Information Sheet on Ramsar Wetlands (RIS) – 2009-2012 version

Available for download from http://www.ramsar.org/ris/key_ris_index.htm.

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

1. Name and address of the compiler of this form:

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DD MM YY

Designation date | Site Reference Number

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2. Date this sheet was completed/updated:

16 May 2013

3. Country:

Denmark

4. Name of the Ramsar site:

Lille Vildmose

5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only)**:**
a) Designation of a new Ramsar site ☒; or
b) Updated information on an existing Ramsar site ❑

7. Map of site:

a) A map of the site, with clearly delineated boundaries, is included as:
i**) a hard copy** (required for inclusion of site in the Ramsar List): ☒;

ii**) an electronic format** (e.g. a JPEG or ArcView image) ☒

iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables ☒.**

b) Describe briefly the type of boundary delineation applied:

The delineation of the Ramsar site follows the boundary of the Special Protection Area for Birds (SPA) under the EEC Birds Directive in the Natura 2000 area no. 17 Lille Vildmose, Tofte Skov og Høstemark Skov. This area is also a Special Area of Conservation (SACs) under the EEC Habitats Directive. See the attached map for boundary details.

8. Geographical coordinates (latitude/longitude, in degrees and minutes):

56°54'N, 10°12'E

9. General location:

The Ramsar area is situated in Himmerland in Jutland between the two fjords Limfjorden to the north and Mariager Fjord to the south in close proximity to coastal areas of Aalborg Bay a part of the Kattegat Sea. The actual distance from Aalborg which is the largest town in Himmerland is about 40 km to the southeast.

10. Elevation: (in metres: average and/or maximum & minimum)

Average elevation: -
Maximum elevation: 25 meters
Minimum elevation: 0 meter

11. Area: (in hectares)

Approximately: 7.393 ha

12. General overview of the site:

The Lille Vildmose contains the largest areas of active raised bog in lowland Northwest Europe. A range of different vegetation types is found in the complex of nutrient-poor bog, mires and fens and especially the large and relatively undisturbed areas of raised bog are of prior biological importance.

Among the many important natural habitats in the area the most prevalent is active raised bog (approx. 2000 ha), bog woodland (approx. 400 ha) and old natural forest of high biodiversity (1000 ha), which are partly managed due to fencing and continuous browsing by Red Deer and Wild Boar.

Peat extraction has taken place in large parts of the area up to 2011 thereby reducing the area of active raised bog from originally approximately 5 500 ha to 2 022 ha. In a few small areas peat extraction continues for various reasons. At present a large central part of the area is drained and partly cultivated thus the areas with active raised bog are fragmented and consist of the Tofte Mose to the south, Høstemark Mose and Paraplymosen to the north, and Portlandmosen to the northwest.

Plans for restoring degraded bog habitat including in the central part of the former bog are now being implemented through the support from EU LIFE+ (www.LIFELilleVildmose.dk).

The bog was until about 2500 years ago part of a strait connected to the sea of Kattegat. The landscape raised and eventually the strait was blocked and a brackish lagoon developed covered by reed poor in nutrients. The reed swamp and forest bog was followed by treeless bog of sphagnum-mosses developed and eventually lost contact with the ground water and the raised bog was a reality. Thus, the large central part of the raised bog receives water and nutrients from rainfall as it is usual for raised bogs.

13. Ramsar Criteria:

1	2	3	4	5	6	7	8	9
☒	☒	☐	☐	☐	☐	☐	☐	☐

14. Justification for the application of each Criterion listed in 13 above:

Criteria 1:
Lille Vildmose contains the largest area of active raised bog in lowland Northwest Europe and thus is an important representative for this nature type. Within this site active raised bog covers approximately 2 022 ha, 252 ha of degraded raised bogs still capable of natural regeneration and bog woodland represents another approximately 400 ha. In addition approximately 1.246 ha of degraded peat is under restoration.

vi) Calculations show that an estimated 6780 t CO_2 /year (medium value) to 8942 t CO_2 /year (high value) net to be stored and these estimated values increase after the restoration project has been implemented to 11983 t CO_2 /year (medium value) to 14055 t CO_2 /year (high value) because the CO_2 emissions from the degraded areas by then is neutralised by the restoration (Aaby 2012, Aaby 2013, Aaby & Riis 2005). The CO2 emission areas are marked by red lines covering the middle part of the area only on an additional attached map. Estimates may be revised as new research and information become available.

