Sustainable Management of Peatland Ecosystems in Mekong Countries

Training Module 1B

PEATLAND TYPES IN MEKONG COUNTRIES

By Faizal Parish, Le Phat Quoi, and Lew Siew Yan (Serena),
Global Environment Centre

December 2020

Executing Partners: The Regional Coordination Unit and Global Environment Centre

1. Introduction

This training module (1b) on peatland types in Mekong Countries has been prepared by the Global Environment Centre (GEC) to complement the training module on peatland identification (1a). It has been prepared for the Project on Sustainable Management of Peatland Ecosystems in Mekong Countries (Mekong Peatland Project) and it comprises training notes and a PowerPoint presentation.

2. Peatland types

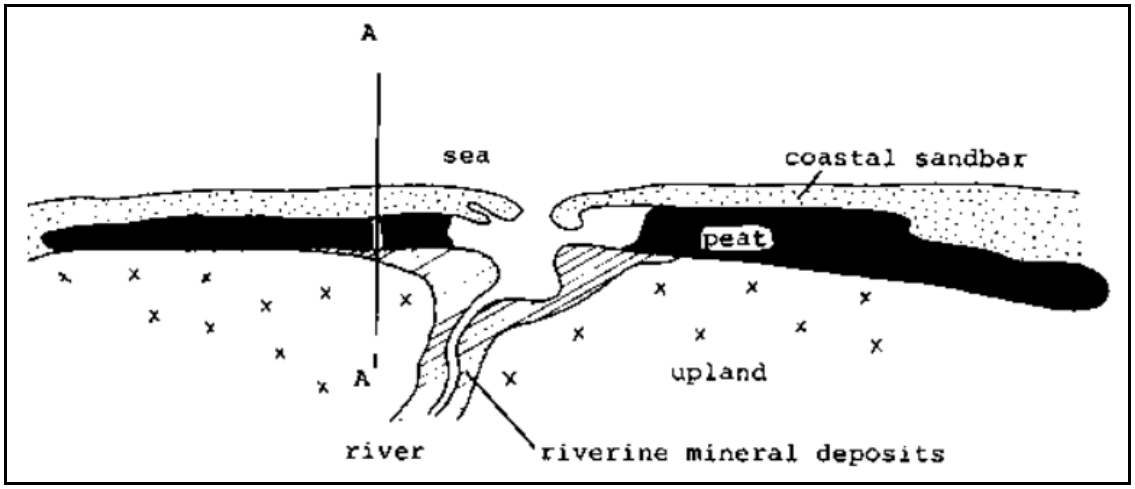
There are seven types of peatlands currently recorded in Cambodia (C), Lao PDR (L) and Myanmar (M). These seven types are:

a) Mangrove lagoonal peatlands (C)
b) Floating peatlands (L, M)
c) Lake shore peatlands (C, M)
d) Pond/ swamp peatlands (L, M)
e) Buried peatlands (C, M)
f) Spring mound peatlands (M)
g) Floodplain and Deltaic peatlands (M)

Each type is briefly described below.

1. Lagoonal peat swamps

Lagoonal peat deposits form in coastal lagoons, generally at the inner portions of the lagoons with higher freshwater content. In cambodia they have been found in more brackinsh water conditions and vegetated with mangrove trees. Such mangove vegetated lagoon peatlands are very rare in Southeast Asia, having only been recorded to date in 2-3 sites.



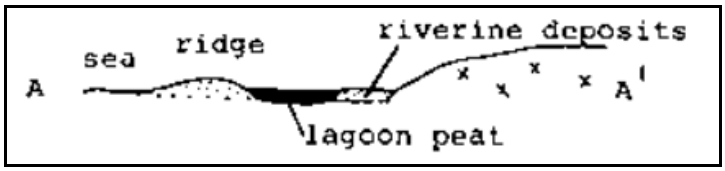


Figure 1: Diagram of lagoonal peat (from Andriese, 1988)

Formation of mangrove lagoonal peatlands:
From the field observations by GEC, it appears that the mangrove lagoonal peats in Cambodia are derived mainly from the fine tertiary roots of the different mangrove trees (as have been recorded in other countries eg Mexico by Ezcurra et.al., 2016) as follows:

Mangrove root systems and peat formation in mangroves (see figure below).
(A) The *Avicennia* root system spreads underground, immediately below the clayey mudflat, forming the underground peat deposits.
(C) As *Rhizophora* root systems spread above ground, the individual roots produce abundant fine lateral roots after entering the substrate, forming dense peat deposits mixed with forest litter.

