrologically regulated without affecting the mire) and by increased used of fertilizers and pesticides/insecticides. The current suspension of the privatisation plan offers a good opportunity to develop integrated land use options that will benefit all stakeholders and interests groups, including government, local population, tourists, and nature conservationists.

*Figure 8: Fire damage on the peatmosses and other plant species in the Ispani 2 bog.*

*Figure 9: Cutting of alder (Alnus barbata) at the margin of the Ispani 2 bog*

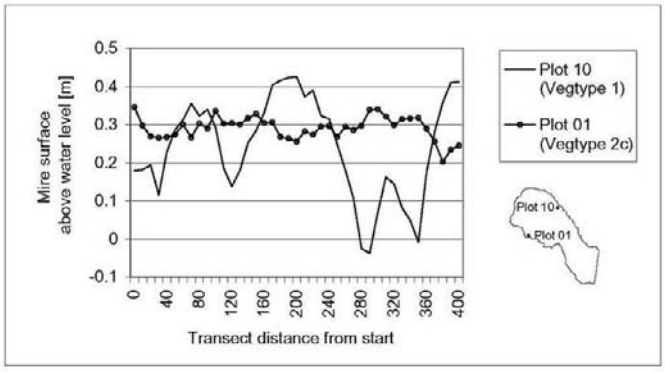


*Figure 10: Microtopography of an intensively grazed (Plot 10) and a non-grazed (Plot 01) transect in the bog margin zone (distance in cm) (Kaffke 2008).*

***Buffer zones***

The former damage to the Ispani 2 bog has proven that the area as such is too small for being effectively protected against impacts from the surrounding areas, which leads to conflicts between neighbouring types of land use. A society that takes nature conservation serious has to aim for a strict separation of incompatible interests (Van Walsum & Joosten 1994). This implies that it is necessary to install and effectively manage protective buffer zones between the Ispani 2 bog conservation area and the agricultural land. The buffer zones must fulfil different requirements (e.g. protecting against water losses and nutrient input) and must thus include adequate form, size and legal regulations to guarantee their effective functioning (BUWAL 1992, Turner et al. 2003, Van Walsum & Joosten 1994).

Such buffer zones must take care of (fig. 11):

1. Supply of all things the reserve *has to receive* from the outside world.
2. Disposal of all things the reserve *has to get rid off* to the outside world
3. Resistance against all things that the reserve *may not receive* from the outside world
4. Retention of all things the reserve *may not get rid off* to the outside world (Van Wirdum 1979, Van Leeuwen 1981).

Supply and disposal relate to the functions that the reserve *minimally requires*, whereas resistance and retention relate to what the system can *maximally cope with*.

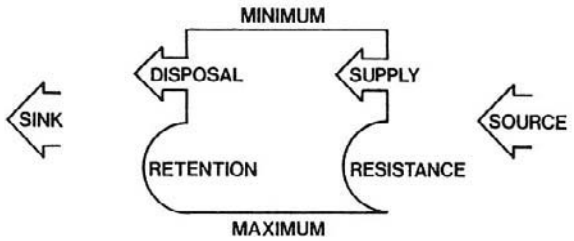


*Figure 11: The basic four relationships of a system with its environment (modified from Van Wirdum 1979)*

The following urgently needed buffer zones can be identified:

a) A genetic exchange zone to facilitate exchange of genetic information;
b) A hydrological buffer zone to minimize hydrological impact from the outside;
c) An immission buffer zone to reduce the input of fertilizers, harmful substance and noise.

The spatial extent of such buffer zones is shown in fig. 12.

*a) The genetic exchange zone (BUWAL 1992)*

This zone must facilitate the genetic exchange between populations of rare plant and animal species in order to maintain sufficient genetic diversity in the populations.

For Ispani 2 especially Ispani 1, south of Ispani 2, is important in this respect. The Ispani 1 bog is in its northern part still largely intact, shows similar habitats as Ispani 2 and is thus very important for ensuring genetic exchange with Ispani 2. It is already included in the Kobuleti Nature and Managed Reserve and can be managed accordingly.

The habitats north, northwest and east of Ispani 2 are strongly altered by forest cutting and agricultural use. Recently, the areas are fallow or are transformed into secondary meadow habitats with many invasive plant species. The re-establishment of Kolkheti forest on these lands would strengthen the forest plant and tree species in the currently too narrow tree and shrub zone surrounding Ispani 2.

*b) The hydrological buffer zone (Edom & Wendel 1998, Joosten 1994)*

Bog reserves need a hydrological buffer zone to shield the reserve from the negative effects of draining surrounding (agricultural) lands. Several studies have identified the extent of the surrounding area in which hydrological interventions may interfere with the water level in the reserve (Poelman & Joosten 1992). Depending on the local hydrogeological conditions and the approach followed, buffer zones widths have been proposed of 5-30 m wide (Turner et al. 2003), 30-80m wide for deep bogs, 120-150m wide for shallow bogs on a subsoil with fine sand (Eggelsmann 1980, Van der Molen 1981), 30-350m wide depending on subsoil and site (BUWAL 1992), and 2 km wide, like the hydrological buffer zone installed around the Groote Peel National Park peatland (The Netherlands). In the latter no further drainage and sprinkling from groundwater is allowed (Vermeer & Joosten 1992). Also an expansion of groundwater pumping for drinking-water-supply on a distance of 6 km of the reserve has been forbidden because of expected negative hydrological consequences for the bog reserve (Joosten 1994).

As the hydrology of the Ispani 2 bog has clearly been harmed in the past by changing the hydrology of the adjacent lands, it is relevant to recognize the importance of the Togona and Otshkhamuri Rivers for the hydrology of the Ispani 2 bog.

The type of land use between Ispani 2 and Otshkhamuri River determines the water management of river Togona, which directly borders the peatland. It is therefore crucial that the use of this area and therewith the hydrological management of River Togona is controlled and remain in public hands, preferably in that of the Protected Areas management. Only then lands and river can be managed according to the requirements of the Ispani 2 bog. In this area any kind of drainage should be forbidden.

To ensure the overall control of the hydrological regime of the Togona (and thus the peatland) it is desirable to have also control over the Otshkhamuri River and the channels north of the river draining into it. It is at this moment unclear to what extent the areas north of Otshkhamuri River determine the water regime and which drainage depths can still be

allowed. This should be subject of further research, but until this question is satisfactorily cleared a policy of prudence should be followed. Furthermore, it is important to have control on the water quality and quantity of the Shavi Gele brooklet directly south of Ispani 2.
The forest that in former times surrounded the bog had an important function in preventing atmospheric water losses from the bog. The bog would certainly benefit hydrologically from restoring the forest north of the bog which would result in raising air humidity, and lowering wind velocity, temperature and incident radiation (Edom & Wendel 1998).

*c) The immission buffer zone*
An immission buffer zone is very important for bogs because these ecosystems are very sensitive to any kind of nutrient input, pollution and visual and acoustic disturbance.
*Nutrients* can be transported by air or water. Main sources are agriculture, industry and traffic.
The vegetation of Ispani 2 (and with that its entire character) has in the past suffered from nutrient input from the adjacent agricultural lands that were fertilized for the production of corn, rice and vegetables. For that reason professional agriculture with high nutrient application cannot be situated close to the peatland and should as a minimum be restricted to areas north of the Otshkhamuri River. This is important to prevent the atmospheric input of nutrients but also their transport by the rivers and channels to the bog.
Eutrophication and acidification of mires are also caused by atmospheric deposition of ammonia and ammonium sulphate from cattle and other domestic animals kept in high concentrations. Therefore intensive livestock breeding should be forbidden in the direct surroundings of the bog.
Since 1989, the already mentioned Groote Peel National Park peatland (The Netherlands) has a 600 m wide 'immission resistance zone' to reduce the harmful effects of atmospheric ammonium input. In this zone the establishment of new farms with intensive cattle husbandry and the expansion of existing farms are forbidden. In the same zone, conversion of grasslands into arable fields is no longer allowed without prior consent in order to maintain suitable forage areas for breeding, hibernating and transmigrating birds (Joosten 1994).
Fertilizing nitrogen oxides ($NO_x$) are also produced by traffic and industry. It is therefore important to plan motorways and industry as far as possible from the bog reserve. This also applies to the planned superhighway northeast of Ispani 2. In case of already existing constructions, legal regulations and mitigation measures must minimise their negative impact.
Also *pesticides* are transported by wind or water. The impacts of pesticides to the bog are difficult to assess. As pesticides are developed to kill, banish or block the development of certain plant or animal species and groups a negative impact of incoming pesticides on bog species is obvious. A buffer zone between the agricultural land and the reserve, in which the use of pesticides is forbidden, can minimize the input of pesticides into the bog.
Such buffer zone will also shield off fire sparks transported by wind from adjacent fields and thus decrease the incidence of fire in the reserve.

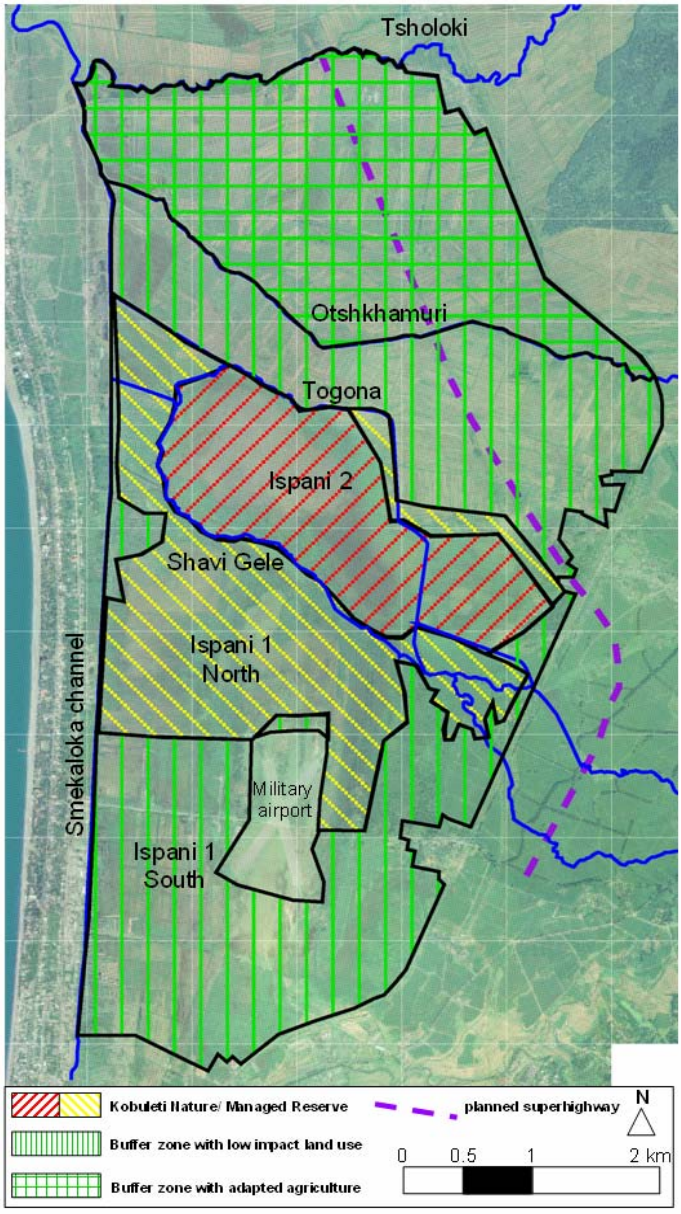


*Figure 12: Location of the proposed buffer zones around Ispani 2 and the Kobuleti Nature and Managed Reserve.*

