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NOT WASTELANDS, LET"S MANAGE OUR PEAT SWAMPS PROPERLY THROUGH A SYSTEMATIC CONSERVATION PLANNING APPROACH

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SUMMARY

The peat swamp forests of Sarawak is largely misconstrued as ‗mosquito-infested wasteland', with less than 5% located inside protected areas. The loss of peat swamp forests is mainly associated with large scale agriculture development, notably for oil palm plantations, whereby Sarawak is regarded as the last frontier for expansion in Malaysia. The peat swamp forests in Sarawak are home to some of Borneo's rarest and unique flora and fauna, and play very important roles in ecosystem processes. In this paper, we present the conservation values of peat swamp forests by identifying their areas of conservation importance. Oil palm plantations contributed to a total 25.8% of peat swamp forest cover loss for the period of 2000 to 2014. Five conservation clusters containing peat swamp forest are identified, namely: Marudi-Loagan Bunut; Sebauh; Rajang Delta; Maludam-Sedilu-Sebuyau complex; and Simunjan. Systematic conservation planning approach, strengthened by sound policy decisions, can be used to guide proper land use planning for sustainable development and conservation.

Keyword: *planning, conservation, Sarawak, sustainable development*

INTRODUCTION

Globally, peatlands (areas with peat substance) cover an estimated 400 million hectares or three per cent of the earth's land surface (Strack, 2008). About 11% of tropical peatlands are found in Malaysia, which is second to Indonesia that had until the recent past, 80 per cent coverage of tropical peatlands (Rieley et al., 1996; Page et al., 2006). Sarawak has the largest peat swamp forest coverage in Malaysia, accounting for about 64 per cent of the total 2.6 million hectares in Malaysia (Hon, 2011). However, much of these areas are already opened up for agriculture developments and other uses, putting extensive pressure to the remaining peat swamp forests.

The peat swamp forests of Sarawak contain some of the most unique and rare fauna species, such as the red-banded langur (*Presbytis melalophos cruciger*), which is now restricted to the forests of Maludam National Park (Hon and Gumal, 2004; 2005), and significant populations of the Bornean endemic proboscis monkey (*Nasalis larvatus*). The largest colonies of flying foxes (*Pteropus vampyrus*) are restricted to the peat swamp forests of Loagan Bunut National Park (Gumal et al., 2008) and Sedilu National Park. The orang-utans (*Pongo pygmaeus*) are also found within the peat swamp forests of Sedilu National Park and Ulu Sebuyau National Park, and in the lowland hill dipterocarp forests of Lanjak Entimau Wildlife Sanctuary, Batang Ai National Park and Ulu Menyang Conservation Area. The only sightings of Storm's stork (*Cicornia stormi*) and masked finfoot (*Heliopais personata*) were in peat swamp forest (Hon, 2011) and the only known breeding colonies of Oriental darter (*Anhinga melanogaster*) and little cormorant (*Phalacrocorax niger*) were in Loagan Bunut (United Nations Development Programme & Global Environmental Facility, 1999).

Peat swamp forests perform crucial functions in flood prevention, nutrient storage and carbon sink. During heavy rainfall events, peat swamps absorb most of the excess water, thereby reducing flood peaks and helps in mitigating floods. Absorbed water is released slowly during drier periods, thereby mitigating droughts in adjacent areas and maintains crucial supply of water for many of Sarawak's coastal areas during droughts (Sawal, 2004).

Sadly, the peat swamp forests in Sarawak are imperiled, their loss driven by economic demands to open land for agricultural expansion and other activities. Timber extraction began in the peat swamp forests in the 1950s and continued until the early 1970s, with species such as *Shorea albida* which was found in abundance in former times, mainly targeted for harvesting. Once logged, degraded peat swamp forests are frequently invaded by pioneer species such as *Colocasia* sp., *Macaranga* sp., *Melicope* sp. and *Melastoma* sp., of which most of them are non-merchantable timber species and rarely harvested or utilized by the local communities.

Sarawak, with a land mass of about 12.5 million hectares, has a land use policy of allocating six million hectares as permanent forest estates, one million hectares as totally protected areas and another two million hectares

for oil palm plantations. In more recent years, logged-over peat swamp forests in the coastal areas were and continue to be excised from state land and permanent forest estates to make way mainly for oil palm and forest plantations, including other agricultural and land development projects. Oil palm planting intensified in Sarawak in the late 1990s. Despite starting off later than other states, Sarawak experienced the highest rate of oil palm plantations development in Malaysia largely at the expense of peat swamp forests situated in the low lying coastal plains (Hon and Shibata, 2013). In 2015, a total of 1.44 million hectares in Sarawak have already been planted with oil palms.

METHODS

We analysed the extend of peat swamp forest cover in Sarawak based on forest cover map from various sources (see Langner et al., 2007; Miettinen et al., 2010; *WWF internal data*). We identified a suit of species and habitat for both terrestrial and freshwater ecosystems that are important for conservation, which are termed as our conservation features. Based on systematic conservation planning approach, we used the programme MARXAN (Ball et al., 2009) to select a configuration of planning units, with conditions that are best for conservation and meet our specified goals for the conservation features. The results from MARXAN analyses identifies the planning units that are best for conservation. We used ArcGIS to plot planning units that are regarded as our priority conservation area.