These figures are based on the accumulation of dry peat. An estimated 100 kg dry peat / m^3 accumulate at a speed of 2.5 – 2.9 mm/year for the intact peat bog areas (corresponding to the habitat type raised bog 7110 in the EU Habitats Directive) and 1.67 – 2.08 mm/year for degraded peat bog (corresponding to the habitat type degraded raised bog 7120 and bog woodland 91D0 in the EU Habitats Directive).

In the highly degraded areas in "Mellemområdet" comprising 1344 ha the emission is estimated to be 5113 t CO_2 / year. After restoration the emission is expected to turn into zero thus the accumulation will balance emissions and in the long term the accumulation of peat will increase and the CO2 balance to be in favour of accumulation. The most important climate regulations aspect of peat bog restorations was considered to be the avoidance of carbon emissions from peat oxidation (Kaat & Joosten 2008).

In the first years of restoration a flux of methane emission may appear, moreover, in selected small areas peat excavation will continue for a few more years. The existing accumulated peat contains a substantial pool of carbon bound in the soil. The raised bog in the south and central parts of Tofte Mose contains turf about 4.5 m thick in an area of approximately 2 000 ha. Finally the old adjacent forests in the Ramsar site Tofte and Høstemark contribute further to accumulate carbon at a yet unknown scale (see also Framstad *et al.* 2013).

The carbon storage function of the wetlands including raised bog, degraded raised bog and bog woodland habitats including an expected cease of emissions in the years to come from rewetting former peat bog areas will have an influence on the regional climate, however, depending on the criteria and definitions used.

A Nordic-Baltic Ramsar project to start up in 2013 will seek to expand the approach taken in Lille Vildmose to include some of the countries with the world's largest peat areas e.g. Finland, Sweden and Norway. Peatland is considered the most efficient terrestrial ecosystem storing carbon and peat conservation and restoration is considered one of the most cost-effective measures for long-term climate change mitigation (Parish *et al.* 2007, Joosten *et al.* 2012).

Criteria 2:
The raised bog comprises large areas of threatened ecological plant communities, which have declined in distribution and number in the continental region of Europe during centuries as a result of large-scale exploitation of peat in combination with a perpetual search for new areas to be included in farming. Thus the site holds an important flora and fauna characteristic of large bogs and including important indicator species such as Sphagnum mosses and *Drosera intermedis*, *Rhynchospora alba* and *Scheuchzeria palustris*. Moreover, threatened breeding birds include Common Crane, Curlew, Golden Eagle, White-tailed Eagle, Eagle Owl, Avocet and most likely Wood Sandpiper.

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15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation): ,0
Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:
The Ramsar site is situated within the Continental Biogeographical Region of Europe as defined by the EU Habitats Directive.

b) biogeographic regionalisation scheme (include reference citation): EU Habitats Directive.

The Continental Region extends in a broad band from west to east, starting in central France and stretches to the Ural Mountains, on the border with Asia. In the south, the region is almost split in two by the high mountain ranges of the Alpine zone and the Steppe plains of the Pannonian Region. Parts of the Adriatic and Baltic coastlines are also included. All-together at least 15 European countries have all or part of their territory in this region including major areas of France, Germany, Italy, Poland, Czech Republic and Bulgaria as well as significant parts of Denmark, Belgium, Austria, Slovenia and Romania (European Commission 2006).

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16. Physical features of the site:
Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Lille Vildmose comprises a blend of bogs, forests, lakes and meadows and degraded land and is first and foremost a raised bog habitat. Until 1760 Lille Vildmose was a more than 55 km² large raised bog surrounded by a narrow wet zone with small streams running to Lindenborg Å and Flansbæk to the northwest and a few small streams to the east. By drainage the groundwater level has generally fallen and parts of the bogs have dried up. Moreover, the former drainage of four lakes in the Lille Vildmose area had led to a lower water table and decreasing height of the surrounding soil.