The Ispani 2 bog as a Ramsar site is important for nesting and migrating birds that can (similar to visiting tourists!) easily be disturbed by *noise and visual disturbance*. These may especially be generated by the superhighway planned northeast of Ispani 2. Although its effect cannot yet be quantified, it is important to take these possible disturbances into consideration when planning the location and design of the motorway. Adequate buffer zones can to some extent shield off these disturbances. In case of Ispani 2 this can again be brought about by reforestation of the area between the road and the bog

*Figure 13: Archaeological open-air museum Gross Raden in North Germany, reconstructing an ancient settlement from the 9th- 10th century (http://www.gross-raden.de/, 26.06.2009).*

***Location, design and management of buffer zones around Ispani 2***

Buffer zones are essential to protect and maintain the Ispani 2 bog. But this does not imply that all use of these areas is prohibited and that they have to be transferred into unused wilderness areas. Land use should, however, be limited to forms that do not negatively affect the bog.

The location of the lands adjacent to the globally important Ispani 2 Nature Reserve and the easy access from the nationally important tourist centre Kobuleti open opportunities for synergies that few other sites in Adjara have. The development of the necessary buffer zone as a multi-functional use area will bring benefits to the local communities that may widely exceed their use as 'standard' agricultural lands and will substantially strengthen the attractiveness of the region for tourists, especially ecotourists.

The following low-impact land use can be envisaged in the buffer zone:

*Ecotourism*

- (Re-)establishment of Kolkheti wet forest on the most sensitive areas. This will enable tourists to visit and enjoy the two main characteristic Kolkheti landscape types – forest and mire – in one easily accessible location;
- Reconstruction of a prehistoric Kolkheti settlement with wooden houses and boardwalks in the newly growing forest with people really living there during the tourists season to show how ancient cultures in former times lived and worked with the forest and peatland (using reconstructed ancient tools for farming, gardening etc.). The reconstruction could be based on the archaeological investigations of the settlements Pichvnari and Ispani 1 (fig, 13).
- Creation of special products of the region e.g. cheese from water buffalos.

*Reforestation*

- Establishment of native fast growing tree species like alder in part of the area to satisfy the demand for fuel and timber of local stakeholders.
- Re-establishment of the former Kolkheti forest to support this globally unique forest ecosystem in combination with the recreation for tourists (see Ecotourism).
- Carbon sequestration and sales of carbon credits on the Kyoto Protocol compliance market (Clean Development Mechanism) and the Voluntary Carbon Market. There is a large interest in afforestation and reforestation projects for climate mitigation. Reforestation of the buffer zone areas areas (certainly with the substantial ecological and social benefits involved) would make a very attractive carbon project that could yield several thousands of euros (gross) per ha.

The reforestation areas would allow a promising combination of immission buffer zone, hydrological buffer zone and economic income in a synergetic way.

*Grazing*

- To do justice to the demand for cattle grazing land for the livelihood of local communities it is necessary to provide improved grazing land. Grazing is largely compatible with the requirements of the buffer zone, as there is no need for fertilizers or pesticides and periodic flooding is not so problematic as for other agricultural land use. Large areas north of and directly adjacent to Ispani 2 are regularly flooded (fig. 14), a situation that will only become more serious with climate change. Because of their height very close to sea level and the enormous and rapid water discharge from the mountains, only very expensive and energy-intensive water management will be able to fulfil the hydrologic demands of modern intensive agriculture. Such management would, however, severely impact the hydrology of Ispani 2.
- The maintenance of grazing lands would also protect the resting areas for migrating wader birds north of Ispani 2 (cf. table 1: List of observed birds).

*Sphagnum farming*

- Currently the perspectives of this new kind of agriculture that combines ecological and economic needs are investigated in the areas bordering the Ispani 2 bog. Sphagnum peatmoss is in high demand in Europe for special cultures (e.g. orchids, bromelias, carnivorous plants…) and is currently unsustainably collected in Chile and New Zealand. Because of its ideal climate, Kolkheti is extraordinarily suitable for the sustainable cultivation of Sphagnum, with large market

benefits. Produced in large quantities and adequately prepared, it is ideal to supply greenhouses with the necessary substrates.

*Table 1: List of observed bird species in the Ispani 2 bog and its surroundings (observations: Andreas Kaffke, Christian Gönner and Matthias Krebs, 2000-2008).*

| | |
|---|---|
| *Accipiter gentilis* | *Gallinago gallinago* |
| *Accipiter nisus* | *Gallinago media* |
| *Alauda arvensis* | *Grus grus* |
| *Alcedo atthis* | *Haliaetus albicilla* |
| *Anas platyrhynchos* | *Hieraaetus pennatus* |
| *Anas querquedula* | *Himantopus himantopus* |
| *Aquila pomarina* | *Ixobrychus minutus* |
| *Ardea cinerea* | *Lanius collurio* |
| *Ardea purpurea* | *Lanius excubitor* |
| *Ardeola ralloides* | *Luscinia svecica* |
| *Asio flammeus* | *Merops apiaster* |
| *Bubulcus ibis* | *Milvus migrans* |
| *Buteo vulpinus* | *Motacilla citreola* |
| *Caprimulgus europaeus* | *Motacilla feldegg* |
| *Carduelis chloris* | *Motacilla flava* |
| *Chlidonias leucopterus* | *Netta rufina* |
| *Chlidonia niger* | *Numenius arquata* |
| *Circus aeruginosus* | *Nycticorax nycticorax* |
| *Circus cyaneus* | *Oenanthe oenanthe* |
| *Circus macrourus* | *Pernis apivorus* |
| *Circus pygargus* | *Philomachus pugnax* |
| *Coracias garrulus* | *Plegadis falcinellus* |
| *Corvus corone* | *Porphyrio porphyrio* |
| *Coturnix coturnix* | *Porzana porzana* |
| *Crex crex* | *Rallus aquaticus* |
| *Cuculus canorus* | *Saxicola rubetra* |
| *Cygnus olor* | *Saxicola torquata* |
| *Egretta alba* | *Streptopelia turtur* |
| *Egretta garzetta* | *Tachibaptus ruficollis* |
| *Erithacus rubecola* | *Tadorna ferruginea* |
| *Falco subbuteo* | *Tringa glareola* |
| *Falco tinnuculus* | *Tringa ochropus* |
| *Falco vespertinus* | *Tringa totanus* |
| *Fulica atra* | |

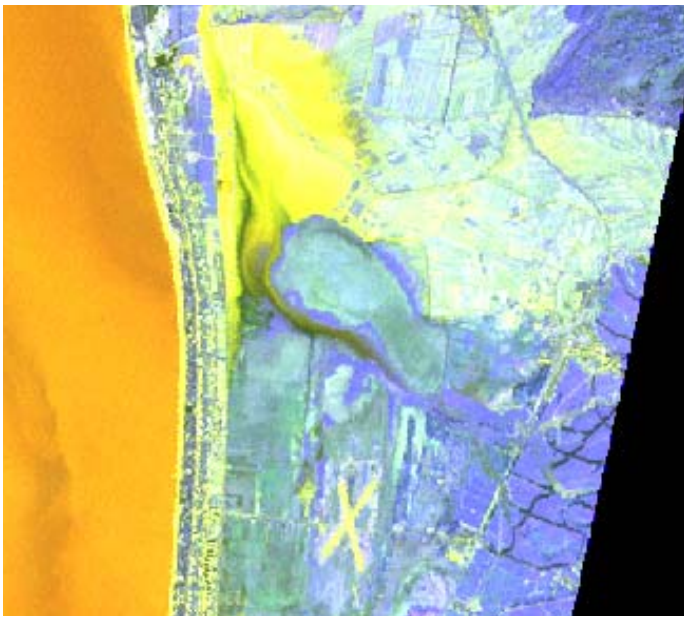

*Figure 14: Satellite image of the Ispani 2 bog and its surroundings, showing the frequently flooded areas in yellow colour.*

***Conclusions***

The peatland Ispani 2 is globally unique as the type locality of the 'percolation bog' and one of the only two percolation bogs known in the world. Furthermore, the bog is special because of its abundance of rare and relict species and the rapid rate of peat accumulation.

Recent scientific studies have revealed that during the 20th century the bog has substantially suffered from deforestation, reclamation, and exploitation of the surrounding lands. The established agricultural lands have negatively impacted the hydrology of the bog and have furthermore let to the input of dust and nutrients, hydrological damage, eutrophication, and a change in vegetation cover. From a nature conservation point particularly the decrease of the rare and sensitive *Sphagnum austinii* has to be mentioned.

Since 1990, the lowered intensity and abandonment of the surrounding agricultural land and a substantial improvement of the management in the framework of the Kobuleti Nature and Managed Reserve has enabled the bog to recover from the damage.

The further economic development of Georgia, Adjara and the region around Kobuleti should take the globally important natural and cultural heritage of Ispani 2 into account. Both the history of the mire itself as well as experiences from bog reserves worldwide show that the establishment of a buffer zone with appropriate location and size is necessary to minimise damaging effects from the outside and to ensure the conservation of the Ispani 2 bog on the long term.

