



SUSTAINABLE MANAGEMENT OF PEATLAND ECOSYSTEMS IN MEKONG COUNTRIES

THE MEKONG PEATLANDS PROJECT

Guidelines For Conservation, Rehabilitation and Sustainable Use of Peatlands in Mekong Sub-Region

Prepared by:



**Global Environment
Centre**

July 2024

TABLE OF CONTENTS

SUMMARY FOR DECISION MAKERS	i
CHAPTER 1: INTRODUCTION	1
1.1 Peat, Peatland Characteristics and Types in Mekong Sub-Region.....	1
1.2 Values and Functions of Peatland in Mekong Sub-region.....	3
1.3 Aim, Intent and Target Audience for These Guidelines.....	4
CHAPTER 2: GENERAL GUIDING PRINCIPLES FOR PEATLAND MANAGEMENT	6
CHAPTER 3: GUIDELINES FOR CONSERVATION, REHABILITATION AND SUSTAINABLE USE OF PEATLANDS.....	8
3.1 Theme 1: Conservation of The Peatlands.....	8
3.1.1 Value of Peatlands for Conservation	8
3.1.2 Peatland Inventory, Mapping and Demarcation	14
3.1.3 Establishment and Management of Conservation Area for Peatlands (Government Protected Area, Community Conserved Area)	20
3.1.4 Recognition of Peatlands in Existing and New Policies and Regulations .	23
3.1.5 Special Protection and Management Measures for Peatlands in Protected Areas	24
3.1.6 Education and Interpretation in Peatland Protected Areas	24
3.2 Theme 2: Sustainable Use of Peatlands	26
3.2.1 Sustainable Agriculture Practices on Peatlands	26
3.2.2 Water Resources Management in Peatlands.....	29
3.2.3 Sustainable Forest Management in Peatland	31
3.2.4 Fishery on Peatlands	32
3.2.5 Grazing and Livestock	33
3.2.6 Non-timber Forest Products (NTFP)	35
3.2.7 Ecotourism in Peatlands	36
3.2.8 Integrated Management or Landscape Approach with Multi-stakeholder Engagement	38
3.3 Theme 3: Rehabilitation of Degraded Peatlands.....	39
3.3.1 Root Causes of Degradation.....	39
3.3.2 Principles and Planning for Rehabilitation	41
3.3.3 Rehabilitation of Forested Peatlands	44
3.3.4 Rehabilitation Experiences and Case Studies	45
3.4 Monitoring and Evaluation	48

List of Tables, Figures and Boxes:

Table 1:	Classification of peat soils through Von Post Scale	1
Table 2:	Distribution of peatlands in Mekong sub-region	3
Table 3:	Some endemic species found in peatland area in Lao PDR (SUPA-Lao Project)	9
Table 4:	Focal Areas and their respective Goals for APMS 2023-2030	11
Table 5:	Strategies and steps in establishing conservation area's management	21
Figure 1:	Distribution of confirmed and potential peatlands in Mekong countries	3
Figure 2:	Overall functions of peatland ecosystem to the Mekong Sub-region	4
Figure 3:	Three main themes to sustainably manage peatlands in Mekong sub-region.	8
Figure 4:	Focus checklist activities for peatland inventory in Country	14
Figure 5:	Assessment methods	15
Figure 6:	Utilising Remote Sensing to undertake peat soils analysis in preparing potential peatland for ground verification	16
Figure 7:	Utilisation of Avenza map smartphone application for limited coverage areas	16
Figure 8:	Potential organic soils in Lower Tonle Sap Basin and Lower Mekong River corridor, Cambodia identified from remote sensing assessment	17
Figure 9:	Distribution of potential areas of organic soils in highlands, Cambodia	18
Figure 10:	Example of demarcation activities carried out in Cambodia and Lao PDR	19
Figure 11:	Transboundary haze pollution dominated Mekong in March 2023	27
Figure 12:	Simple guides on sustainable agriculture on peat soils	28
Figure 13:	Assessment of conservation zone in Lao PDR	30
Figure 14:	Paddy field on peatlands areas within Lao PDR	31
Figure 15:	Example of framework that support local sustainable peatland management	32
Figure 16:	Fishery is a subsistence that essential to peatland community	32
Figure 17:	Swamp buffaloes on its niche ecosystem on peatlands	34
Figure 18:	Krajood in Nakhon Si Thammarat Province, Thailand	35
Figure 19:	Ecotourism activities at Thale Noi Non-hunting Area	37
Figure 20:	Agriculture on peatland and floating peatland	39
Figure 21:	Examples of setting fires by fishermen or farmers at Inle lake Myanmar	40
Figure 22:	Peat mining ponds in Lao PDR and in Ngong Phommalu	40
Figure 23:	Sand mining in Koh Kong mangroves and peatland, Cambodia	41
Figure 24:	The activities carried out in conservation and rehabilitation of North Selangor Peat Swamp Forest	46
Figure 25:	U Minh Thuong National Park in Vietnam	47
BOX 1:	Peatland Management in Thailand	20
BOX 2:	Protected Areas Management in Cambodia	23
BOX 3:	IBIS Rice Programme in Cambodia	29
BOX 4:	Sustainable Fisheries Practice from Lao PDR	33
BOX 5:	Swamp Buffaloes Raising Practice from Thailand	34
BOX 6:	Good Practice for Management of Non-Timber Forest Product (NTFP) on Peatland from Indonesia	35
BOX 7:	Example of Ecotourism in Peatland with Example of Positive Practices	37
BOX 8:	Management Plan of the Beung Kiat Ngong Ramsar Site	39

SUMMARY FOR DECISION MAKERS

Compared to other parts of the ASEAN region, peatlands in Mekong sub-region are unique with its own hydrological functions and purposes. As peatlands are known for its main function in regulating climate and freshwater sources, it is important for decision makers or policy makers and the authority of country to take an initiative in strategizing the best effort to protect this unique ecosystem. Though it is noted that the area of peatlands is not as large as in other ASEAN Member State (AMS) in southern sub-region, the peatlands need to be properly managed as they provide important ecosystem services that are beneficial to the countries in the Mekong sub-region.

Since peatlands are not widely distributed in the Mekong sub-region, there is limited policy guidance and peatlands are currently facing degradation especially from rapid development, peat soil extraction and unsustainable agricultural practices.

The purpose of this guideline is to provide support for countries to conserve, rehabilitate and sustainably manage the peatlands in the Mekong sub-region. This guideline is open for practitioners and policy makers that are working within environmental division to provide a clear country's perspective.

This guideline covers three different themes specifically in term of peatland conservation, managing peatland sustainably, and strategy to rehabilitate degraded peatlands. Overall, **Peatland Conservation** theme is focussing on the value of peatlands as perceived by countries in Mekong sub-region. It also offers some strategies in mainstreaming the peatland aspect into national policy framework.

The following theme which is **Sustainable Uses of Peatlands** touches on strategic measures to sustainably manage peatland areas through multi-stakeholder and landscape approaches. It also emphasises on the ecosystem services that is possible to be utilised.

The third theme of **Rehabilitation of Degraded Peatlands** provides an insight on rehabilitation that can be undertaken at national level. The proposed rehabilitation measures take into account the unique features of peatlands in the Mekong sub-region.

This guideline has been prepared by Global Environment Centre (GEC) for the Mekong Peatlands Project financed by the Global Environment Facility (GEF) through International Union on Conservation of Nature (IUCN), in partnership with the governments of Cambodia and Lao PDR.

