Ecosystem and Floristic Diversity of Tropical Peat Swamp Forest, Pahang, Malaysia

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Abstract:- Peat swamp forests are highly significant globally, both for their diverse and threatened species and as representative unique ecosystems. Apart from its critical role in providing habitat for wildlife, the tropical peat swamp forest also acts as a gene bank that harbours potentially useful varieties of plant species. Malaysia's peat swamp forests also provide crucial benefits and services for the sustainable development of human communities. The objective of the study is therefore to assess the status of the remaining peat swamp forest ecosystem and floristic biodiverstity in Pahang towards the efforts in establishing guidelines for its sustainable management and conservation. This collaborative study was undertaken by the Pahang Forestry Department, United Nation Development Programme/Global Environment Facility (UNDP/GEF) and DANIDA focusing on the South East Pahang Peat Swamp Forest (SEPPSF), Pahang, Malaysia. The UNDP/GEF component emphasized on the ecosystem and floristic diversity of the peat swamp forest. The final output from the collaborative efforts was used by the state authority, in particular the Pahang Forestry Department as a guide to manage the remaining peat swamp forest in the state for both ecosystem and floristic diversity conservation and sustainable use of the forest resources. Results indicated that the SEPPSF is very rich in ecosystem and floristic diversity and an integrated management plan is proposed to ensure biodiversity conservation of Peat Swamp Forest in Pahang.

Key Words:- Sustainable management, Peat swamp forest, Floristic, Ecosystem, Diversity, Conservation

1 Introduction

In line with the global requirement on the timber certification scheme, the Malaysian Timber Certification Council (MTCC) introduced in 2001 the *Malaysian Criteria, Indicators, Activities and Standards of Performance for Forest Management Certification* [2], which is based on the ITTO Criteria and Indicators for *Sustainable Management of Natural Tropical Forests.* The scheme was further improved and on 30 October 2002 the new standard entitled *Malaysian Criteria and Indicators for Forest Management Certification* [2], which was based on the Principles and Criteria of the Forest Stewardship Council (FSC) was adopted by consensus at the National-level Consultation held on 28-30 October 2002 in Kuala Lumpur. Beginning January 2005, the MC & I standard has been used to assess all Forest Management Units (FMUs) for the purpose of forest management certification under the MTCC scheme. Being a production forest, the current management of the South East Pahang Peat Swamp Forest (SEPPSF) undertaken by the Pahang State Forestry Department need to be in line and comply with the MC & I requirements [2]**.**

Malaysia possesses about 1.45 mil.ha of peat swamp forest (PSF), of which some 200,000 ha remains in Peninsular Malaysia, the majority of which is found in a single, nearly contiguous area in the state of Pahang.[5]. Peat swamp forests are highly significant globally, both for their diverse and threatened species and as representative unique ecosystems. Apart from its critical role in providing habitat for wildlife, the tropical peat swamp forest also acts as a gene bank that harbours potentially useful varieties of plant species. Malaysia's peat swamp forests also provide crucial benefits and services for the sustainable development of human communities. The primary objective of this project is to develop and implement plans, which encourage processes to ensure the conservation and sustainable use of globally significant genetic, species, and ecosystem diversity within these forests. The expected output from this study is timely and in line with the Sustainable Forest Management (SFM) concept practices by the Pahang Forestry Department.

2 Methods and Materials

2.1 Description of Study Site

The SEPPSF project area is located in Pekan District, in the state of Pahang, Peninsular Malaysia and is by far the largest intact PSF area (c. 160,000 ha) in mainland tropical Asia (Fig.1). Over half of the area or about 97,441 ha is located within four Production Forest Reserves. Topographically, the area is flat and characterized by slopes less than 2^{o}. The highest point is an isolated hill, Bukit Bangkong (60 m above mean sea level) located in the Pekan FR. The whole SEPPSF area consists of Recent Deposits [4] which can be divided into three broad geomorphic units namely the Coastal Beach Ridges Interspersed with Swales (BRIS), the Inland Swamp Basin and the Sungai Pahang Flood Plain. The inland swamp soils consist of almost entirely of organic deposits with two common soil types; the Gali Series and the Gondang Series. These soils are

characterised by the presence of shallow to moderately deep (50 – 150 cm) to deep (> 150 cm) partly decomposed organic soil material or hemic materials overlying riverine or colluvial clays [4].