The instalment of such buffer zone should not be seen as a restriction to economic activities, but as a challenge to developing new land use concepts. The prospects of combining nature conservation (buffer zone, nature development), sustainable land use (incl. afforestation, Carbon trade, *Sphagnum* farming, and grazing) and (eco)tourism (forest restoration, open air museum) in a multi-functional buffer zone around Ispani 2 are very promising and also economically attractive. Such integrated land use planning and management will diminish the inevitable conflicts between incompatible types of land use and will bring benefits to all stakeholders in a synergistic way. Parallel to similar projects in Western Europe, it would be elegant to establish such bufferzone as a compensation measure for the construction of the highway east of Ispani 2. The pilot character of such project will create a very positive image that will radiate far beyond the boundaries of Adjara and Georgia.

We hope that jointly with the Adjaran government we can further develop and implement these ideas.

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*Route of the IMCG field trip through Georgia and Armenia, details here: www.imcg.net/09/imcg09dp.pdf*

## The Ingula Mire: peatland drowned at the Eskom Ingula Pumped Storage Scheme.

*by Piet-Louis Grundling & Jonathan Price*

The Ingula Mire in the Bedford-Chatsworth wetland (previously known as the Braamhoek or Waterval Vlei Mire) is acknowledged worldwide as a wetland of high importance. About 11 ha of this 329 ha peatland is being flooded by a dam (Fig. 1) that is part of a pump-storage scheme being built by South African parastatal Eskom, the country's largest electricity supplier.

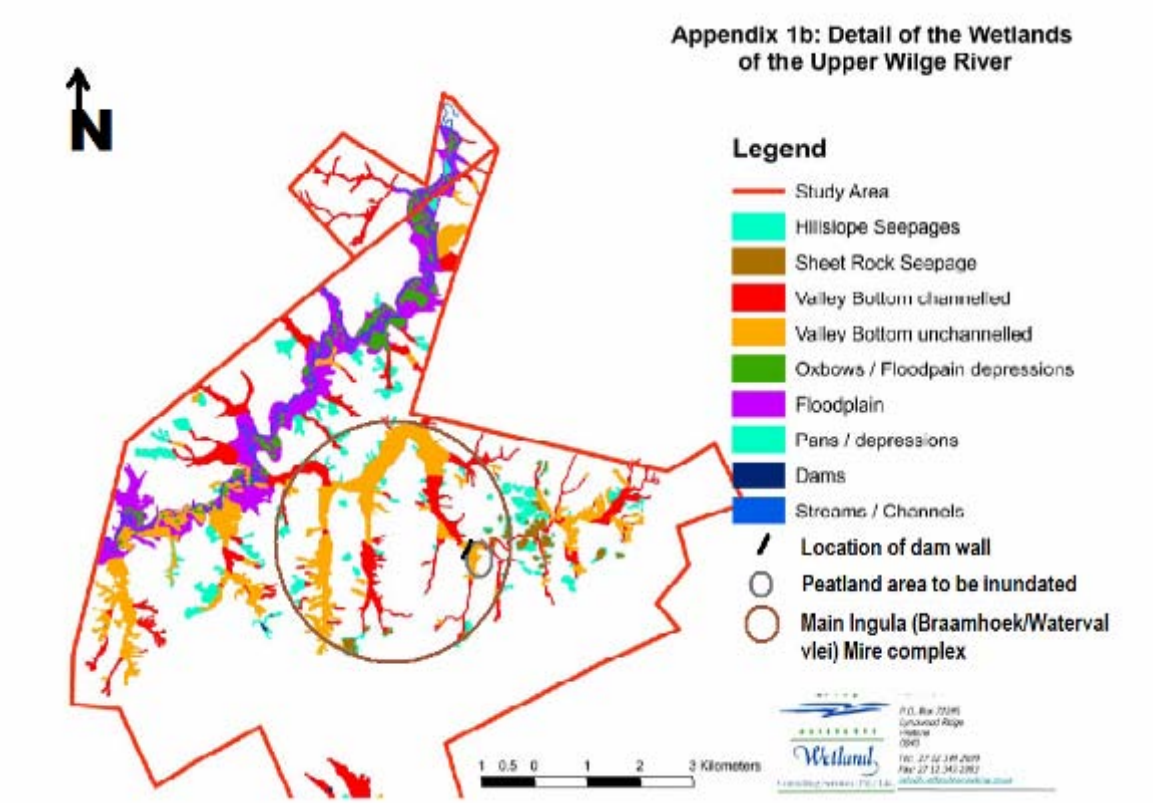


*Figure 1: The location of the Ingula Mire within the Upper Wilge River catchment (from WCS, 2006)*

The need for the Ingula Pumped Storage Scheme (IPSS) arose from increasing demand for electricity in South Africa, and particularly the need to increase peak electricity generating capacity. Pumped storage technology is internationally recognised as one of the best means of providing electricity during periods of high demand. Using primarily coal-produced electricity, the scheme will pump water from a dam below the Great Escarpment of South Africa to a storage dam above the escarpment during periods of low electricity demand, so that hydro-electric power can be generated by return flow when demand is high.

The IPSS is situated approximately 25 km northeast of Van Reenen, straddling the Great Escarpment on the border between the Free State and KwaZulu-Natal provinces (Fig 2). The wetland was visited by the IMCG during the 2004 Symposium held in South Africa.

The IPSS raised enormous concerns and controversy in the environmental community, including wetland scientists, with representation having been made to the relevant government ministers at the time. Although the wetland was never under conservation, it is remote and was used minimally, mainly for grazing and traditional small-scale reed harvesting. It is therefore in near-pristine condition and of high importance for biodiversity and water supply. It is also of some anthropological importance.

In terms of the relevant Record of Decision granting approval for this project, Eskom acquired more than 9000 ha of land around the mire and has set this aside for conservation purposes. The para-statal is required, in terms of the Record of Decision, to implement the necessary measures to rehabilitate the land. Such measures include relocation of former labour tenants on the farms to mutually agreed locations, removal of cattle from the farms, and implementation of the necessary rehabilitation measures to limit ongoing soil erosion.

The IPSS land is considered to have significant conservation value as it contains various wetlands, the mire, and is home to several species that are critically endangered, near endangered, or at risk. In addition to harbouring several red list species, at least five species are considered to be endemic to the region. The creation of the conservation area will provide the opportunity to increase the current extent of 'conserved grasslands'. It is important to manage correctly and conserve the IPSS land as well as ensure that the IPSS design, construction and operation takes cognisance of the sensitivities of the

surrounding environment. The Ingula Advisory Conservation Committee (IACC) was established to monitor progress with respect to the implementation of the environmental management plan (EMP) and conservation targets.

The IMCG, with various conservation partners from part of the IACC, over the past two years has focused Eskom's attention on the secondary impacts of the IPSS infrastructure development on smaller wetlands. Of greatest concern is the poor knowledge base of the extent, distribution and hydrology of the peat in the system. Eskom's proposed enviromental management plans and mitigation could thus be flawed. Eskom recently (April 2009) admitted that not enough is known about the peatland. This represents a breakthrough in terms of future cooperation with IPSS environmemtal managers, but it remains to be seen if Eskom's engineers will be convinced to investigate the peatland in more detail.

*Present status*

Eskom is at present constructing the upper storage dam in the Bedford-Chatsworth wetland (Fig 2 – 5). Downstream of the waterfall, this wetland is 239 ha in extent (Mentis, 2005) and about 11 ha will be inundated by the dam. A hydrological study for the project recommended that 80% of the normal surface flow above the dam should be released to the wetland downstream based on the concerns of Department of Environmental Affairs and Tourism (Stephenson, 2004). However, this study only incorporated surface flow from upstream in its calculation and modelling, and did not consider groundwater input into the system. The report states that "seepage from the hillsides ... was unaccounted for" (page 7) and that "more accurate gauging …. should be considered for improving flow estimates" (page 21). The current dewatering problems as a result of groundwater influx at the Bedford Dam construction site demonstrate the importance of understanding the groundwater dynamics and its relationship with the wetland.

Another crucial component in the hydrology study (Stephenson, 2004) and the subsequent study on the "Management objective for regulated rivers" (Mentis 2005) is that the occurrence of peat in the Bedford-Chatsworth wetland, documented by Grundling (2001) and Partridge (2002), was not considered. Wetland Consulting Services (2006) indicated that "about 44% of the main wetland system downstream of the waterfall in the Wilge wetland system is constituted of peat" (page 24 ). However, this report did not indicate the type and distribution of peat, its hydrological properties nor its influence on the flow regime. Partridge (2002) indicated that only 10 cores were taken to investigate peat distribution for both the upstream (94 ha) and downstream (239 ha) parts of the system. This is about one hole per 30 ha and is not considered sufficient in determining the proper extent and distribution of the peat, or its hydrological characteristics.

*Figure 2: The upper portion of the Ingula Mire before construction of the dam: View - Southeast to Northwest. Photo: Peter Nelson.*

*Figure 3: The site during construction – will Eskom be able to maintain the desired fluxes to the remainder of the peatland? : View – Northwest to Southeast.*

*Figure4: Secondary impacts on other wetlands such as from roads to the construction sites. This road is effectively draining the upstream part of a seasonal wetland.*

*Figure 5: Failed attempts to rehabilitate. Note the sheet erosion still occurring in the foreground and rubble behind the gabion structure. This structure has recently collapsed, resulting in more erosion of this wetland.*

These omissions are significant as most peatlands in South Africa are sustained primarily by groundwater inputs. The recommendation that 80% of the surface flow should be released from the dam to keep the wetland functioning, without due consideration of the peat or groundwater flow in the system is therefore poorly founded. The role of groundwater fluxes should be considered in the management of this system.

We have highlighted this shortcoming (and others, such as secondary impacts on smaller wetlands along access routes) during IACC meetings with Eskom, and believe we could contribute to a positive outcome in the long-term management of this once pristine mire system. The legacy that will be left behind once the construction is completed and power generation has started will be a testimony of the IMCG's ability to influence the environmental ethics and practices of corporate business. We might have lost the battle in 2002 to keep Eskom out of this wetland; hopefully we can maintain the peace in securing proper conservation management of the remainder of the system.