**Project component on Myanmar was suspended due to the political situation.*

CHAPTER 1: INTRODUCTION

1.1 Peat, Peatland Characteristics and Types in Mekong Sub-Region

Peat

Peat or organic soil, technically known as histosols, are formed by accumulation of organic materials at the soil surface. These materials consist of undecomposed, partially decomposed and highly decomposed plant remains. Tropical lowland peatlands are mainly formed through accumulation process of plant material – mainly tree roots, dead wood and other materials. Temperate and boreal (as well as upland and montane) peat is mainly formed by accumulation plant materials from mosses, grasses and sedges. Peat can be classified by using their degree of decomposition and fibre content using Von Post Scale. According to American Society for Testing and Materials (ASTM) standard, peat soils are classified into three categories, namely fibric, hemic and sapric.

Table 1: Classification of peat soils through Von Post Scale

Peat Layer/Class	Details	Von Post Scale	Fibre Content
Fibric	Least decomposed	H1 - H4	>66%
Hemic	Partially decomposed	H5 - H7	33% - 66%
Sapric	Highly decomposed	H8 - H9	<33%

Peatland

A peatland is an area with a layer of naturally accumulated organic materials. Peatlands are the most widespread of all wetland in the world, representing 50% to 70% of global wetlands¹. They cover around 4 million square kilometre (km²) equivalent to 3% of the land and freshwater surface of the planet. These ecosystems are characterized by its unique ability to accumulate and store dead organic matter under stagnant water saturation. The ecosystems are also fairly extreme with low oxygen content, presence of toxic elements and low availability of plant nutrients. Water chemistry varies from alkaline to acidic² and reduced decomposition rate as the water level is high which prevent any aerobic activities. The accumulation of organic materials in the area is due to the rate of vegetation biomass accumulation is greater than rate of decomposition.

Peatland Forest

Peatland forests are areas where natural or semi-natural forests occur on peat deposits³. Within Southeast Asia, Peat Swamp Forest (PSF) is the main wetland forest type where it originally covering about 25-million-hectare areas and provides many benefits for water resources management, climate regulation, biodiversity conservation, production of timber and non-timber forest products, and support for local livelihoods⁴. The term tropical peat swamp is defined as land containing peat in the tropical or subtropical zone. A tropical peat swamp forest is then defined as land qualifying as forest located on tropical peat swamp.

¹ Exploitation of northern peatlands and biodiversity maintenance: a conflict between economy and ecology (https://www.researchgate.net/publication/41083374_Exploitation_of_Northern_Peatlands_and_Biodiversity_Maintenance_A_Conflict_between_Economy_and_Ecology/link/59f4fa8eaca272607e2a89cb/download?tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmtpY2F0aW9uIiwicGFnZSI6InB1YmtpY2F0aW9uIn19)

² Wise use of mires and peatlands – Background and principles including a framework for decision-making (2002)

³ Guidelines on Integrated Management Planning for Peatland Forests in Southeast Asia (2014)

⁴ Enhancing Sustainability of Forestry Practices on Peatlands (2014)

Peatland Characteristic in Mekong Sub-Region

Based on various assessments undertaken in the Mekong Sub-region, specifically Cambodia, Lao PDR and Myanmar, seven (7) types of peatlands have been identified. These types of peatlands⁵ are listed as below:

(1) Mangrove Lagoonal Peatlands	• Lagoonal peat deposits formed in coastal lagoons and river systems, and vegetated with mangrove tree species • Found in Cambodia
(2) Floating Peatlands	• Floating vegetation mats held together by a dense rootmass which forms a floating peat layer up to 1m thick. • Found in both Lao PDR & Myanmar
(3) Lake Shore Peatlands	• similar to floating peatlands as it is formed by lakeshore vegetation combined with floating vegetation mats held together by the root system. • Found in Cambodia, Lao PDR & Myanmar
(4) Pond/Swamp Peatlands	• A development stage of the lakeshore or floating peatlands where the entire body has mostly been infilled with peat and vegetation. • Found in Cambodia, Lao PDR & Myanmar
(5) Burried Peatlands	• Naturally formed peatlands which have subsequently been covered with a layer of sediments washed from surrounding hills. • Found in Cambodia & Myanmar
(6) Spring Mound Peatland	• A calcareous spring mire (or pring mound peatland) is a peat forming ecosystem with sedge vegetation that is fed by calcareous groundwater that regularly depositing travertine (calcite) on the surface of the mire (forming thin layers of the calcite throughout the mound. • Found in Myanmar
(7) Floodplain and Deltaic Peatlands	• This type of peatland may be formed behind coast but can be found inland due to land accretion with features of tall vegetations in the edge of dome but stunted forest in the central portion of the dome. • Found in Myanmar

