

NEWLY DISCOVERED MANGROVE PEAT IN KOH KONG PROVINCE, CAMBODIA

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ABSTRACT:

Follow up from a preliminary survey in 2012, a recently completed field survey in August had confirmed the initial findings of mangrove on peat. Using combination of remote sensing and ground thruthing, It is estimated that 4,976 hectares of peatlands were found in mangrove in Peam Krasop Wildlife Sanctuary in Koh Kong Province, Cambodia. 32 locations were assessed with gauge auger, where peat depth were found to be in the range 44cm to 200cm, with average depth of 115cm.

The mangrove of Peam Krasop Wildlife Sanctuary consists of a few smaller islands. The outer layer (about 50m) of these islands are dominated by *Rhizophora apiculata* and *Rhizophora mucronata*. But as we moved further in to about 100m – 150m, there are clear vegetation change in terms of species and height of tree. In general, 4 types of vegetation were identified: stunted *Rhizophora apiculata* only, stunted *Ceriops tagal* only, stunted *Ceriops tagal* or *Rhizophora apiculata* with tall *Lumnitzera littorae* and a mixed species of *Hibiscus tiliaceus*, *Xylocarpus granatum* and *Malaleuca cajuputi*. In total, 14 species of tree were recorded for this survey, all of which are common mangrove species with the exception of *Malaleuca cajuputi* which is a species typical of fresh water swamp.

INTRODUCTION:

Peatland extend in Southeast Asia is rather well documented (Page *et al.*, 2011, Hooijer *et al.*, 2006) except Cambodia. No histosol exist in Cambodia based on the interpretation of World Soil Map (Van Engelen and Hunting, 2002) and lack of inventory may lead to the absence of peatland in Cambodia (Joosten, 2010).

Through a funding from EU, under the SEApeat project, more information was being assembled and the peatlands area of Cambodia is slowly come to the surface. Initial rapid survey has been conducted back in 2007 (Davies, 2007) and this was followed by a more detailed survey in 2012 (Quoi, 2012), which has preliminary identified some area of peatlands and additional area of potential peatland in mangrove area in Koh Kong Province, Cambodia. In 2014, another survey was planned, and this time with the right tools such as peat auger to measure the depth of the peat layer.

METHODOLOGY:

Remote sensing had become a useful tool in vegetation assessment (Gandesecca *et al.*, 2009) or monitoring land use change/ peatland degradation (Miettinen and Liew, 2010, Miettinen *et al.*, 2012). This study combines Remote Sensing/ GIS technology and ground-truthing at the field for verification.

Interpretation of satellite images (Landsat TM 8 image taken in March 2014 on the right) was used to identify peatland areas in coastal mangrove forest of Koh Kong Province. Polygons of identified peatland areas were transposed onto GIS maps. The peat soil and its distribution was detected and delineated by band 2 satellite images, which located mostly under mangroves. Peat soil distribution is mapped by using spatial interpolation method based on collecting peat soils samplings. The area of peatlands identified in the drawn polygons was surveyed and land-use and/or vegetation were recorded onto a map. Ground survey include peat depth measurement and floristic survey.



STUDY SITE:

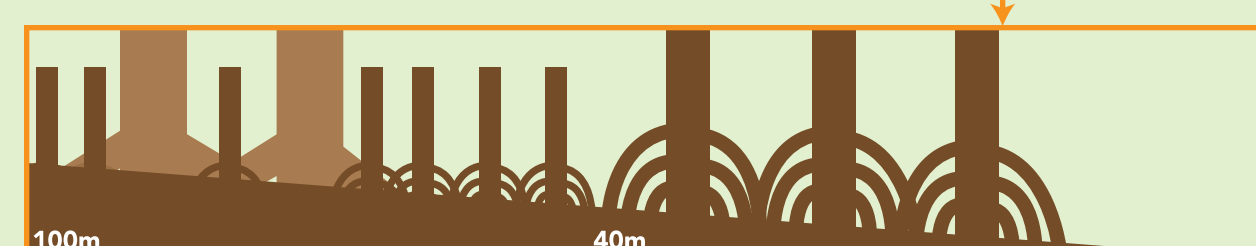
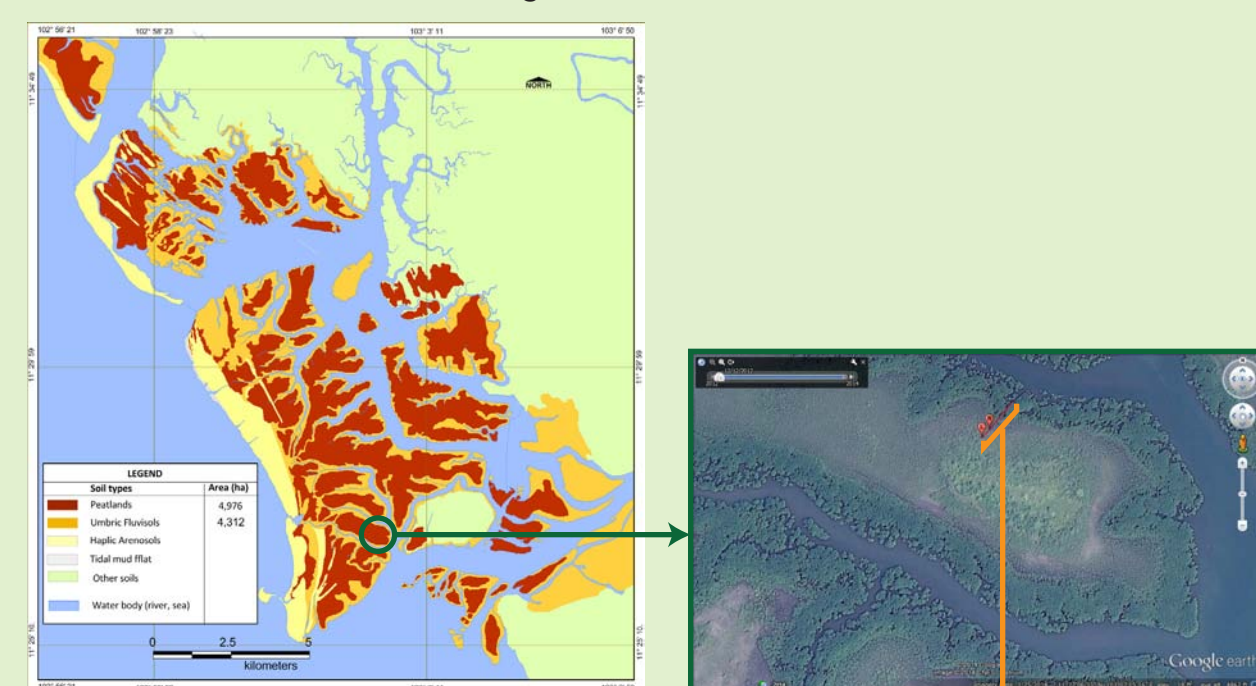
Peam Krasop Wildlife Sanctuary (PKWS) which is located in Koh Kong Province is one of the 23 protected areas in Cambodia. PKWS was established by Royal Decree on 1 November 1993 and covers areas of 25,897 hectares. (An *et al.*, 2009). Much of the PKWS are also designated as Koh Kapik and Associated Islets Ramsar Site, Wetland of International Importance. The PKWS is consisted of two forest type: mangrove forest to the west and evergreen forest to the east.



RESULT AND DISCUSSION:

The mangrove of Peam Krasop Wildlife Sanctuary consists of a few smaller islands / islets with extensive networks of connecting water ways. Altogether, 32 locations were assessed with gauge auger, where peat depth found are and varies from location to location, it is in the range of 44 -200cm, with average depth of 115cm. From the analysis, about 4976 hectares of the area is estimated to be peatlands. (see map below)

Peatlands in coastal area in Koh Kong Province, Cambodia



Example of vegetation across a 100m transect: *Rhizophora apiculata* on the right, follow by stunted *Rhizophora apiculata* and tall *Lumnitzera littorae* on the left.