A large part of the raised bog has been drained and cultivated and used for a turf industry. However, this development has ceased almost completely and nature restoration has taken place and will continue in Lille Vildmose with a main aim to restore hydrology and the original raised bog. The restored lakes contain quite high levels of phosphorus but are, however, rich in birds.

Originally four lakes covering 400 ha were situated in the raised bog: Tofte Sø, Birkesø, Lillesø og Møllesø surrounded by the peat habitat, and with an outlet to the sea at Strebæk south of Mulbjerge. Between 1760 and 1769 these lakes were drained and the land used for agriculture. Two of these lakes have been re-established namely Tofte Sø (60 ha) and Lillesø (18 ha) and there are now project plans for restoring Birkesø in 2015.

17. Physical features of the catchment area:
Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

The surrounding land is cultivated to the west, north and south and the southern part of the bog Tofte Mose is drained by the Haslevgård Å at the western edge and with scattered settlements and villages. To the east is the sea and with cultivated land or forests in between. At Haslevgård Å water is still drained at the periphery of the core area of the raised bog.

18. Hydrological values:
Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

The specific climate regulating function in Lille Vildmose as described under criteria 1 iv increases as the restoration activities are being implemented and is based on waterlogged conditions.

Moreover, the increased water table will recharge the ground water in the Lille Vildmose area.

19. Wetland Types

a) presence:
Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K • Zk(a)

Inland: L • M • N • O • P • Q • R • Sp • Ss • Tp Ts • U • Va •
Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

b) dominance:
List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

U, W, O, Xf,

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20. General ecological features:
Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

Peat is produced by the decomposition of bog plants. Normally plants decompose into carbon dioxide, a greenhouse gas. Because peat is formed in the watery environment of an oxygen-free bog it decomposes into carbon. That carbon stays in the bog, locked away from the atmosphere. The process of creating a peat bog takes thousands of years such as the case of Lille Vildmose.

Destruction of bogs causes the stored carbon to be released back into the atmosphere and thereby increasing the potential for increasing temperatures and climate change. Through drainage, the dry peat comes into contact with the air and starts oxidising, decomposing and emitting CO_2. This situation is now being reversed in Lille Vildmose.

Bogs, swamps and mires comprise perhaps 3-8% of the world's land surface, amounting to around perhaps 400 million ha and thus help, keep perhaps 500 billion metric tons of carbon out of the atmosphere (or twice as much as is incorporated into all the trees in all the world's forests). Although

peatlands do emit methane—a potent greenhouse gas—this would be outweighed, in terms of the overall balance of greenhouse gases in the atmosphere, by the carbon dioxide they sequester.

With the increasing emissions of CO_2 the importance of the terrestrial sinks such as Lille Vildmose is becoming even more important because the two alternative sinks are the atmosphere (causing global warming) and the sea (causing ocean acidification).

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

The vegetation is typical for raised bogs and includes species such as: *Eriophorum vaginatum, E. angustifolium, Andromeda polifolia, Vaccinium oxycoccos, Rubus chamaemurus, Rhynchospora alba, Drosera rotundifolia, D. anglica and D. intermedia.*

Moreover, a number of peat mosses are involved in the development of the bog and include: *Sphagnum cuspidatum, Sphagnum fallax, Sphagnum magellanicum, Sphagnum papillosum,Sphagnum rubellum (including Sp. capillaceum-type), Sphagnum tenellum, Spagnum austinii (syn.: S. imbricatum) and Sphagnum fuscum.*

Monitoring of epiphytic lichens and mosses has been initiated in Tofte and Høstemark Skov. So far 19 of 120 plots have been monitored, and 95 taxa of lichens have been identified of which 46 species are red-listed for Denmark. Two species that were regarded as extinct, however, have been rediscovered in Lille Vildmose.

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

The Lille Vildmose area is partly fenced to keep local populations of Red Deer and Wild Boar in the area and prevent them from destruction the adjacent agricultural land. The restoration areas in between is expected to be fenced as well to be finalised in 2015. Badger and Otter has re-colonised the lake areas.