Extent of peatlands in the Mekong Sub-region

The total area of confirmed and potential peatlands in Mekong sub-region is estimated to be 158,237 hectare (ha) (Table 2). This is based on multiple sources including recent assessments undertaken by the Mekong Peatlands Project and SUPA projects in the countries. The distribution of confirmed and potential peatlands the in Mekong countries as shows in Figure 1.

⁵ Updated from Training Module 1A Peatland Identification: Definition, Characteristics and Identification of Peatlands

Table 2: Distribution of peatlands in Mekong sub-region

Countries	Peatland area (ha)	Reference
Cambodia	57,000	Assessment reports, 2014-2015, SEApeat Project, Peatland Surveys and Mapping 2023
Lao PDR	1,822	Assessment reports, 2014-2015, SEApeat Project, Peatland Surveys 2023
Myanmar	11,233	Assessment reports, 2014-2015, SEApeat Project
Thailand	64,555	National Action Plan on Peatlands (NAPP)
Vietnam	24,000	National Action Plan on Peatlands (NAPP)
TOTAL	158, 610	Estimated figures from multiple sources as listed above

PEATLAND IN MEKONG COUNTRIES

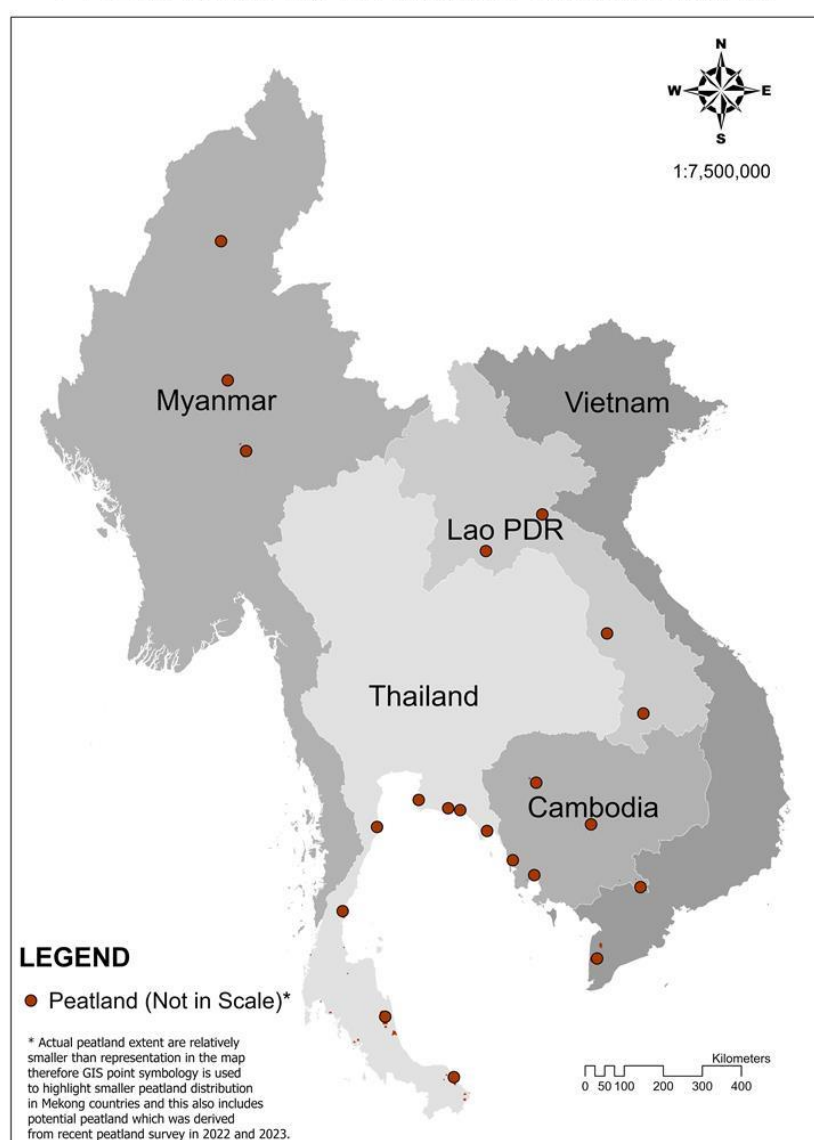


Figure 1: Distribution of confirmed and potential peatlands in Mekong countries

1.2 Values and Functions of Peatland in Mekong Sub-region

Peatlands are important ecosystems for a wide range of wildlife habitats supporting important biological diversity and species at risk, freshwater quality and hydrological integrity, carbon storage and sequestration, and geochemical and paleo archives. In addition, they are inextricably linked to social, economic and cultural values important to human communities

worldwide. Their total carbon pool exceeds that of the world's forest and equals that of the atmosphere.

Natural peat swamps in Southeast Asia have been recognized as important reservoirs of biodiversity and stratigraphic information and exhibit a range of important ecological and natural resource functions. In particular, they contain a large number of endemic tree species many of which are of significant commercial value⁶.

Peatlands worldwide play a major part in regulating water in the ecosystem. They serve as freshwater reservoirs and so stabilize water levels and reduce peak-flow. Coastal peat swamps act as a buffer between marine and freshwater systems, preventing any saline intrusion into the coastal land and the groundwater. Peatlands also serve as a natural gene bank, by preserving potentially useful varieties of plant and animal species at global scale⁷.

Aside from that, further details on benefit provided by intact peatlands that align with ecosystem services as follows.