*Beyond the Ingula Pump Storage Scheme*

Approximately 10% of South Africa's wetlands are peatlands. Many of these are located in the headwaters of tributaries feeding important rivers and dams. The role these systems play in supplying water to downstream ecosystems and estuaries affect fisheries, agriculture, domestic water supply, and tourism. International treaties such as Ramsar and NEPAD (The New Partnership for Africa's Development) acknowledge the importance of wetlands. The positive economic impact of peatlands in this regard is difficult to quantify but is likely to be substantial. However, it seems that wetlands are at the mercy of developers, miners and related departments on a national level in South Africa (which is a founder member of both Ramsar and NEPAD). It seems that it is especially development related to energy needs and commodities (e.g. coal and minerals) earning foreign currency which is receiving unconditional support from government to go ahead with exploration and exploitation in environmentally sensitive areas (see previous IMCG newsletters). These include amongst others the headwaters of wetlands and peatlands such as Chrissiesmeer, Wakkerstroom or Lakenvlei or are located in or nearby World Heritages (Mapungubwe National Park) and Ramsar sites (Verlorenvlei and Verloren Vallei). Unrelenting expansion of timber plantation in the catchments of Ramsar wetlands at Kosi Bay and Lake Sibaya remains problematic.

It is clear that climate change and population dynamics will have a negative impact on South African peatlands. The continued degradation of these ecosystems will have a profound impact on the local economy and human well-being. There is a good reason for protecting these resources in a country already facing water shortages. Yet it seems that government has embarked on a path of exploiting resources for gain today with total disregard for generations to come.

We need to ask ourselves as members of the IMCG how we want to position ourselves in dealing with these challenges in our countries. Will we always loose battles such as the one at Ingula or will we be able to operate pro-active and influence government and commerce to protect and conserve resources we depend on? There must be similar stories to these from across the world. It would be interesting to hear what the status in other countries is and how IMCG members have been dealing with it.

*Acknowledgements*

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## 'Lost' peatlands between the steppe and the arctic

*by Tatiana Minayeva & Andrey Sirin*

In July 2009, we undertook two short peatland field trips to the forest steppe part of the southern Ural mountains (Bashkiria – Republic of Bashkirtostan) and delta of Petchora River in European Russian Arctic (Nenets Autonomous Okrug). These geographically separated and very different regions share a common character: they display beautiful, rare and unique peatlands that are poorly known and understood both by local experts as well as by common people.

*Bashkiria*

This was our second visit to Bashkiriyan peatlands after an invitation last year from Prof. Boris Mirkin (Institute of Biology, Bashkirian Scientific Center, Ural Branch of the Russian Academy of Sciences in Ufa) and his team (Vassily Martynenko, Ludmila Abramova, Elvira Baysheva and Albert Muldashev).

In August 2008, we focused on highland peatlands in the Southern Ural mountains visiting a typical peatland for the taiga mountain belt, the Tuluk Mire located in the saddle of two of the highest ridges in the Southern Ural mountains – Yagodny Ridge with famous Mt. Yeremel and Avalyak Ridge. The mire serves as a source of the Tuluk River, is some 2000 ha in size, and has peat depths that surpass our 6 m long corer.

Tuluk Mire is an elongated mire with a typical vegetation zonation. Coming from the outside, it starts off with *Alnetea glutinosae*, goes through paludified spruce (*Rubo chamaemoro Piceetum*) and birch forest at the edge, followed by a treed slope with *Vaccinio uliginosi-Pinetum* and raised bog in the central part on the top. The mire is divided by several streams into three parts. The largest of these has a pronounced hummock-hollow complex, the others are mainly forested and only partly covered by hummock-hollow sites.

Remarkably for a mire at only 920 m a.s.l. and longitude 54°, *Rhynchospora alba* was replaced by *Trichophorum caespitosum* in the hollows, and a lot of cloudberry (*Rubus chamaemorus*) was present on the hummocks. Considered a rare species in Bashkiria, *Scheuchzeria palustris* was common in the hollows, in some places replaced by *Triglochin palustris*. The mire seemingly serves as a refuge for boreal flora.

On the way to Tuluk Mire, near to the top of Mt. Yeremel we found two interesting mire types hitherto unrecognized by local experts. At ~1290 m a.s.l. there were percolating sloping mires with shallow peat up to 1 m and a rich flora dominated by *Ligularia sibirica* and *Salix glauca*. On the mountain pass (1350 m a.s.l.) we found a tundra like shallow peat mire with green mosses and dwarf forms of ericaceous shrubs, willows and *Betula humilis* and with a very species rich herb layer. The 40 cm deep peat was underlain by gravel.

We were excited with our fiend, but our bashkirian friends remained unimpressed. It is common that large, evident peatlands are considered and small non-typical mires are overseen.

In July 2009, we visited the forest-steppe part of Bashkiria with its typical karst processes and salty bedrock. We found beautiful roundish, perfectly zoned and 5-10 m deep mires in the karst holes. The view is spectacular when there are hundreds of them in close vicinity to each other. One such group in the open and overgrazed area near the village of Ulkundy (55º38'33"N 57º59 11 E) has more than 200 karst holes in different stages of paludification. Most lack trees with willows growing only on some of them. One can spend a life time studying this area. The second such area we found near the village of Novo Troitskoye (55º45'55"N and 56º12'02"E), where mires are mostly treed.

*Paludified karst hole*

Furthermore, we found floating mats surrounding lakes. While floating mats may constitute a common type of mire, they present great value to species maintenance and conservation, especially taking into account the densely settled and transformed landscapes of tha bashkirian forest-steppe.

The third type of mire encompasses valley mires with elements of spring fens. Here the varying influence of the salty bedrock makes for interesting patterns. Depending on peat depth and the distribution of salty deposits salty mire features are more or less pronounced. We surveyed three such mires.

The first one is located in the foothills of the Yamantau ridge near the village of Bashkirskoye Elchibaevo (55º01'52"N, 58º27'32"E) is drained by the Sikiyaz River. The sedge-sphagnum swamp of around 600 ha has open, shrubby and forested parts, and peat depth varies between 3 and 5 m. Several springs provide rich waters, and peat pore waters have EC values around 500 mS, which is high for *Sphagnum* mires. The mire hosts a rich flora with many orchid and moss species. In the other two mires – located near the villages of Arkaulovo (55º25'05"N, 57º55'50"E) and Sabaevo (55º23'49"N 56º00'55"E) –

the salty bedrock has a strong influence. There are salty lakes, salty vegetation patches with typical species like *Cladium mariscus*, and *Sphagnum* mosses survive at an EC of 2300-2800 mS.
The salty peatlands of Bashkiria still await thorough scientific study. The local experts consider these peatlands mainly as habitats for rare species. We hope understanding of their ecosystem value will come in the nearest future.

*Nenetsky Okrug*
Nenets Okrug represents the European Russian Arctic. If you look at the lower reaches and delta of the Petchora River, you can easily find the Bolshezemelskaya and Malozemelskaya tundra – another example of 'lost' peatlands. This case differs from Bashkiriya in that here peatlands are everywhere, but nobody realizes it. This can be illustrated by following two episodes. Our local Nenets guide, who followed us during the long walking tour not limited by the 24 hour polar day, became very interested in the practical and theoretical background of peatlands – despite of millions of mosquitoes buzzing through the windless air. His conclusion: peatlands are everywhere here in the tundra.


*Old road and mosquitoes*

The second story tells of Dr. Nadezhda Matveeva – well known Arctic botanist from Komarov Botanical Institute in St.Petersburg and an acquaintance of Tatiana. As often happens, you meet somebody you know in some remote area somewhere far away. So we met Nadezhda in the middle of a flat palsa mire that spread dozens and dozens of kilometers in all directions. Devoted all her life to inventory of Arctic flora and vegetation she never realized this was peatland and had always referred to such sites as mere tundra. That this is typical can be deduced from looking at the CAFF vegetation maps.

In Bolshezemelskaya Tundra, 90 km East of Naryan-Mar city – the capital of the okrug – we found flat palsa mires, occupying entire watersheads following the relief, except for the valleys and some sandy hills. Permafrost commenced at 30-50 cm which made it hard to measure total peat depth.
In the Petchora Delta we visited plenty of islands, each a number of some sedge fens. Usually these open sedge fens are surrounded by willow shrubs. Water was found standing above the surface with pH 6 to 6.5 and EC from 120 up to 150 mS. In their central parts some mires had some ridges with sphagnum and dwarf shrubs and a lower pH of 5.2-5.6 and EC of 35 to 50 mS.
Finally, we visited the northern part of the Malozemelskaya tundra at the coast of the Korovinskoye Bay. The seawater is not brackish, because of the outflow of the Petchora River. This was slightly disappointing to our colleague from Petrozavodsk, Dr. Ludmila Sergienko, who specializes in saltmarshes.
The tundra was very satisfying to us, however, with its diversity of mires ranging from paludified lands with shallow peat to sedge and willow fens to flat palsas and hummock ridge mires. Some flat palsas near the coast have a well-developed polygon structure of 20×20 m plateaus divided by cracks of up to 1.5-2 m depth.
Our main objective here was to investigate the impacts from oil and gas exploitation. We visited plots and roads that were built in the early 1980s and then used once again to remove installations some ten years later. The structures are still clearly identifiable and some look as if they were constructed yesterday. Regeneration of the peat sites is different but generally very slow. At places the oligotrophic vegetation with *Sphagnum* and dwarf shrubs developed into wet sedge patches; and sedge fens into willow stands. In some cases the roads led to erosion.
In the flat palsa area round patches of stones were found, indicative of melted ice mounds.
All these changes likely are caused by the effects of a changing climate enhanced by human interference (and vice versa). Many sites suffer from overgrazing by reindeer which multiplies the impacts from oil and gas exploitation. Further, detailed analysis is definitely needed.
This was the story of peatlands lost, simply because no one realizes they exist – in the forest-steppe regions because they are special and rare, in the Arctic because they are typical and everywhere. Yet in both cases peatland values are underappreciated and ‘lost’ to common people as well as scientists.

Tatiana Minayeva (Wetlands International Russia Programme) &
Andrey Sirin (Institute of Forest Science of the Russian Academy of Sciences.)

## The long and winding peatland road to Copenhagen, stage Bonn III

*by Hans Joosten*

Peatlands should be an easy issue in the climate discussion. When drained (for agriculture, forestry, peat extraction…) they emit huge quantities of carbon dioxide ($CO_2$) and nitrous oxide ($N_2O$). Worldwide nearly 10% of all anthropogenic emissions stem from drained peatland. Rewetting stops these emissions. Many drained peatlands are marginal agricultural land; large areas are abandoned and can easily be rewetted. "Low hanging fruit" thus for climate change mitigation, as UNEP director Achim Steiner expressed it a year ago.

Indeed environmental groups (incl. IMCG) and relevant countries are vigorously trying in the last couple of years to get peatland rewetting recognized as an official instrument under the Climate Convention. One would think that this opportunity would be enthusiastically embraced. But the construction of the Convention and its important instrument the Kyoto Protocol make things complicated and progress slow. A report from the discussions in and around the Ad Hoc Working Group on Land Use Land Use Change and Forestry (AWG-KP LULUCF) at the 2009 Bonn III climate meetings (10-14 August 2009).