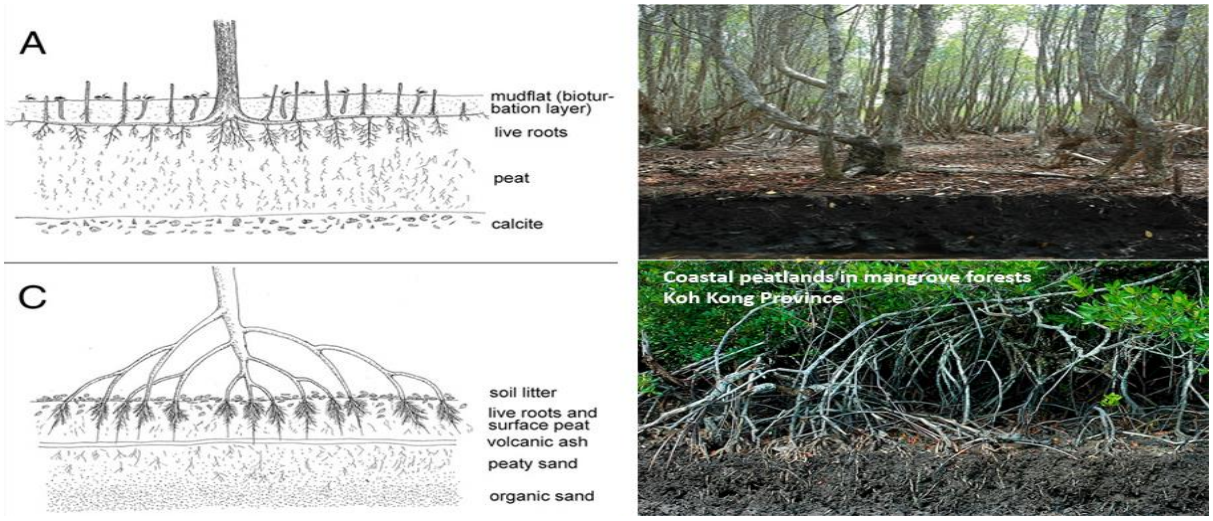


Figure 2: Cross section of mangrove peatlands (Source: Ezcurra et.al., 2016. Photos: Le Phat Quoi, SEApeat Project, 2014, Peatland assessment in coastal Mangrove peatlands, Koh Kong Province, Cambodia)