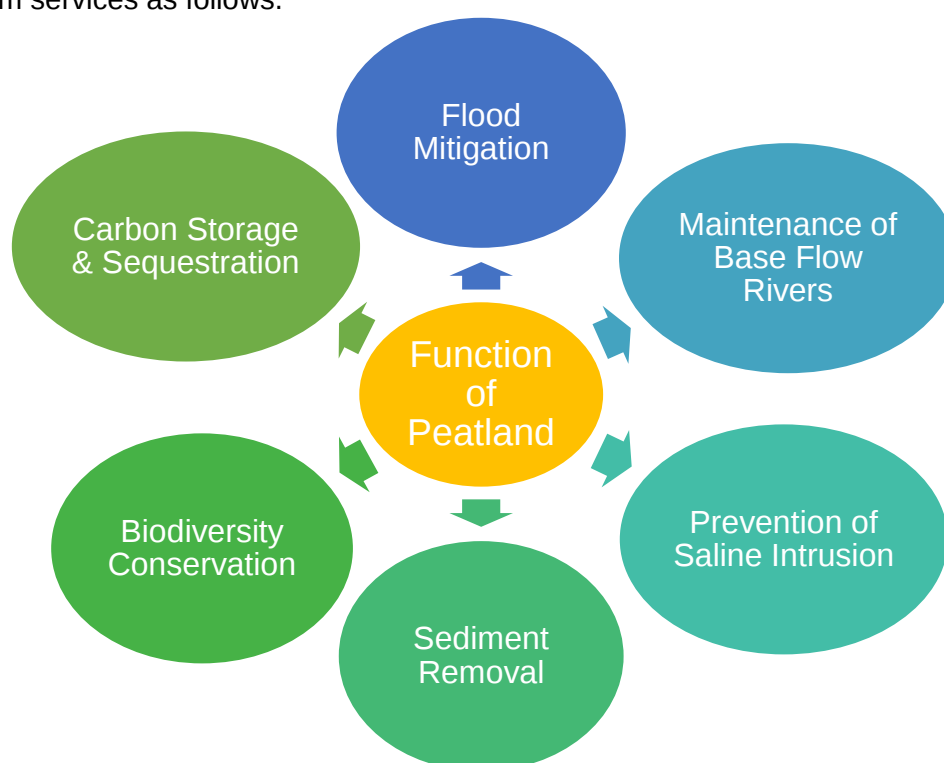


Figure 2: Overall functions of peatland ecosystem to the Mekong Sub-region

1.3 Aim, Intent and Target Audience for These Guidelines

Aim

The overall aim of this Guideline for Conservation, Rehabilitation and Sustainable Use of Peatlands is to provide guidance to policy makers and land managers on the functions and values of peatlands and how to protect, maintain and rehabilitate these important ecosystems. The guideline will also share information on best management practices (BMPs) for peatlands that have been implemented in Southeast Asia region. It will also serve as a baseline for the countries in Mekong sub-region to refer in development of National Action Plan for Peatlands

⁶ Restoration of tropical peatlands: efforts undertaken by the EU funded restoration project, Henk Wösten (2008),

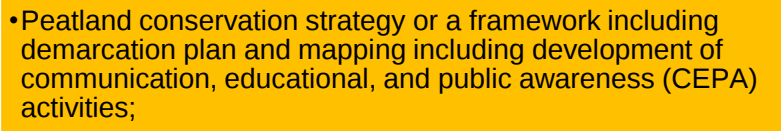
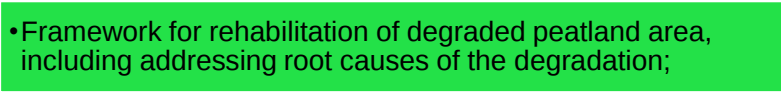
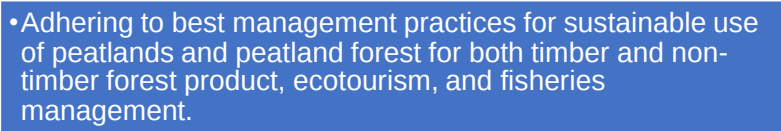
⁷ RSPO Manual on BMPs for Management & Rehabilitation of Peatlands

(NAPP) and other strategies and plans for sustainably managing peatlands and other wetland ecosystems.

Intent

This guideline is intended to inform the sustainable planning, development and management of peatlands in the Mekong sub-region to support conservation effort and land management. They draw on the experiences from countries in the Mekong sub-region as well as from other AMS.

The Guidelines for Conservation, Rehabilitation and Sustainable Use of Peatland provides:

- (i)  • Peatland conservation strategy or a framework including demarcation plan and mapping including development of communication, educational, and public awareness (CEPA) activities;