The Lille Vildmose area has some threatened and rare breeding birds including White-tailed Eagle (1 pair), Golden Eagle (2 pairs), Honey Buzzard, Marsh Harrier, Eagle Owl (adjacent to the Ramsar site), Common Crane, Bittern, Wood Sandpiper, Black Woodpecker, Nightjar, Red-backed Shrike and Wood Lark.

Moreover, threatened populations of the Bean Goose *Anser fabalis* feed on the bog and adjacent grassland and roost during night at Tofte Sø in winter.

Nine or ten species of bats have been recorded in Tofte Skov. In Smidie Kalkgruber nearby Lille Vildmose and the Ramsar site winter roosting bats such as Daubenton's Bat *Myotis daubentonii*, Pond Bat *M. dasycneme*, Brandts Bat *M. brandtii*, Natterers Bat *M. nattereri* are present in numbers and are expected to use Lille Vildmose for foraging.

A number of moths and butterflies have their only Danish occurrence in the area including Scarce Vapourer (*Orgyia recens*) and *Idaea pallidata*. In addition a number of rare butterflies are recorded for the central parts of the raised bog areas including the Cranberry Fritillary (*Boloria aquilonaris*), Large Heath (*Coenonympha tullia*) and the Cranberry Blue (*Vacciniina optilete*).

23. Social and cultural values:

a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

Peat extraction largely ceased in 2011. The area has today substantial recreational values.

After Danish standards this remote landscape contains significant signs of human activities throughout the time which can be seen at the site or at the tourist centre. Especially from the Iron Age there are archaeological findings from the bog area and especially from the drained lake bottoms. Several settlements have been discovered

The raise bog has in centuries been an area where people did not go because of mist and local beliefs and stories about demons etc.

The area is a story about peat extraction and the utilisation of turf. Until 1750 the bog was isolated and impassable flat. An old saying states that the only thing breaking the flatness was the branches and turf sea eagles have collected for their nest. However, until 1936 the bog was largely intact and in growth after when a massive drainage started.

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

If Yes, tick the box ❑ and describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:
a) within the Ramsar site:

The majority is privately owned now by the Aage V. Jensen Foundations (5.881 ha) including Tofte, Høstemark, Portlandmosen, Mellemområdet and Birkesø and with an aim to conserve natural values and re-establish former areas of raised bog. The other large owner is Pindstrup Mosebrug A/S, which owns 474 ha especially south of Høstemark with the former aim to extract turf. The remaining land is owned by a large number of private owners apart from 30 ha publically owned by Aalborg Municipality.

b) in the surrounding area:

Largely private land.

25. Current land (including water) use:
a) within the Ramsar site:

Used for conservation of natural values including bog habitat and threatened plant and animal communities as well as for recreational values, hunting and carbon storage.

b) in the surroundings/catchment:

Mainly cultivated land and settlements.

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26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

a) within the Ramsar site:

One of the primary threats is fragmentation of the bog habitat due to former excavation causing overgrowth of bog habitat and drying up the bog due to drainage. This drainage from especially Haslevgård Å is despite the recent major restoration activities a significant threat to the core areas in the southern Tofte Mose.

Moreover, a threat to the plant composition of especially the bog is nutrients input from the air coming from agriculture and other production.

b) in the surrounding area:

Drainage from the Haslevgård Å.

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27. Conservation measures taken:
a) List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site:
In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

The Ramsar site is covered by the largest nature conservation order in Denmark to date to protect the natural, cultural and landscape characteristics including 7.513 ha. Furthermore, the area is protected as a Natura 2000 site and a management plan has been developed for the entire area with the main aim to restore the raised bog habitat.