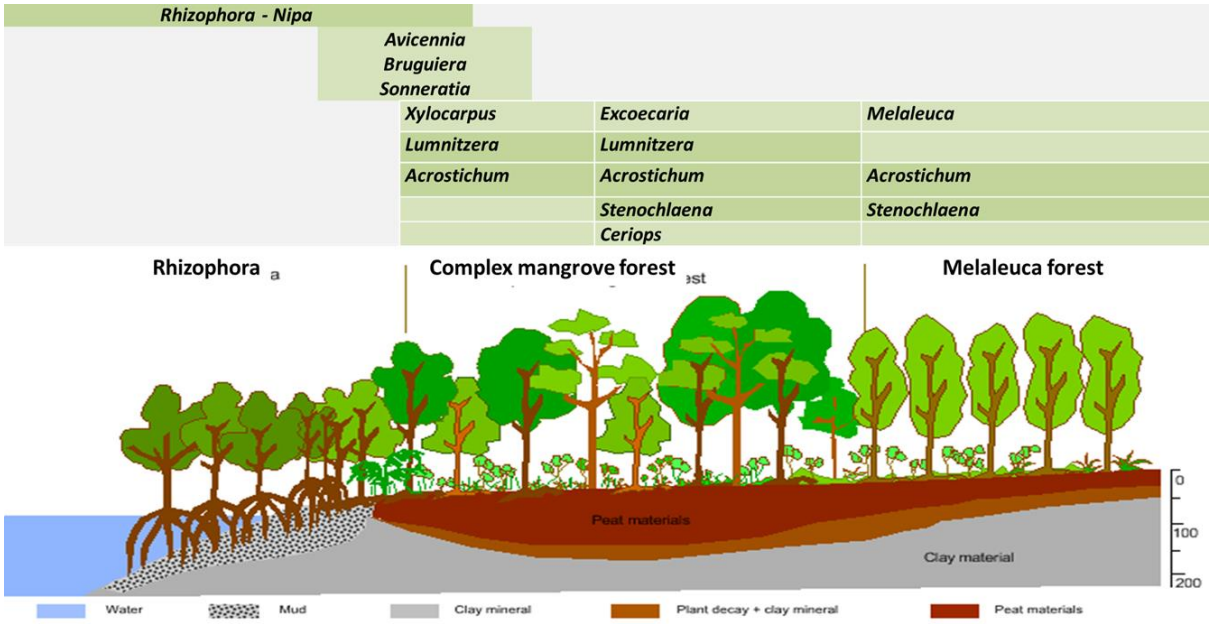


Figure 3: Transect through mangrove peatland at Botum Sakor National Park, Cambodia (Source: Quoi L. P. and J. Lo, 2015)

2. Floating peatlands (L, M)

One of the ways in which peat is formed is through a process known as terrestrialisation or lake in-filling (Craft, 2016). This involves the filling of a pond or lake with sediment and peat over an extended period of time. Initially, the pond becomes shallower as sediment and aquatic organisms and algae are deposited on the bottom. In the early stages of succession, wetland vegetation grows around the periphery of the pond, depositing peat there and some floating vegetation mats may form. Over time, peat begins to grow outward toward the center and, in the middle stages of infilling, wetland vegetation forms a floating mat around the increasingly small pond centre. Eventually, the pond fills with peat with herbaceous emergent vegetation characteristic of a fen.

Floating peatlands have been recorded in Lao PDR and Myanmar in large lakes such as Inle lake or shallow ponds (such as in southern Lao PDR). Beneath the floating mats, peat is formed, which slowly sinks downwards and gradually fills the water body.