*Kyoto Protocol*

The United Nations Framework Convention on Climate Change (UNFCCC) has as its goal to achieve "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". The Kyoto Protocol (KP) is the legally binding commitment for the industrialized nations (the annex I countries of the UNFCCC) and formulates general tasks for all member countries.

The Kyoto Protocol was initially developed to curb industrial emissions of greenhouse gases (GHG sources), but simultaneously the possibility was opened for compensating these emissions by afforestation and reforestation (GHG sinks). Because re-forestation would be senseless without also accounting for 'de-forestation' (to prevent a country from first cutting its forest and then claiming the subsequent reforestation as a climate mitigation activity) all three activities have to be "measured as verifiable changes in carbon stocks" whereas the GHG fluxes "shall be reported in a transparent and verifiable manner" (art. 3.3. KP).

Art. 3.4. opens the possibility to include also other "human-induced activities … in the agricultural soils and the land-use change and forestry categories" taking into account "uncertainties, transparency in reporting, verifiability" and "the methodological work of the Intergovernmental Panel on Climate Change" (IPCC). In the first session of the meeting of the Parties to the Kyoto Protocol (Montreal 2005) these activities were specified under Decision 16/CMP.1 as "revegetation", "forest management", "cropland management" and "grazing land management". Accounting these activities is – in contrast to afforestation, reforestation and deforestation – not mandatory, but voluntary. The Kyoto Protocol is primarily "activity-based", but as activities are actually defined referring to land categories (e.g. cropland management applies to land on which agricultural crops are grown), some elements of a 'land-based' approach are implicit. If one of the above categories is chosen, however, all activities under that category have to be accounted. So if a country chooses 'cropland management' all activities on cropland have to be accounted. How this applies to the activity of 'revegetation' is unclear.

In Decision 17/CMP.1 the Parties to the Kyoto Protocol decided to "apply the good practice guidance for land use, land-use change and forestry, as developed by the Intergovernmental Panel on Climate Change". These guidelines use Forest Land, Cropland, Grassland, Wetlands, Settlements, and Other Land as categories in a hierarchical order (cf. "Wetlands include any land that is covered or saturated by water for all or part of the year, and that does not fall into the Forest Land, Cropland, or Grassland categories", i.e. wetlands is all land that is wet except when it is forest, cropland or grassland).

*Measurable, reportable, verifiable*

The first doubt to arise in the discussions on inclusion of peatland rewetting as a climate mitigation activity was whether emissions and emission reductions from peatland rewetting could be "reported in a transparent and verifiable manner" following "the methodological work of the Intergovernmental Panel on Climate Change". For that purpose we analysed the first question to conclude that sufficient methods are available and under development to allow a reliable reporting on GHG emissions from peatland (Joosten & Couwenberg 2009). A critical evaluation of the reporting of 10 European countries (Barthelmes et al. 2009) revealed some important gaps and inaccuracies but also showed that– with good will and good guidance – it is very well possible to report emissions from peatlands reliably. An analysis of the IPCC default values on GHG emissions from organic soils (Couwenberg 2009a) showed that several of the default values should be modified in the light of latest scientific insights.

*Peatland and land use categories*

The second question was under which categories "rewetting" should be classified.

A first – simple – idea was to add a new land use category "Peatland". This would, however, mean changing some basic UNFCCC/IPCC philosophies and everybody is reluctant to address the basics under international conventions. It would furthermore be inaccurate, because peatland is in fact no land use category but a cross-cutting phenomenon. Peatland is land with a specific type of soil/substrate of which the properties are so dominant and conspicuous that the peat becomes eponymous for the landscape in

which it occurs. Forest land, cropland, grassland, and wetland may all be peatland. Within their UNFCCC reporting countries have to (but not always do…) distinguish between areas on peat and areas on mineral soil. This is correct, because the presence or absence of peat on a site assigned to a category has enormous consequences for its greenhouse gas emissions:

- Peatlands contain an enormous soil carbon stock, which is mobilised through drainage and emitted as **$CO_2$** over a (very) long time span.
- Peatlands maintain, under drained conditions, such soil humidity that optimal conditions for nitrous oxide production easily and frequently occur. As a result **$N_2O$** emissions from drained peatland are – with the same nitrogen availability – considerably higher than those from mineral soils.
- Peatlands have originated because wet, anaerobic conditions hampered decomposition of organic matter. These are the same conditions under which methane is generated. Peat soils may therefore under wet conditions emit substantial volumes of **$CH_4$**.

As GHG emissions from drained peatland may be substantial under each category, it would be useful to allow "peatland rewetting" as eligible activity in every category. This is indeed largely possible under the current Kyoto Protocol: countries can rewet their grassland on drained peat soil and account the reduced emissions. But this can not be done selectively: if countries want to account for rewetting they have to choose the *full* category and *all* activities within this category: not only rewetting, but also draining, ploughing, fertilizing and all actions that influence the greenhouse gas emissions not only from peat soils, but from mineral soils as well. This rule is to prevent "cherry picking": only choosing the positive and 'forgetting' the negative activities.

In Kyoto Protocol practice countries flinch from electing the categories cropland and grasslands, because of the extra inventory and reporting efforts and the unpredictability of the results. So "peatland rewetting" on cropland and grassland would have little chance as long as the accounting of these categories is not mandatory. Peatland rewetting of "Wetland" (under which also peatlands, such as peat extraction sites, are classified) does not bring anything yet, because activities under the category "Wetlands" are not eligible for accounting under the current Kyoto Protocol.

*Wetland rewetting*

The alternative discussed in Bonn is to restrict the activity "rewetting" to the category "Wetlands" in the follow-up of the current Kyoto Protocol after 2012 (where mandatory accounting of all categories still seems beyond reach). This would thus imply that 'wetland management' (or whatever it may be called) becomes – next to forest management, cropland management and grassland management – an eligible activity under the Kyoto Protocol, but restricted to the category "Wetlands".

Following the philosophy of the UNFCCC, the category "Wetlands" should only encompass *managed* wetlands, i.e. those wetlands that are being managed or of which former management (especially drainage) still defines their current GHG fluxes. It should be noted that pristine wetlands lack anthropogenic greenhouse gas fluxes and thus need not be reported under UNFCCC. Pristine wetlands thus do not fall under the category 'Wetlands', but under un-managed = 'non-categorized' land, where land use is limited to hunting/gathering.

The limitation of the activity 'rewetting' to the category 'Wetlands' would imply that the rewetting of peatlands under other categories (Forest land, Cropland, Grassland) requires an administrative transfer of the involved lands to the category 'Wetlands' (i.e. to the subcategory 'drained wetland'). Also the accounting of the emissions from these areas prior to rewetting (i.e. in the KP baseline year 1990) should then be transferred to the latter category. This seems to be feasible. Assigning all land to be rewetted to one land use category ("Wetland") is also consistent with the observation that water level is a better predictor for GHG emissions from peatland than type of land use.

The subcategory 'drained peatland' under "Wetlands" would also create a refuge for peatlands that were Cropland or Grassland but have been abandoned, a situation that is common all over the world. These abandoned peatlands often disappear from the accounting and are not reported because they are considered 'un-managed' (Barthelmes et al. 2009), although – without rewetting – their emissions may remain as high as when they were still used as and were still assigned to Cropland/Grassland.

*The 'balance': rewetting versus drainage*

Within the Kyoto Protocol there is an increasing attention for "balance": if climatically positive activities are accounted, also their negative counterparts must be reported. This means: next to 're-forestation' also 'de-forestation', next to 're-vegetation' also 'de-vegetation', next to 're-wetting' also 'drainage'. With respect to 'peatland rewetting' this implies that (with a baseline 1990) every land (both under the categories *and* in the non-categorized lands) that has been drained after 1990 (i.e. of which the water level has been artificially lowered) must be assigned to the subcategory 'drained wetland' under the category 'wetland', whatever its actual land use (forestry, agriculture) is. This to prevent that – similar to the de-/re-forestation example above – countries would rewet areas they just had drained. The areas concerned can easily be assessed with archival satellite imagery. In practise this will be a very limited area, because in all UNFCC Annex I countries hardly any new areas of wetlands/peatlands have been drained after 1990. The only exception might be peat extraction, but this activity already is subsumed under the category "Wetlands".

'*Rewetting*' *versus* '*flooded land*'

The phrasing of the activity as '*re*wetting' implies that it deals about lands that were 'wet', subsequently have been drained, and now are made wet again. Rewetting refers to the most important variable for GHG emissions from wetland: the water level. Rewetting is furthermore a clearer term than 'restoration', because the latter requires much more specification (and thus creates more ambiguity). What aspect of a Wetland would you want to restore: hydrology, flora, fauna, biomass, ecosystem services, landscape? Rewetting relates to Wetland like Reforestation to Forest (you wouldn't call *re*forestation 'forest restoration') similarly to how deforestation relates to drainage.

Areas that are flooded but have never been drained do not comply with the activity '*re*wetting', because there is no return to a previous situation: there is no '*re-*' involved.

Also areas that have been drained but have been flooded to the extent that the mean water level to the surface and the water level fluctuations by far exceed that of the area before drainage, do not comply with this activity. This thus excludes the subcategory 'flooded land' (i.e. reservoirs for hydro-electricity, drinking water etc.). This might be politically interesting because several countries are very afraid of having to report and account their huge methane emissions from hydro-electricity reservoirs. Another option is to remove such reservoirs from the Wetlands' category and bring them under 'Other Land Use', or to account the methane losses from hydro-electricity reservoirs in a life-cycle-approach under the 'Energy' sector.

*Methane*

Peatland rewetting is an effective way of reducing the emissions of $CO_2$ and $N_2O$ substantially, but revives the $CH_4$ emissions. In cases that abundant fresh biomass is flooded, $CH_4$ emissions may even increase to such an extent that the climate effect of $CO_2$ and $N_2O$ emission reduction is temporarily annihilated. On the mid- and long-term, however, rewetting of peatlands always leads to a substantial net reduction of climate relevant emissions from the peat body compared with the drained baseline.

Several countries in the Bonn meetings expressed doubt whether methane could be adequately addressed. This point was addressed by Belarus in an intervention during the last session of the AWG-KP-LULUCF that follows literally:

"Belarus would like to react on the correct observation of Brazil, Japan and China in our last meeting that rewetting of drained /wetland/peatland is complicated by failing IPCC guidance on methane.