PHYSICAL CONDITION

Most of the areas assessed have water above surface. Even if there is no water above surface, the top layer is damp and when stepped, water oozed out from beneath. The colour of the water is transparent and not brownish. It tasted salty.



The peat material found here is not uniform and varies in term of colour and rate of decomposition. (see photos below) Some of the peat are well decomposed whereas some are still in fibric stage — fibres of the plant material is clearly visible.



Vegetation wise, 14 species of tree were recorded during this survey, all of which are commonly found mangrove species (major and minor) with the exception of *Malaleuca cajuputi* which is a species typical of fresh water swamp.

In general, the outer layer (about 50m) of these areas is dominated by *Rhizophora apiculata* and *Rhizophora mucronata*. However as we moved further inward to about 100m – 150m, there are clear vegetation changes in terms of species and height of tree. Four vegetation types were identified: stunted *Rhizophora apiculata* only, stunted *Ceriops tagal* only, stunted *Ceriops tagal* or *Rhizophora apiculata* with tall *Lumnitzera littorae* and mixed species of *Hibiscus tiliaceus*, *Xylocarpus granatum* and *Malaleuca cajuputi*.

Rhizophora apiculata with tall *Lumnitzera littorae*



Zone with stunted *Rhizophora apiculata*



Ceriops tagal and *Lumnitzera littorae*



Observation from the field indicated that tide water only affected the thin strip of *Rhizophora* species along the outer edge. Conversation with local communities revealed that tide water could have reached the inner part of these isles, but only during certain time of the year. This may probably explained the salty water there.

Apart from the changes in vegetation, the microclimate also changes as we moved further inward. For example, full sunlight (inner part) versus shady (outer edge). This is best illustrated when we moved barefooted, hot surface (inner part) versus cool surface (outer edge).

Mangrove can grow in different substrate- clay, muck, sand and peat. Peat forming mangrove are widely reported (Joosten, 2010) and mangrove peat is not uncommon in other part of the world i.e. Belize (Cameron and Palmer, 2005, Mckee & Faulkner, 2000, Middleton & Mckee, 2010), Puerto Rico (Medina *et al.*, 2010) and Florida (Giesen *et al.*, 2006). However, mangrove peat in Southeast Asia is not common. In Indonesia, there two areas reported to have mangrove peat in Lariang-Lumu area in South Sulawesi (where *Rhizophora-Bruguiera* thrived on 3m deep peat, and Thousand Islands group, off Jakarta Bay (Giesen *et al.*, 2006, Rusila *et al.*, 2006). One report by FAO (2007) could have highlighted the peat layer unknowingly i.e. "the soil is blackish, very moist and criss-crossed by mesh of fine roots".

Although peat can formed in various geological setting all over the world, mangrove peat can only formed in mangrove swamps in salt and brackish water along tropical and subtropical coastlines and islands. (Cameron and Palmer, 2005).

The stunted *Rhizophora apiculata* may be due to the result of sharp rise in the land where it was above flood water most of the time (FAO, 2007). Could this be the only factor? Could the presence of peat layer also contributed to the stunted version of the species especially *Rhizophora apiculata*? May be, as can be seen in the area, *Rhizophora apiculata* thrived so well in the outer edge, where the soil beneath is more clayed (umbric fluvisol). In a study on mangrove peat in Puerto Rico (Medina *et al.* 2010), dwarf version of *Rhizophora mangle* also been observed further inland, and it was concluded that the combination of P limitation and seasonal water stress most likely caused the stunted growth of *Rhizophora mangle*.

It is seemed that the mangrove of Koh Kong is more similar to the mangrove in island i.e. Belize, Puerto Rico compare to mangrove found along coast of mainland or peninsula.

In lieu of this, this recent finding of mangrove peat in Koh Kong Province could shed new light in the development of peatlands in Cambodia.

Unusual combination: Clams / cockles and flowers of *Bruguiera gymnorhiza* on top peat layer



CONCLUSION:

It is always exciting to record new peatlands area, more so that the newly identified area is actually mangrove peat. Further study/ test especially on the peat material on bulk density, pH, salinity carbon content is recommended for the site. It would worth taking additional survey to understand why certain species further inland is stunted but other is not.

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