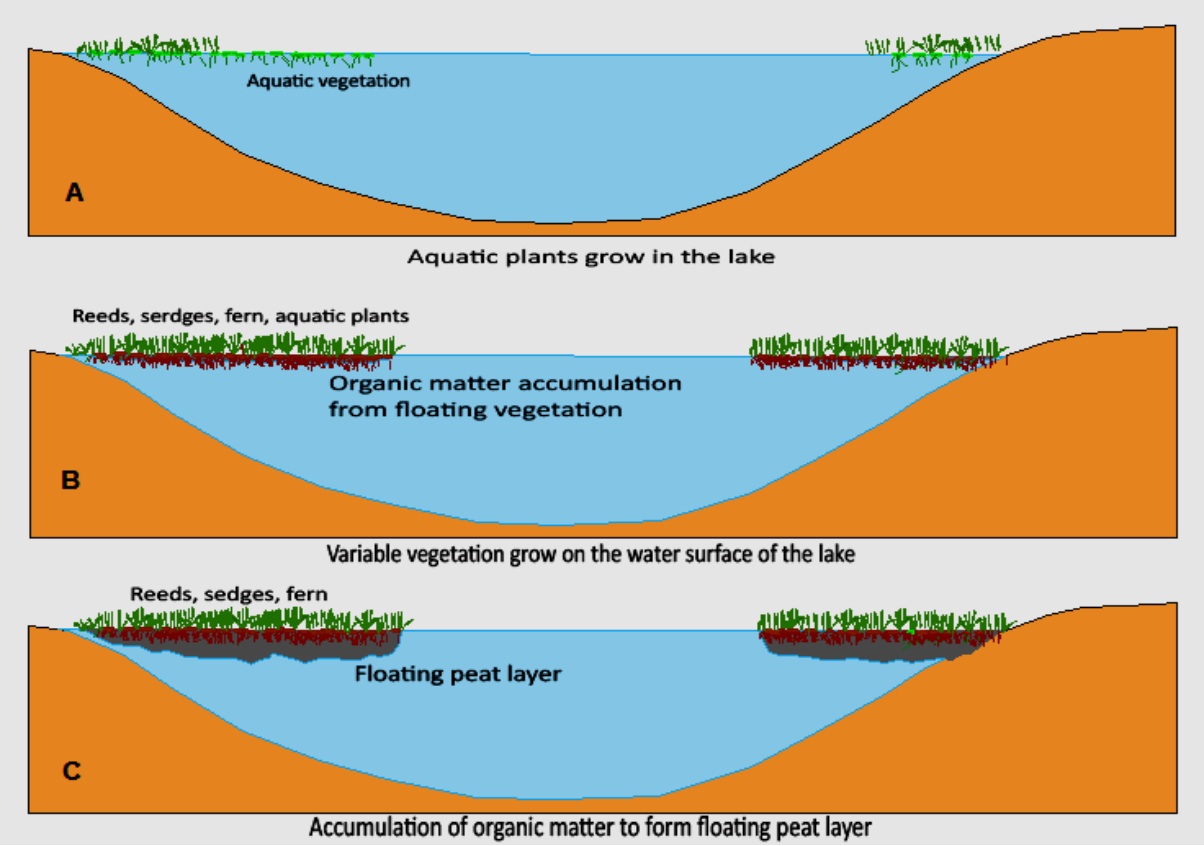


Figure 4: Sequence of development of floating peat layer in Inle Lake (Source: Le Phat Quoi, unpublished, SEApeat project, 2015. Peatland Assessment in Shan State, Myanmar)

A. Aquatic plants (waterlily, water weed) on the water surface of lake.
B. Sequence of variable plant species that are dominantly reeds, sedges, fern and grasses.
C. Floating vegetation remained and Peat is formed beneath the vegetation mat.

3. Lake shore peatlands (C, M)

The lake-shore peatlands are much linked to the floating peatlands as the lakeshore peatland is being formed by lakeshore vegetation combined with floating vegetative mats. The mats are held together by their root systems. Reeds or rushes growing by the lakeshore resulted in a floating area. Surrounding the lakeshore, the floating mats are stable and large enough where trees can grow on them.

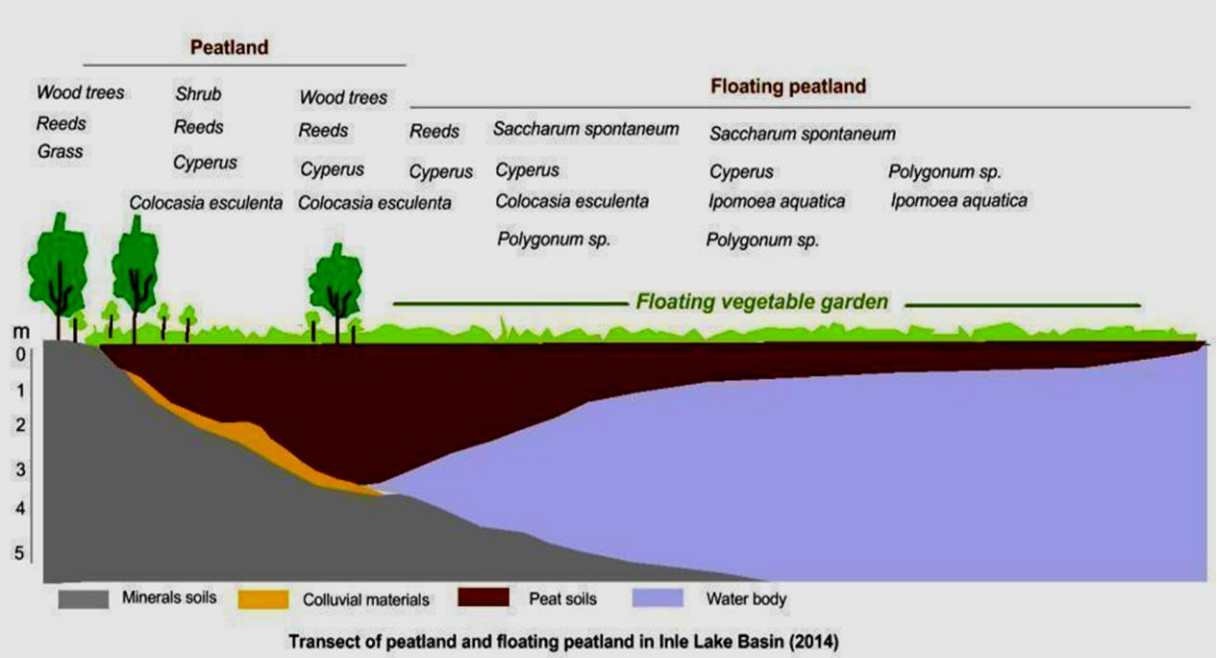


Figure 5: Transect through lakeshore and floating peatland, Inle Lake basin, Myanmar (Source: SEApeat project, 2015. Peatland Assessment in Shan State, Myanmar)