This lack of guidance in the 2006 Guidelines can easily be explained. Addressing methane from peatlands was not opportune, because pristine peatlands do produce methane, but are irrelevant under UNFCCC, whereas drained peatlands don't emit methane.

Peatland rewetting, however, produces anthropogenic $CH_4$, next to suppressing $CO_2$ and $N_2O$ emissions.

Only in its 4th Assessment (2007) IPCC recognized that drained peatlands are responsible for over 25% of the emissions from land use. This makes peatland rewetting an important mitigation option and the lack of $CH_4$ guidance a gap that urgently needs to be filled.

This is not that difficult:

- Methane has been addressed in various IPCC guidance (rice, biomass burning, livestock, waste);
- There are much more data on $CH_4$ than on $CO_2$ and $N_2O$, simply because it is easier to measure. We understand by now the major mechanisms behind $CH_4$ emission;
- Recently high quality reviews have been published, both for the tropics and for the boreal/temporal zones, covering almost all relevant peatland areas of the world;
- An overview of the state-of-the art is given in a recent Wetlands International report [Couwenberg 2009b].

Therefore Belarus proposes to invite the IPCC to complete its 2006 guidelines urgently, e.g. by producing an addendum, to fill this important gap and to enable a mitigation option that can be beneficially applied in many countries of the world."

*Carbon stock changes versus GHG fluxes*

Related to the fear for methane was the proposal of some countries in the Bonn II meeting (June 2009) to limit the reporting/accounting of 'wetland management' to carbon stock changes and not to include greenhouse gas fluxes. This with the idea that – similar to forests – the major GHG fluxes can be addressed by accounting for carbon stock changes only and that methane is too difficult to be addressed.

The first misconception we have refuted in Barthelmes et al. (2009). In peatlands a stock-change approach is not feasible, because of the enormous stocks involved. A drained peatland in the temperate zone easily loses 25 tons of $CO_2$ per hectare and year from peat oxidation, even in absence of fire, in the tropics 2-3 times more. Even such huge amounts (7-20 tons of Carbon per ha and year) can hardly be assessed in a stock-based approach, because the change is smaller than the error in determining the total soil carbon stock (that may amount to several *thousands* of tons per ha). Furthermore a stock change approach does not adequately consider the methane problem. Neglecting methane would substantially overestimate the emission advantages from peatland rewetting and thus create 'hot air': emission reductions that only exist on paper but can be used to compensate real emission increases elsewhere. More of such 'hot air' is not something the world is waiting for…

For these reasons emissions from organic soils should not be assessed via stock changes but directly via *emissions*. This conclusion is also drawn by the IPCC in its 2006 Guidelines.

*The way ahead*

The current "Options and proposals on how to address definitions, modalities, rules and guidelines for the treatment of land use, land-use change and forestry" formulated before the Bonn III meetings illustrate the above mentioned discussions. We find under definitions:

*[["Wetland] ["Peatland] management" is a system of practices for stewardship and use of [wetlands] [peatlands] that have an effect on [greenhouse gas emissions and removals] [carbon stock changes], including drainage of [wetlands] [peatlands] and restoration of drained [wetlands] [peatlands];]*

For KP Article 3, paragraph 4 is proposed:

*6. [Prior to the start of the second commitment period [and, where relevant, any subsequent commitment period],] a Party included in Annex I [may choose to] [shall] account for anthropogenic greenhouse gas emissions by sources and removals by sinks resulting from [any or all of] the following human-induced activities, other than afforestation, reforestation, deforestation[, and any activity under Article 3, paragraph 4, elected in the first commitment period (If rules change substantially this may need to be reconsidered)]: [revegetation [, devegetation]], [forest management,] cropland management, grazing land management, [[wetland] [peatland] management] [harvested wood product management]].*

Under "B. Accounting rules for greenhouse gas emissions and removals" currently two options exist:

*Option 1: For the purpose of accounting greenhouse gas emissions and removals from land use, land-use change and forestry, a Party shall account for anthropogenic greenhouse gas emissions by sources and removals by sinks on forest land, cropland, grassland, wetlands and settlements as well as greenhouse gas emissions by sources and removals by sinks resulting from land-use changes from the land-use categories forest land, cropland, grassland, wetlands or settlements to any other land-use category.*

This option thus proposes to make (almost) all land use and land use changes mandatory. Option 2 proposes only to make Forest Land mandatory and to keep (Cropland, Grassland) or make (Wetlands, Settlements) eligible.

Next to the Kyoto Protocol peatlands have also been discussed under the REDD (Reducing Emissions from Deforestation and Degradation) mechanism, where the big discussion is whether soil (peat) carbon should be considered as an integral part of the forest carbon or not. Parallel to the REDD mechanism (where peat swamps could be covered) also first discussions have been taking place about a possible instrument to protect the carbon stocks of non-forested peatlands. More about that in the next IMCG Newsletter.

After the informal Bonn III meetings, the next round of climate discussions in Bangkok (28 September – 9 October) and Barcelona (2 – 6 November) will be again official sessions. Hopefully there clear and good rules for including peatlands in the UNFCCC climate mitigation package will emerge. We will be there to get the best possible result.

Barthelmes A, Couwenberg J, Joosten H (2009) Peatlands in National Inventory Submissions 2009 – An analysis of 10 European countries. Wetlands International, Ede.

Couwenberg J (2009a) Emission factors for managed peat soils - An analysis of IPCC default values. Wetlands International, Ede.

Couwenberg J (2009b) Methane emissions from peat soils (organic soils, histosols) - Facts, MRV-ability, emission factors. Wetlands International, Ede.

Joosten H, Couwenberg J (2009) Are emission reductions from peatlands MRV-able? Wetlands International, Ede.

# Regional News

## News from the UK: Palm oil company under fire

The Scottish firm Jardine Matheson Holdings is the majority shareholder of AAL, the palm oil company behind plans to decimate the untouched forests of Tripa in Aceh Province, northern Sumatra. Jardine's chairman, Sir Henry Keswick, was recently knighted in the Queen's birthday honours list.

An environmental coalition – including groups such as the Sumatran Orangutan Society, Wetlands International, Orang-Utan land trust and Greenpeace – accused the firm of turning a blind eye to a massive rainforest crime and driving the destruction of an entire ecosystem.

The region, on the north-western coast of Sumatra, is home to the highest concentration of Sumatran orang-utans in the world. Less than twenty years ago the Tripa swamp forests harboured around 1,500 orang-utans. Today there is only a handful left.

The thick peat layers of the 13,000 ha plot are of course also under threat and would release huge amounts of carbon into the atmosphere if the planned conversion of this area to palm oil plantations goes ahead.

For more information and an online petition to save the are, surf to www.tiny.cc/pAJ82

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## News from Belarus: Plans to increase peat extraction

The government of Belarus plans to expand extraction of peat for energy. Besides an attempt to cover its energy demand by domestic resources, the idea was also to gain carbon credits for rewetting after extraction. Current tendencies on the voluntary carbon market as well as on the compliance market under the UNFCCC are to avoid such imbalances, however.

According to the National Academy of Sciences of Belarus, the total volume of peat in the country amounts to 4 trillion tonnes, 1.2 trillion of which lies outside of protected areas. Under the state programme 'Torf', which aims at intensified use of peat and was established in 2008 to run until 2020, 4.4 billion tonnes of peat shall be extracted per year. This amounts to an increase of 60% compared to 2008.

In 2008, 101 trillion BYR (33 billion €) was invested in the 'Torf' programme. This is 65% more than was invested in the peat industry of the country in 2007. The amount of peat extracted in 2008 was 2.72 billion tonnes, slightly below 92% of the planned amount. The domestic demand was completely covered, about 350 000 briquettes were exported.

Belarus aims to provide 25% of its energy demand by domestic sources in 2012, and increase of 8% compared to 2007.

## RIP Vladimir Tarasenko


On 6 June, during the UNFCCC Climate Talks in Bonn, head of the Belarus delegation Vladimir Tarasenko suddenly passed away

Born in 1967, Mr Tarasenko was key in the elaboration of documents for the accession of Belarus to the Kyoto Protocol, development of the National Kyoto Action Plan, and building of institutional and legal framework for climate change mitigation in Belarus, including in promotion of peatland issues under the UNFCCC and the Kyoto protocol. Under his leadership Belarus initiated the process to include peatland restoration under future UNFCCC policy.

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## News from Ukraine: Fires in Polissya

Due to extremely dry weather in April, fire outbreaks on an abandoned peatland caused the Polisskiy Nature Reserve to catch fires on 29th of April 2009. The peatland had been drained for agriculture long ago. Peatland fires are considered as the most difficult for control as it smoulder fires can burn undetected for a very long period of time.

Several thousand hectares of valuable land were burned as a result of wildfires in Ukrainian Polissya (Lviv, Volyn, Rivne, Zhytomyr regions). High-intensity fire has burned down 550 ha of the Polisskiy Nature Reserve, seriously destroying critical wildlife habitats. Crown fire has rapidly spread through the forest and supported by powerful wind and high air temperature. After five hours the fire was put out by 25 fire brigades. It was the biggest fire over all history of the reserve.

Calls are rising in Ukraine to have abandoned peatlands rewetted, as they endanger wildlife and their fire management costs a lot of money every year. Taking into account that the areas were polluted after Chernobyl disaster in April 1986, there is an additional risk of setting free radioactive elements.

More intensive fires occurred on neighboring lands in Belarus.

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## News from Uganda: Ruwenzori Ramsar site

Uganda has nominated the Rwenzori Mountains as a Ramsar site (99,500 hectares, 00°25'N 030°00'E). The new site, within a National Park and World Heritage Site, is located in the west of the country, ranging from 1,600 to 5,100 meters above sea level in mountains that are home to one of only three glaciated

areas in Africa (with Mounts Kenya and Kilimanjaro) and contiguous with the Ramsar site "Parc national des Virunga" in the Democratic Republic of Congo.
The entire Afro-alpine ecosystem (between 1,600 and 5,100 meters asl.) is unique; with the contribution of high rainfall and the melting of snow from the peaks, various wetland types are present such as peatlands, freshwater lakes, and tundra, amongst others. The mountains are known to support 21 species of small mammals, including the endemic and vulnerable Ruwenzori Shrew. Other species of global conservation concern include L'Hoest's monkey, Horseshoe bat, and Rockefeller's Sunbird. With the distribution of fish varying with altitude, several indigenous fish species are found within the site, with the most common Cyprinid species including Varicorhinus rwenzorii.
The Rwenzori Mountains continue to face challenges from increasing population pressure resulting in increased demand for agricultural land, growing tourism, and climate change, despite the stringent protection measures in place within the Park. Through its designation as a state-owned National Park, it is covered by a management plan that allows activities such as tourism, firewood collection, research, etc., to be carried out in zoned areas only.