In the MARXAN inputs, we set oil palm and industrial tree plantations together with other features such as mines, infrastructures, settlements and forest cover changes since 2010 according to their respective levels of severity rankings as costs layers. This will generate a layer that identifies areas that are costly for conservation and best to be avoided. In the conservation target setting, alongside more than 50 other features, we used different conservation goals for vegetation types. For peat swamp forests, we set the conservation goal of 45% of their current extent. The boundary length modifier was set at 0.2 to improve connectivity of conservation areas. We then inspect where the areas of conservation importance are from the MARXAN output, and by overlaying with current extant of peat swamp forests and oil palm plantations with the map output, we are able to identify areas of conservation concerns where proper land use planning and management interventions are required.

RESULTS

Our MARXAN analysis identified 155,624 hectares of peat swamps forests within the areas of conservation importance. Forest cover loss data from 2000-2012 (Hansen et al. 2013) with updated data for 2014 (earthenginepartners.appspot.com) is largely consistent with areas that have been licensed out for oil palm plantations. Oil palm licensed area when overlaid with forest cover loss areas between 2000-2014 represent 650,117 hectares or 30.7%, of which 545,974 hectares are on peat (Table 1).

Table 1: Coverage of areas of conservation priority, association with forest cover loss and oil palm expansion on peat in Sarawak

	Hectares
Areas of conservation importance in Sarawak*	4,254,500
Peat swamp forests captured inside areas of conservation importance	155,624
Forest cover loss (2000-2014)#	2,116,047
Forest cover loss associated with oil palm plantation	650,117
Forest cover loss associated with oil palm plantation on peat	545,974

**Results from MARXAN analyses*
 # Source: Hansen et al. 2013

Remaining peat swamp forests, adjacent to large scale agricultural activities such as oil palm plantations are identified as clusters at: Marudi-Loagan Bunut; Sebauh; Rajang Delta; Maludam-Sedilu-Sebuyau complex; and Simunjan (Figure 1).

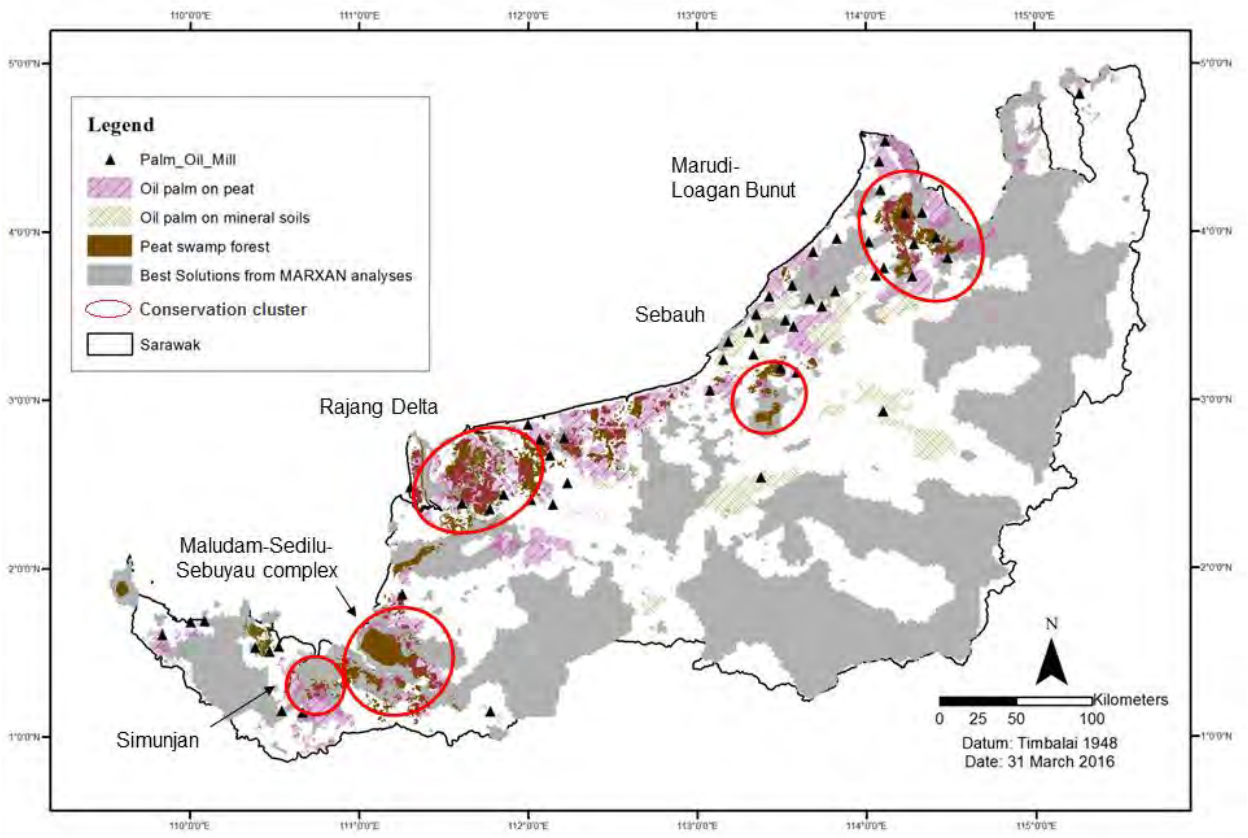

Figure1: Areas of conservation importance (as identified from best solutions score from MARXAN analyses) with five of the conservation clusters where oil palm plantations are established on peat and adjacent to peat swamp forests