Figure 6: Lakeshore peatland Inle Lake (Le Phat Quoi, 2015)

4. Infilled Pond/ lake peatlands (L, M)

Infilled pond or lake peatlands are a further development stage of lakeshore or floating peatlands, where the entire water body has mostly been infilled with peat and vegetation. These are found in floodplains of the Mekong River basin and in smaller ponds in Southern Lao PDR. In these systems, most of the pond or lake have been filled with peat but there may still be some small areas of open water and floating peat.

Figure 7: Infilled pond with areas of Floating peatland in Ban Phonhang, Vientiane (SEApeat, 2014)

5. Buried peatlands (L, M)

Buried peatlands are peatlands that may have formed as lakeshore or infilled pond/lake peatlands but subsequently covered with a layer of eroded sediment washed from surrounding hills. The peatland would then be covered with a layer of eroded sediment (colluvial). The sediment may come from erosion of nearby areas or in some cases may be layers of volcanic ashes directly deposited or washed in from other areas.

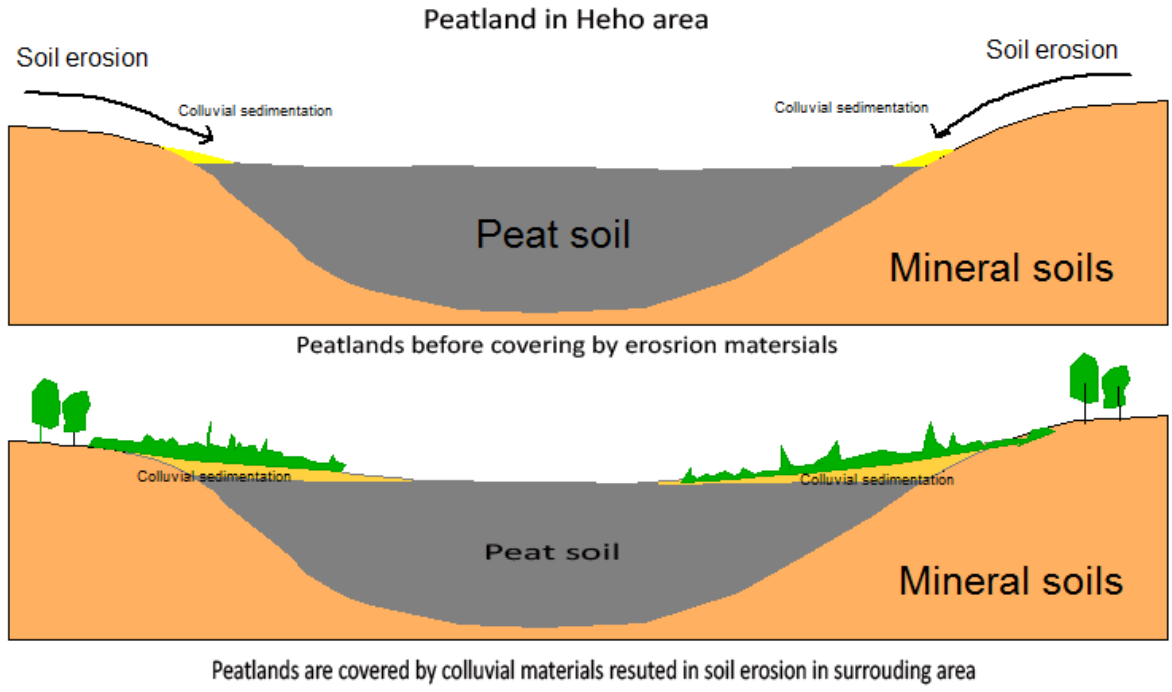


Figure 8: Process of formation of colluvial layer above the Heho peatland, Myanmar (Source: SEApeat, 2015. Peatland Assessment in Shan State, Myanmar)

Figure 9: Section through buried peatland in Heho, Myanmar (SEApeat project, 2015. Peatland Assessment in Shan State, Myanmar)

6. Spring mound peatlands (M)

Spring Mound peatlands or fens are raised areas where peat has accumulated due to single strong source of upwelling of water (see Figure 4). This type often occurs at the base of slopes associated with sloping fens (Weixelman and Cooper, 2009).