Source: www.ramsar.org

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### News from the Republic of Korea: Odaesan National Park Ramsar Site

The Republic of Korea has designated three new Ramsar sites, one of which comprises peatland areas. The Odaesan National Park Wetlands (2 ha; 37°48'N 128°38'E), a National Park in Gwangwon-do in the northeast, are a complex of three small fens at about 1000m altitude on Odaesan mountain, including some of the best conserved peatlands in the country. They are home to a large number of species of flora that are considered to be endangered or at risk, as well as fauna such as Musk deer, Long-tailed goral, and Water deer, all classed as Vulnerable by the IUCN Red List. The site is owned by the state and public access is not permitted.

Source: www.ramsar.org

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### News from Vietnam: Peat exploitation in U Minh Ha forest

A recent study by the Department of Environment and Natural Resources in the southernmost province of Ca Mau concluded that there were 13 million tons of peat under the U Minh Ha forest, more than 4.2 million tons of which could be exploited.
At a conference last month, the Mekong Delta province announced a plan to extract the 13 million tons over a ten-year period beginning in 2010. Ca Mau authorities said the project would bring total profits of VND1.5 trillion (US$84.2 million) over the period.
Peat layers of 0.4-1.5 meters thick are present on around 14,000 hectares of forest. Trees currently grow on more than one third of this area. The department said it planned to exploit peat on roughly 4,000-5,000 hectares. The peat would be used to produce fertilizer and the area exploited would be transformed into farms to expand cultivation and fish breeding in the region.
Apparantly, the 4,000-5,000 hectares designated for the project falls within a 25,000-hectare protected area that had been set aside to help revive several threatened endemic species. U Minh Ha, one of the Mekong Delta's three flooded forests, is home to more than 250 native plants, 182 bird species, 40 mammals, more than 20 reptiles and amphibians, not to mention many fish and insect species.
In essence the forest and the peat would be exploited for a decade only to earn money equal to the province's annual budget.

*Source: SGTT*

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### News from Brunei: Rehabilitation Peat Swamp Forest project

The Rehabilitation Peat Swamp Forest project is concerned with rehabilitating degraded peat lands and conserving intact peatlands in Brunei. It falls under the Heart of Borneo initiative, which is an inter-government project supported by WWF, officially launched in April 2006. With the support from the three Bornean governments - Brunei Darussalam, Indonesia and Malaysia - the initiative aims to preserve one of the most important centres of biological diversity in the world.
An important action for the conservation of high value ecosystems in Brunei would be to establish a more extensive network of protected areas. The main reason for this it to reduce the risk of fire and haze during dry periods, reduce carbon emissions from degraded peatlands and to maintain the carbon-sequestering ability of the in tact peat lands.
Although there have been many sensible recommendations for protected areas, only a few areas have been gazetted at present. The Heart of Borneo initiative supports protection of the Belait Peat Swamp Forest Reserve, which would help ensure that the largest area of peatlands in Brunei would be conserved for the valuable services it provides, including sustainable forestry.
The first phase of the project is aimed to increase the capacity for peatlands management among relevant, agencies and to garner support for the rehabilitation of peatlands.

*Source: Brunei Times*

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### News from Malaysia: Fire

Satellite imagery from 10 August shows more than 900 hotspots in Sarawak and West Kalimantan. In parts of eastern Sarawak, especially near Sarawak's border with Brunei, where more than 1000 ha of wildfires are raging in several forests, air quality has dropped to the worst level on the scale.

The fires are believed to be caused by plantation operators who set brush fires to clear land during the dry season. State authorities have said they are considering tighter restrictions to ban setting fires on peat soil areas, which are harder to extinguish. Fires keep spreading due to the strong wind and new hotspots keep on appearing.

Meanwhile, travel along the Pan-Borneo Highway has become dangerous as visibility has been reduced to less than 100m on some stretches as a result of haze. A thick haze covering some stretches of the highway along a 50km route between Sarawak and Brunei was reported.

*Source: Borneo Bulletin*

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### News from the USA: Gladesmen

The US Army Corps of Engineers, in partnership with the state of Florida, is restoring the Everglades. The Comprehensive Everglades Restoration Plan (CERP) describes a framework for restoring the wetlands, lakes, rivers and estuaries of the greater Everglades ecosystem, an area spanning 16 counties in central and south Florida.

As part of the Comprehensive Everglades Restoration Plan, the Corps of Engineers and South Florida Water Management District (SFWMD) are developing a Master Recreation Plan. The plan identifies recreational uses for the 50 CERP projects that cover more than 200,000 acres. During public meetings for the recreation plan, a number of people commented on the effects of Everglades restoration on traditional and cultural uses of the land. As a result, the Corps commissioned a study of a unique Everglades culture (Gladesmen) and the identification of associated historic sites eligible for protection.

The Gladesmen culture is characterized by a strong sense of community based on cultural, behavioral and ideological ties to the Everglades. Decades ago, Gladesmen often depended on the natural ecosystem for their livelihood. In 1947, the Gladesmen lost a great deal of the area they once used with the dedication of Everglades National Park. Today, the park covers 600,000 ha and contains a large part of the remaining Everglades ecosystem. Many traditional uses such as hunting, trapping and commercial fishing are prohibited in the park. Now, Gladesmen are concerned that Everglades restoration will further limit their activities. On the other hand, most appreciate the efforts to restore and preserve this great natural treasure.

The draft Gladesmen study identifies 13 sites as potential Traditional Cultural Properties within the CERP study area, and recommends that five of these sites meet the criteria to be eligible for listing on the National Register of Historic Places as Traditional Cultural Properties. The study results will also help evaluate the potential social impacts of CERP for a National Environmental Policy Act (NEPA) study.

The study is available at www.evergladesplan.org/pm/progr_master_rec_plan_gladesmen.aspx

### Agreement on Everglades restoration

Lead state and federal agencies 13 August signed an interagency agreement critical to the success of Everglades restoration. The agreement paves the way to begin construction of important Everglades restoration projects.

The Master Agreement, which applies to Comprehensive Everglades Restoration Plan (CERP) projects, contains important provisions that determine how the US Army Corps of Engineers and the South Florida Water Management District will address key issues related to project construction including cost-sharing, operations, maintenance, repair and oversight by agency technical staff.

The technical and legal complexities associated with restoration of the Everglades ecosystem made completing the Master Agreement a challenging effort that required several years to complete. Negotiations required the direct engagement of myriad agency experts at all levels.

The signing of the CERP Master Agreement and the individual project partnership agreement for the Picayune Strand Restoration Project allows the Corps to move forward with construction of the Merritt Pump Station and restoration of thousands of acres of wetlands. The Corps plans to initiate construction on the pump station before the end of the year.

www.evergladesplan.org

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

### Wetlands International Annual Review 2008

The achievements of the past year demonstrate the growing relevance and impact of the work of Wetlands International worldwide. This science-based NGO has seen an increase in its presence and activity in all regions, with 21 offices mostly located in the global South, working with a large network of partners and local communities.

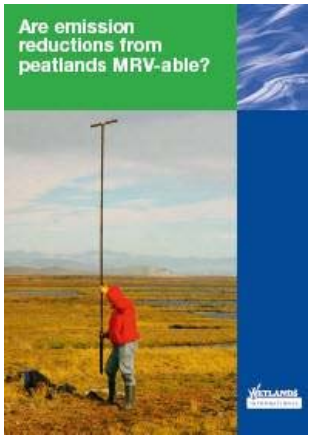
Besides working on the ground in several restoration projects, in 2008 Wetlands International intensified its collaboration with many partners on global policy issues of critical significance to wetlands. With support of a growing number of governments and NGOs, Wetlands International has put wetlands (and especially the huge carbon stores of peatlands) strongly on the agenda of the UNFCCC climate negotiations.

Wetlands International programmes resulted in hundreds of African government staff being trained on the links between poverty reduction and wetland management and steps were taken to help secure partnerships and finance for on-going capacity development of this kind.

Download the Annual Review 2008:
http://tinyurl.com/p6wqx4

In 2009, Wetlands International, together with Greifswald University, has produced a series of reports to inform the UNFCCC Climate Change Talks on peatland related issues (see below). At the June Climate Change Talks in Bonn, Wetlands International organised a side event on peatland issues that was broadcast online by the UNFCCC Secretariat. The webcast and presentation slides can be found online here: http://tinyurl.com/o6xtx2

### Joosten H, Couwenberg J (2009) Are emission reductions from peatlands MRV-able? Wetlands International, Ede.

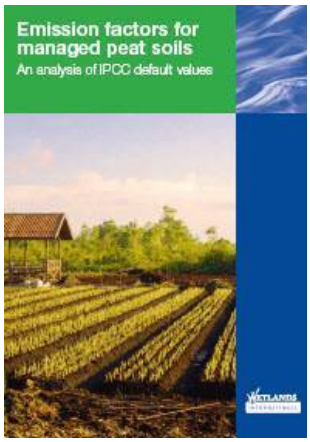



Globally very significant greenhouse gas benefits can accrue by avoiding peatland degradation and by actively restoring peatlands. This report, produced for the UNFCCC Climate Change Talks in Bonn, June 2009, addresses the question whether the results of such actions are Measurable, Reportable and Verifiable, or in UNFCCC-speak: MRV-able.

The practice-oriented proxy methodologies currently under development in Europe and SE Asia (based on water level, vegetation, and subsidence) are critically discussed with respect to feasibility and costs. It is concluded that – whereas further development is necessary and is being pursued in running research and implementation projects – these methodologies will enable cost-effective and reliable baseline setting and monitoring of GHG emissions. This will allow inclusion of peatland conservation and rewetting in a post-2012 climate framework.

Download PDF here: http://tinyurl.com/mud9a9

### Couwenberg J (2009) Emission factors for managed peat soils - An analysis of IPCC default values. Wetlands International, Ede.




This paper evaluates IPCC approaches to greenhouse gas emissions from managed organic (peat) soils and notices that the IPCC Guidelines 2006:

- use an organic soil definition that is not fully compatible with FAO definitions,
- use climate zones that are not fully comprehensible,
- present default $CO_2$ values for peat mining and for tropical and boreal forestry that are substantially (often an order of magnitude) too low,
- present a default $N_2O$ value for tropical cropland that is an order of magnitude too low, and
- present default $CO_2$ values for grasslands and for tropical cropland that are 100% too high.