Table 2: Conservation features inside conservation areas adjacent to oil palm plantations on peat

Conservation areas cluster	Conservation features present
Marudi-Loagan Bunut	Ramin; legumes-lianas association; flying fox (*Pteropus vampyrus*); false gharial (*Tomistoma schlegelii*); tapah (*Wallago* spp.); mud volcano; peat swamp forests; tagang river system; oxbow lakes.
Sebauh	Peat swamp forests; arowana (*Scleropages formosus*); false gharial (*Tomistoma schlegelii*); tapah (*Wallago* spp.).
Rajang Delta	Ramin (*Gonystylus bancanus*); mangroves; peat swamp forests; tagang river system; terubok (*Tenualosa toli*).
Maludam-Sedilu-Sebuyau complex	Orang utan (*Pongo pygmaeus*); proboscis monkey (*Nasalis larvatus*); red banded langur (*Presbytis chrysomelas cruciger*); terubok (*Tenualosa toli*); dolphins; false gharial (*Tomistoma schlegelii*); tapah (*Wallago* spp.); ramin (*Gonystylus bancanus*); *Dipterocarpus coriaceus*; mangroves; peat swamp forests.
Simunjan	Flying fox (*Pteropus vampyrus*); false gharial (*Tomistoma schlegelii*); tapah (*Wallago* spp.); peat swamp forests; ramin (*Gonystylus bancanus*); *Dipterocarpus coriaceus*.

DISCUSSION

The systematic conservation planning approach when used in combination with government‘s land use policy is able to come up with the best land use strategy for conservation and development. It is used as a decision

support tool to assist in the conservation of biodiversity and ecosystems at a landscape scale, using best available data to identify priority areas for conservation actions. This approach that helps to identify areas of priority conservation importance should be adopted as part of the government policy to aid in decision making for land development in Sarawak, especially in granting greater protection to the remaining peat swamp forests. Where areas of conservation importance lie adjacent to existing agriculture areas such as oil palm plantations, among the measures that could be taken include: management interventions by oil palm plantations through the adoption of best management practices; and government prioritizing areas for conservation that focuses on intact large peat swamp forests. Nevertheless, it must be noted that the output from our analyses is not final and should never be construed as the only and final configurations for the identification of areas of conservation importance. The process should be an ongoing one whenever new data or land use policies are made available. As it is now, the identified peat swamp forests within our areas of conservation importance may actually represent the only remaining areas that urgently require conservation attention.

One of the steps that could be taken by the government in protecting our peat swamp forests now is to relook at the current agriculture policy, by discouraging large scale conversion of remaining intact peat swamp forests into other land uses such as oil palm plantations. The conservation goals of 45% adopted by our analyses is a conservatively low figure and can be adjusted higher to prioritize the conservation of peat swamp forests in Sarawak.

There is an urgent need to protect more peat swamp forests in Sarawak, and to leave them in their natural state. Under our environmental protection ordinance, Article 3 of the Natural Resources and Environment (Prescribed Activities) Order 1997 mentions that development of an oil palm plantation or forest harvesting exceeding 500 hectares falls within the order‘s prescribed activities, thereby warranting an environmental impact assessment approval before commencement of project implementation (Sawal, 2004).

Sufficient areas of peat swamps forests, pristine and otherwise, must be set aside to ensure that the ecosystem, species and genetic diversity are preserved. Therefore, resources and attention should be focused on conserving peat swamp forest patches that are left, with similar effort expanded on rehabilitation of degraded or logged over forests. In the end, it is envisioned that more pet swamp forests can be legally protected inside our totally protected area network.

CONCLUSION

The remaining peat swamp forests in Sarawak is still important for conservation. Despite being under threats from conversion into other land uses, efforts could be intensified to identify where the remaining peat swamps forests can be accorded better protection. Systematic conservation planning approach can be used as a tool to help in decision making for the conservation of peat swamp forests in Sarawak, and to guide development planning. While we report specifically on the conservation of peat swamp forests, our systematic conservation planning approach has also include a whole suite of other conservation attributes including other forest types that occur in Sarawak. Therefore, it is a holistic and encompassing approach. If used properly, conservation efforts can be optimized to focus on priority areas, which must include the unique, yet important peat swamp ecosystems of Sarawak as one of the conservation targets that warrant our utmost attention now.

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