A calcareous spring mire is a peat forming ecosystem that is fed by calcareous groundwater and that is regularly depositing travertine (calcite) on the surface of the mire. In most mire typologies these mires belong to the rich fens, in which the word rich refers to richness in dissolved minerals, not to species richness or nutrient availability. The nutrient availability in calcareous fens is very low, but its biodiversity is usually very high. In Europe, Calcareous fens are situated in river valleys, fed by large hydrological systems, near geological faults where clay layers have shifted and where cold groundwater from relatively large aquifers is discharging, but also on calcareous substrates, which have been exposed after lowering lake levels (A. Grootjans *et al* 2005).

Calcareous Spring Mire (or peatland) is an extremely rare peatland system in Southeast Asia and currently has only been found in two locations in the Inle Lake Basin in Myanmar. They have been is found in Taung Poe Gyi and Hopon Villages to the north west of the Inle lake. An assessment by GEC and FREDA in 2014 indicated that Taung Poe Gyi Mound Spring peatland is at least 6.7m deep and has thin layers of calcium deposits (Calcite) at regular intervals throughout its depth. It has been utilised by the local community for water supply for crop cultivation and family use in the dry season. A rare crab species (not yet identified) has been recorded living in long burrows within the peatland. The Taung Poe Gyi Peatland has reportedly been protected at the request of an adjacent monastery, based on its role in water supply and grazing and cultivation restricted on its slopes.

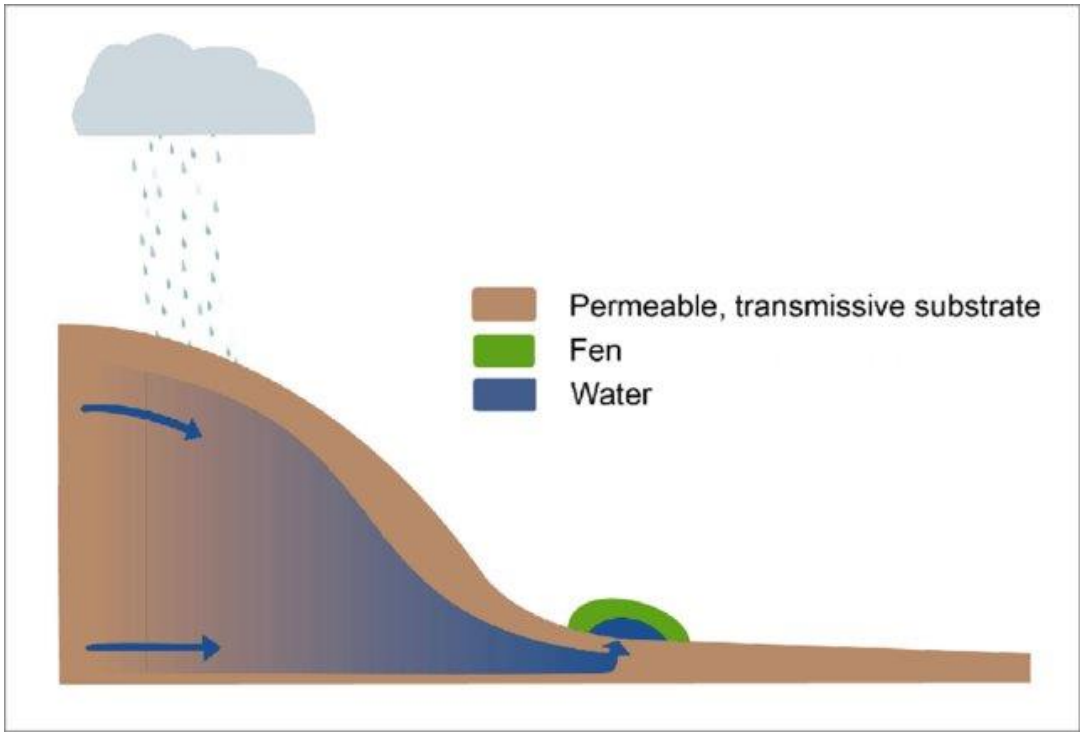


Figure 10: Conceptual Diagram of a Mound spring peatland (Source: Weixelman and Cooper, 2009)