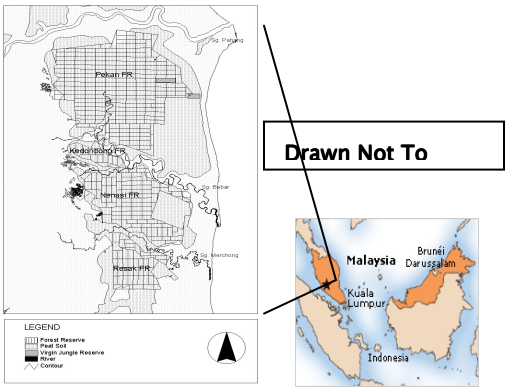

Fig. 1. A map of Malaysia showing the location of the study site

The project area experiences a relatively drier period lasting eight months from February to September, followed by four months of heavy rain between October and January, the peaks being in December and January. December records the highest mean monthly rainfall at the three selected stations with an average of 483 mm and the driest July with 106 mm. Moderate mean monthly rainfall is experienced in the months of October (230 mm) and November (266 mm).

2.2 Methods

The floristic survey is part of the overall Multidisciplinary Assessment (MDA) activities undertaken by the Project in order to compile and update the baseline information of the entire SEPPSF Project area. Three agencies namely the Pahang State Forestry Department in collaboration with United Nation Development Programme/Global Environment Facility (UNDP/GEF) and DANIDA were involved in the Project. The floristic information was gathered based on two main data sources namely through the existing secondary data and from rapid field ecological assessment of the project site.

For the purpose of a rapid assessment of the flora in the project area, a total of 10 transect plots measuring 50 m x 10 m were laid out in randomly selected forest area. All trees of 10 cm dbh and above were identified and enumerated within the entire transect. Sampling within these transects provided the quantitative data on species composition, size class distribution and forest profiling. In addition, for each habitat, data on forest structure, status of natural regeneration and relative abundance of non-woody plants such as herbaceous flora, climbers, palms, ferns, etc were also noted but not exclusively.

In some areas, a "walk through the forest" was conducted with the common and obvious canopy trees and understorey plants noted on either side of the main trail. These were done so as to cover a much wider area within the forest. Similarly, surveys along much of the riverine and swampy areas were done either on adjacent dry land or by boat. River courses were treated as natural transects lines and the riparian belt subjected to sampling 5 m landward from the water's edge.

Technical skill was required in the identification of plant species. The identification of trees was based on the root, bole, bark and leaf characteristics. Fallen leaves were generally used, but fertile specimens (with flowers and fruits) were much preferred. Those samples together with the non-tree plants were collected with the help of an Orang Asli tree climber. These leafy specimens were later brought back for processing at herbarium and later identified with species names.

3 Results and Discussion

3.1 Ecosystem Diversity

The South-East Pahang peat swamp forests are specialised ecosystems with a rich variety of habitats types that support unique communities of flora and fauna. The multidisciplinary assessment (MDA) undertaken by the Project indicates the presence of individually distinctive forest sub-types within the Project area besides peat swamp forest. There are riverine habitats, mainly the Sg Bebar and Merchong and their tributaries together with their associated riverine vegetation. Bordering these rivers is another type of swamp forest, freshwater swamp forest, which develops on mineral rather than organic soils. Running parallel to the coast there are low sand ridges which represent ancient beaches and which have developed a unique type of heath forest. Within the Forest reserves there are "islands" of dryland forest such as Bukit Bangkung in Pekan Forest Reserve and several others in southern Resak Forest Reserve.

It is anticipated that by protecting the ecosystem diversity and ecosystem processes of the Project area, the species richness of the project area will be protected. Thus, protection of representative examples of all these ecosystems within the project area will be an important objective of the Project.

3.2 Floristic diversity

The forest reserves are currently classified as having mixed Peat Swamp Forest. This forest type can be found in Pekan forest reserve in the north and all the way through to Resak forest reserve in the south. The peat swamp forests are special wetland habitats with intriguing ecologies that harbour unique biological diversity. Species restricted to peat swamp and specialist species including those endemic to the South-East Pahang region and the Malay Peninsula have been recorded in the project site [3].

In-terms of flora, an overall total of 287 species in 52 families were recorded from the sample plots in the four forest reserves. Kedondong has 210 species, Nenasi FR 106 species, Pekan 164 species and Resak 92 species. The most dominant families in terms of numbers found and on a basal area basis are Anacardiaceae,Bombacaceae,Burseraceae,Clusiaceae,Dipterocarpaceae,Euphorbiaceae, Leguminosae, Myrisiticaceae, Myrtaceae and Sapotaceae (not in order of relative density. Significant tree species include *Gonystylus bancanus* (Ramin), an important timber species which has restricted distribution in Malaysia, *Durio carinatus* and *Tetramerista glabra* - a food source for birdsand mammals, *Alstonia angustiloba* which is preferred nesting place for the globally Vulnerable Lesser Adjutant Stork and *Nageia motleyi*, a relatively rare gymnosperm, is found in Pekan FR within the SEPPSF.