Moreover, a large part of the proposed Ramsar site is protected under the article 3 of the Danish Nature Protection Act generally protecting fens, bogs, meadows and heath above 2500 m² and lakes above 100 m². An EU LIFE+ project proposal has been funded with a primary aim to restore raised bog.
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4035#RM

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ❑;Ib ❑; II ❑; III ❑; IV ☒; V ❑; VI ❑

c) Does an officially approved management plan exist; and is it being implemented?:

The Natura 2000 management plan was endorsed by the Ministry of Environment in 2011. The plan was followed by action plans developed by the various stakeholders in 2012.

d) Describe any other current management practices:

The water table has been restored in various areas including in a large area – middle area - between the intact raised bogs in south and north for connecting bog habitat.

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28. Conservation measures proposed but not yet implemented:
e.g. management plan in preparation; official proposal as a legally protected area, etc.

A number of new conservation measures are planned for the next five years through support from EU LIFE+ as part of a large-scale wetland restoration project to restore the bog habitat.

Today the main use of the area is nature conservation. The Nature Agency of Denmark, the Municipality of Aalborg and a private foundation has established a collaborative LIFE+ Lille Vildmose nature conservation project with the aim to enhance and secure existing areas with raised bog and restore excavated areas in between the existing raised bog areas. This project is contained within the proposed Ramsar site (and Natura 2000 site).

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29. Current scientific research and facilities:
e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

A long list of studies and research projects exists see *Natura 2000 basisanalyse* for literature.
www.naturstyrelsen.dk/Naturbeskyttelse/Natura2000/Natura_2000_planer/Se_Planerne/001_125/17_Lille_Vildmose.htm

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30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:
e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

Lille Vildmose is one of the most advanced Danish areas in terms of nature communication and visitor facilities. A large tourist and visitors centre is situated centrally in the area and contains an exhibition and information activities and guided tours in the area is arranged on a regularly basis in the summer time. Boardwalks have been established in Portlandmosen and Tofte Mose as well as information boards scattered around. Several watch towers are also situated in the area including at Tofte Sø.

Information boards will be placed in eight areas of special interest to the restoration project between 2012 and 2015. Moreover, an observation platform at Birkesø will be set up as well as a web-site and the further arrangement of guided visits in the area.

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31. Current recreation and tourism:
State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

The area is visited by a large number of visitors including foreign tourists especially in the summer time. There are guided trips arranged to the various bog areas and the Vildmosegård visitor centre.

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32. Jurisdiction:
Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

Large part of the Ramsar site is privately owned and managed by the Aage V. Jensen Foundations. Administrative regions are Aalborg and Mariagerfjord municipalities and the Danish Nature Agency Aalborg.

33. Management authority:
Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

The implementation of the LIFE+ restoration project is undertaken by the Aalborg municipality, Aage V. Jensens Foundations and the Agency for Nature. The municipalities are responsible for the Natura 2000 action planning and the Nature Agency for the overall management plan.

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34. Bibliographical references:
Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

Aaby, B. 2005. Opgørelse af CO2 emissioner fra tørveindvindings- og græsningsarealer i Lille Vildmose. Notat til Nordjyllands Amt (In Danish).

Aaby, B. & Riis, N. 2012. Lille Vildmoses natur i fortid og nutid. I: Tofte Skov og Mose. Statusbog 2+012, side 10-50 (In Danish).

Aaby, B. 2013. Notat til Naturtyrelsen - CO2 binding i Lille Vildmose (In Danish).

European Commission 2006. Natura 2000 in the Continental region. ISBN 92-894-9985-0

Framstad, E., de Wit, Heleen, Mäkipää, Raisa, Larjavaara, Markku , Vesterdal, Lars and Erik Karltun 2013. Biodiversity, carbon storage and dynamics of old northern forests. Nordic Council of Ministers.

Kaat, A & Joosten, H. 2008. Factbook for UNFCCC policies on peat carbon emissions. Wetlands International.

Parish, F., Sirin, A., Charman, D. Joosten, H., minayeva, T. & Silvius, M. 2007. Assessment on Peatlands, Biodiversity and Climate Change. Global Environmental Centre, kuala Lumpur and Wetlands International, Wageningen.

Joosten, H., Tapio-Biström, Marja-Liisa & Susanna Tol (eds.) 2012. Peatlands - guidance for climate change mitigation through conservation, rehabilitation and sustainable use. FAO and Wetlands International.

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