Figure 11: Panoramic view of Taung Poe Gyi Mound Spring, Inle Lake Basin in Myanmar (SEApeat project, 2015. Peatland Assessment in Shan State, Myanmar)

Figure 12: Hopon Mound Spring, Inle lake basin, Myanmar (SEApeat project, 2015, Peatland Assessment in Shan State, Myanmar)


Figure 13: (Left) Pool on the surface of Tuang Poe Gyi Mound Spring; (Right) Crab species lining in burrows in the mound spring (SEApeat project, 2015. Peatland Assessment in Shan State, Myanmar)

7. Floodplain or Deltaic peatlands (M)

Floodplain or deltaic peatlands may have been formed behind the coast, but can be now inland due to land accretion. These systems may be domes in shape with tall forest in the edge of dome and lower stature or stunted forest in the central portion which receives limited nutrient input from surface waters.

Figure 14: Peat swamp forest on Kauk Ye Island, Bok Pyin Township, Myanmar

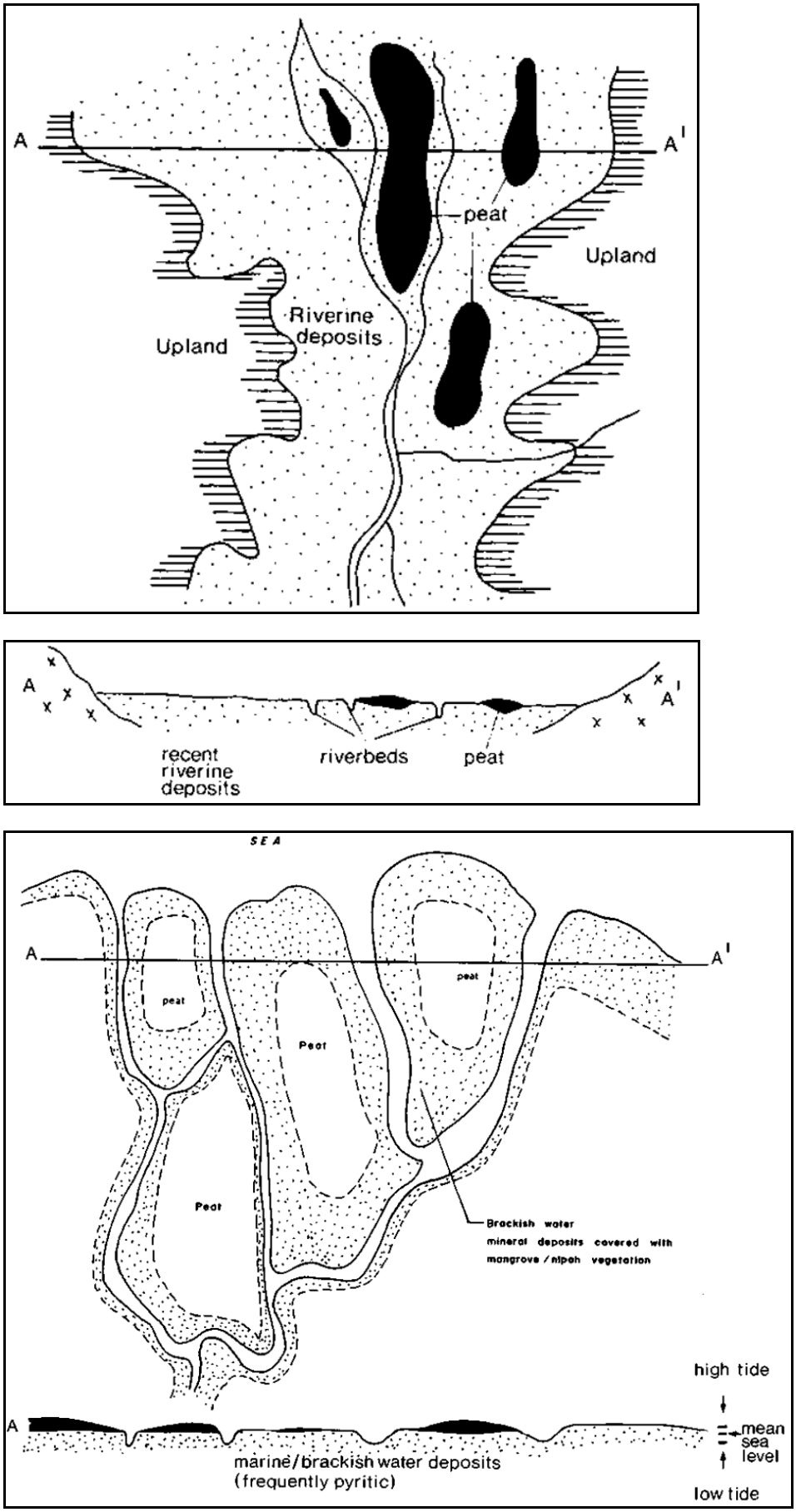


Figure 15: Floodplain and Deltaic dome-shaped basin peat swamps (Source: Andriesse, 1988)

References

Andriesse, J. P. 1988. Nature and Management of Tropical Peat Soils FAO Soils Bulletin 59, FAO, Rome.

Aung Kyaw Myint, Yezin Agricultural University. Best Management of Peatland in Myanmar: Experience of Agriculture on Peatland: A Case Study of Taung Poe Gyi Village. Technical Workshop on Sustainable Peatland Management, Nay Pyi Taw

Craft, C. 2016, Chapter 7 Peatlands in Creating and Restoring Wetlands, From Theory to Practice. Elsevier. Pages 161-192

Ezcurra, P., Ezcurra, E., Garcillan, P.P., Costa, M.T. and Aburto-Oropeza, O. 2016. Coastal landforms and accumulation of mangrove peat increase carbon sequestration and storage. Proceedings of the National Academy of Sciences of United States of America (PNAS). https://www.pnas.org/content/113/16/4404/tab-figures-data