Within the various habitats occurring in the SEPPSF, a high number of different sub-habitats or vegetation assemblages were observed. Some of this vegetation assemblages arising from the limited surveys in the various peat swamp forest reserves have been determined as follows:

- North-east Pekan FR: *Durio carinatus - Gonystylus bancanus - Tetramerista glabra* type;
- Pekan VJR: *Gonystylus bancanus - Madhuca motleyana - Parastemon urophyllus* type;
- Nenasi FR (Southeast): *Alstonia spatulata - Artocarpus kemando - Durio carinatus* type;
- Nenasi FR (West): *Durio carinatus - Gymnacranthera eugeniifolia - Parastemon urophyllus* type; and

- Resak FR (Southeast): *Durio carinatus - Gonystylus bancanus - Horsfieldia crassifolia* type

These results verify the sub-level habitat diversity that exists within the PSF and confirms the fact that the peat swamp forest assemblage in South-East Pahang is indeed a mixed swamp forest type. It is mixed not only in terms of different tree species composition within a small geographical range but also in terms of individuals of different size classes.

3.3 Integrated Management Plan

The PSFD recognizes that the conservation and sustainable use of the remaining PSF is a critical issue that needs to be addressed in a professional manner by taking into consideration the interests of the various stakeholders and the environment. Guided by the Project team the PSFD is pursuing multi-stakeholders consultation in preparing an Integrated Management Plan (IMP) for the Project area. The approach allows the establishment of a full planning process which is consultative, i.e. taking into account broad stakeholders' views, cross-sectoral as it involves relevant inter-agencies and multi-disciplinary involving knowledge on flora, fauna and socio-economic features. The planning process which is consultative and involving multi-sectoral inputs was reported by [1]. Overall the IMP and the planning process were accepted by the state government and its implementation is being supported by the PSFD, Pahang JPBD and the State Economic Planning Unit (UPEN). The IMP is in the final stage of completion. The adoption of *Environmental Sensitive Areas* (KSAS) and the six management zones proposed under the IMP had been discussed during wider stakeholder consultations involving local communities, private plantation owners and NGOs.

The presentation of the important elements of the IMP was made to the state authorities at the State Planning Committee Meeting on 19 January and June 2006. The paper focused on the proposal to integrate the project findings and IMP inputs such as the reclamation of fragmented areas between four Forest Reserve of the SEPPSF and the adoption of *Environmental Sensitive Areas* concept (KSAS) (Fig. 2) into the Pekan District Local Plan. The Committee agreed in principle to the reclamation of connectivity areas, 200 m river buffers and 1000m outer buffer zones within the six management zones introduced under the IMP. These were further presented and approved at the State Executive Council meeting held on 5 July 2006. The importtant elements of the IMP on the zonation of the SEPPSF and the management prescriptions discussed and endorsed by the state include the gazettement of 12,070 ha as additional forest reserve area and 20,660 ha as buffer zones (1 km surrounding the Forest Reserves) in the SEPPSF.

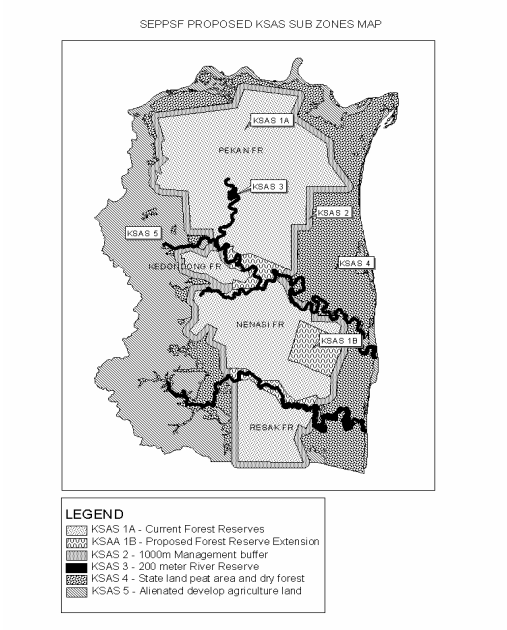

Fig.2: Proposed KSAS External Zonation for the SEPPSF

4 Conclusions

Due to the uniqueness and richness of ecosystem and floristic diversity of SEPPSF, capacity building and awareness campaign of the significant contribution of the peat swamp forest in Pahang is deemed required to ensure that it is well managed and sustainably conserved for future generations. More research on other biodiversity surveys such as fauna is required to provide input to the preparation of the forest management plan in the SEPPSF project area.

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