The paper concludes with a summary table comparing IPCC default values with best estimates based on recent literature.

Download PDF here: http://tinyurl.com/kmeqet

### Couwenberg J (2009) Methane emissions from peat soils (organic soils, histosols) - Facts, MRV-ability, emission factors. Wetlands International, Ede.


Huge reductions of carbon dioxide ($CO_2$) and nitrous oxide ($N_2O$) emissions can be attained by rewetting drained peatlands. A post-2012 framework aiming at peatland rewetting must, however, also address associated methane ($CH_4$) emissions. The scientific data base for methane emissions from peatland is much larger than that for $CO_2$ or $N_2O$. The data show that, once anaerobic conditions are given, the availability of fresh plant material is the major factor in methane production. Old (recalcitrant) peat plays only a subordinate role.

The annual mean water level is a surprisingly good indicator for methane emissions, but at high water levels the cover of aerenchymous shunts (gas conductive plant tissue) becomes a better proxy. Ideally, both water level and cover of aerenchymous shunts should be assessed to arrive at robust estimates for methane emissions.
The available data provide sufficient guidance for arriving at consistent Tier 1 methodologies as presented in this report. For higher Tier approaches, vegetation provides a promising basis for development of more detailed emission factors. Vegetation is a strong indicator for mean water levels and can provide – with extra attention for aerenchymous shunts – a robust proxy for accurate and spatially explicit estimates of methane emissions over large areas.
Download PDF here: http://tinyurl.com/lch5jj

**Barthelmes A, Couwenberg J, Joosten H (2009) Peatlands in National Inventory Submissions 2009 – An analysis of 10 European countries. Wetlands International, Ede.**


The substantial greenhouse gas emissions from peatland drainage can largely be avoided through peatland rewetting and restoration. There is, however, doubt to whether emission reductions from peatland can be correctly quantified and transparently reported. This report analyses the most recent (2009) National Inventory Submissions of 10 European countries to evaluate their experiences with the reporting of anthropogenic peatland emissions.
It appears that several countries still apply IPS (2003) methodologies where the IPCC Guidelines (2006) have already consolidated related and better methods. The latter are certainly more consistent and complete in assessing emissions from agriculture. Countries should therefore adopt the most recent IPCC guidance.
Taking into account the enormous differences in emissions between mineral and organic soils, it is correct that these have to be reported separately within categories. To assess the impact of organic soils on GHG emissions, it is necessary to perform a key category analysis for the soil types separately. This is, however, not done in most National Inventories. Some countries even use the default Tier 1 method of mineral soils for their forest area on organic soils which may lead to a (severe) underestimation of emissions. Countries should intensify their efforts in this respect.
$CO_2$ or $N_2O$ emissions from Grassland and Cropland (and in one case even other categories) were often reported aggregated. This relocation between categories is likely only a matter of convenience, but of course also affects the default emission factor used. Countries should elaborate sufficient area data to estimate emissions in the relevant category. Area estimates of land use categories can be easily improved with already available sources and rapidly developing technology.
Drained peatlands release $CO_2$ and $N_2O$ up to many hundreds of years after initial drainage. Emissions do not end with the termination of land use, but continue until all peat is gone or the drainage system collapses. As the category approach does not adequately cover abandoned drained peatlands, their emissions are not adequately addressed and thus underestimated.
Several inconsistencies in the provided data hamper insight to the procedure of emission estimation. Countries should be encouraged to improve the transparency, e.g. by reporting in English, providing more detailed descriptions of methods and avoiding unnecessary reference to grey and non-English literature.
In general the inventories, however, show that with some effort countries can achieve an adequate reporting of their emissions from peatlands. The largest caveats to date seem to be the insufficient recognition of the importance of peatlands for GHG emissions coupled with a reluctance to follow the up-to-date guidance of IPCC.
Download PDF here: http://tinyurl.com/meo5hb

**Trumper K, Bertzky M. Dickson B, van der Heijden G, Jenkins M, Manning P (2009). The Natural Fix? The role of ecosystems in climate mitigation. A UNEP rapid response assessment. United Nations Environment Programme, UNEPWCMC, Cambridge, UK.**

The conclusion of this UNEP assessment is simply: Ecosystem-carbon management can be used to reduce carbon emissions at a very low cost compared with carbon capture and storage. The report reckons that managing land-use changes and carbon in ecosystems could tackle 15% of the roughly 10 Gigatonnes of carbon emitted by human activities each year. It highlights tropical forests, peatlands and agriculture as priority systems for carbon management.
Peatlands are also addressed, stating that peatland degradation contributes up to 0.8 Gigatonnes of carbon a year, much of which could be avoided through restoration. While peatlands cover only a tiny percentage of the surface of the Earth they are the most effective carbon stores of all of the ecosystems, storing an average of 1,450 ton of carbon a hectare. Around 65 million hectares of peatlands worldwide are considered degraded, with large quantities of carbon lost as a result of drainage. The re-wetting of peatlands and replanting of forests in areas that have been deforested could significantly reduce future greenhouse-gas emissions.
While it is expected that governments negotiating the new climate agreement in Copenhagen in December will start to pay developing countries for reducing emissions from deforestation and forest degradation,

the report argues that a more comprehensive system of payments for ecosystem services needs to be considered: Our planet's living systems have developed ingenious, efficient and cost-effective ways to manage carbon. Sending the right price signals to those who make economic and development choices about the value of preserving and effectively managing our forests, grasslands, peatlands and agricultural lands is critical for the success of any climate change mitigation strategies.
http://www.unep.org/pdf/BioseqRRA_scr.pdf

**EcoSecurities (2009) The forest carbon offsetting survey 2009.**

EcoSecurities, Conservation International, ClimateBiz and the Climate, Community and Biodiversity Alliance (CCBA) conducted this survey, collating responses from 141 large and small organisations in financial services, professional services, transport and aviation, energy & utilities and IT, mainly in Europe and North America. These are the sectors with the most active buyers in the voluntary carbon market. Companies in these sectors purchase offsets to voluntarily balance their own emissions or to offer carbon neutral products and services to their customers.
The survey found there was a 91 per cent acceptance of carbon offsets from activities to prevent deforestation. Close behind was reforestation which enjoyed 89 per cent support, as long as native species were used. Agro-forestry was also well regarded, 81 per cent of respondents rating it desirable or highly desirable, as was *peatland conservation* at 76 per cent. Commercial non-native plantations for large scale timber harvest attracted a desirable rating from only 39 per cent of respondents with 48 per cent declaring it undesirable or highly so.
http://www.ecosecurities.com/Registered/ECOForestrySurvey2009.pdf

**Pritchard D (2009) Reducing Emissions from Deforestation and Forest Degradation in developing countries (REDD) - the link with wetlands. FIELD, London.**

This paper summarises the importance of wetlands in relation to climate change, as a basis for examining their potential role in the measures for Reducing Emissions from Deforestation and Forest Degradation (REDD) being discussed under the Kyoto Protocol.
This report provides an annotated and selective list of some key decisions of the Conventions on Wetlands (Ramsar), Biological Diversity (CBD), World Heritage (UNESCO), Desertification UN CCD), Migratory Species (CMS), European Wildlife (Bern), and the Agreement on African-Eurasian Waterbirds (AEWA), which have particular relevance to the links between wetlands and climate change and/or may be relevant to REDD.
A PDF can be downloaded from the homepage of the Foundation for International Environmental Law and Development (FIELD):
www.field.org.uk/files/WetlandsREDD_FINAL_26.3.pdf

**Natuurresrevaat Bargerveen. Staats-bosbeheer, Groningen/Zwartemeer, 40 p.**

Nicely illustrated summary on glacial landscape and Holocene peatland development in the Bargerveen, a major remnant of the former Bourtanger Moor on the border of Netherlands and Germany.

**Zones humides et sports d'hiver. Bibliographie.**

This bibliography collects literature references that relate to winter sports and wetlands. Mostly French citations with occasional English and German.
http://www.pole-tourbieres.org/docs/biblio-ZH-sports-hiver.pdf

**Final draft IPS document on "Responsible Peatland Management Strategy" online**

The final version of the "Global Strategy for Responsible Peatland Management", after the third consultation draft, was sent to different stakeholder bodies dealing with peat and peatlands and published on the IPS website on 1 July 2009. All decision makers are asked to study the document and deal with its contents within their own organizations and to inform the IPS Secretariat of their approval by 30 September 2009.

If there is approval of course…

The focus of the document is still much on "Peatland Management for Economic Purposes", which is a euphemism for destructive use of peatlands. There is only passing reference to 'emerging markets' based on ecosystem services of peatlands, including carbon storage. These markets are evolving fast, however, and the document may be out of date already before publication.
The complete document can be downloaded at :
http://tinyurl.com/paz3s9

## IMCG Main Board

## UPCOMING EVENTS

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

**International Conference: Problems of studying and use of Siberian peat resources**
*24 - 27 August 2009, Tomsk, Russia*
http://tinyurl.com/cvzpog

**IMCG Field Symposium and Congres**
*1 - 16 September 2009, Georgia & Armenia*
The theme will be 'Mires and peatlands of Kolkheti lowland and highlands in Georgia and peatlands in Armenia', more information in this Newsletter and on the IMCG homepage www.imcg.net

**WETPOL 2009: 3rd Wetland Pollutant Dynamics and Control**
*20 - 24 September 2009, Barcelona, Spain*
http://gestion.pacifico-meetings.com/www/wet-pol2009/index.html

**Peatlands in the Global Carbon Cycle**
*25 - 30 September 2009, Prague, Czech Republic*
http://www.peatnet.siu.edu/CC09MainPage.html

**Conservation of Wetlands in the Carpathians**
16 - 19 November 2009, Tatranska Strba, Slovakia
Read the first circular here:
http://imcg.net/09/slovakia_09.pdf

**Wetlands in a Flood Pulsing Environment**
*1-5 February 2010, Maun, Botswana*
The symposium is held near the Okavango Delta; one of the worlds largest inland wetlands.
For more information:
http://www.orc.ub.bw/floodpulse.

**7th SER European Conference on Ecological Restoration**
*23 - 27 August 2010, Avignon, France*
Ecological Restoration and Sustainable Development - Establishing Links across Frontiers
For more information: www.seravignon2010.org

*Palsas in the Bolshezemelskaya Tundra (article on p. 18)*