Grootjans, A. *et al* 2005. Calcareous spring mires in Slovakia; Jewels in the Crown of the Mire Kingdom Stapfia 85, zugleich Katalogeder OÖ. Landesmuseen Neue Serie 35 (2005), 97-115

Le Phat Quoi, SEApeat Project, 2014, Peatland assessment in coastal Mangrove peatlands, Koh Kong Province, Cambodia

Le Phat Quoi, 2015. Peatland Assessment in Shan State, Myanmar. SEApeat project

Lo, J., Quoi, L.P. and Visal, S. (2014) New Mangrove Peatlands found in Cambodia. Peatlands International magazine 4.2014

Lo, J., Quoi, L.P. and Visal, S. (2016) Mangrove Peat of Botum Sakor in Cambodia. Abstract No: A-226, 15th International Peat Congress 2016. https://peatlands.org/assets/uploads/2019/06/ipc16p718-721a226lo.quoi_.etal_.pdf

Lo, J., Quoi, L.P. and Visal, S. (2018) Some preliminary observation on peat-forming mangroves in Botum Sakor, Cambodia. Mires and Peat, Volume 22 (2018), Article 03, 1-10, International Mire Conservation Group and International Peatland Society. http://mires-and-peat.net/modules/download_gallery/dlc.php?file=280&id=1558728543

Lo, J., Quoi, L.P. and Parish, F. (2015) Newly discovered mangrove peat in Koh Kong Province, Cambodia poster. http://www.aseanpeat.net/view_file.cfm?fileid=509

SEApeat Project 2015. Peatland assessments in Myanmar, (reports and powerpoint presentation files prepared by FREDA)

Quoi L. P., and Julia Lo 2015, Peatlands assessment in Botum Sakor National Park, Koh Kong Province, Cambodia. SEApeat project. GEC

Weixelman, Dave A, Cooper David J. 2009. Assessing Proper Functioning Condition for Fen Areas in the Sierra Nevada and Southern Cascade Ranges in California, A User Guide. Gen. Tech. Rep. R5-TP-028. Vallejo, CA. U.S. Department of Agriculture, Forest Service, Pacific Southwest Region, 42 p