- (ii)  • Framework for rehabilitation of degraded peatland area, including addressing root causes of the degradation;
- (iii)  • Adhering to best management practices for sustainable use of peatlands and peatland forest for both timber and non-timber forest product, ecotourism, and fisheries management.

Target Audience

This document is intended primarily for the uses of local, regional and national planning authorities including peatland managers within the Mekong sub-region. The guideline can be used as a source of information for engagement and awareness for government agencies, local communities and the public. It may also be used to guide the management of peatland conservation areas.

Target Audience

1	Governmental Agencies
2	Non-governmental Organisations
3	Local Communities

CHAPTER 2: GENERAL GUIDING PRINCIPLES FOR PEATLAND MANAGEMENT

This Guideline for Conservation, Rehabilitation and Sustainable Use of Peatland are based on ASEAN experience and best practices for peatland assessment and management in is based on three (3) elements:

- i. Recognition of good practices in conservation of the peatlands which including methodology in assessment and inventory, demarcation, establishment of conservation areas, and communication, educational and public awareness (CEPA) to promote the conservation work;
- ii. Recognition and aware of the country's peatlands status which involves case study in root causes of degradation on the peatland area, with reference to policies and principles, and contribute to planning for rehabilitation through both integrated multi-stakeholder engagement and landscape approaches;
- iii. Recognition on good practices in sustainable use of peatlands using a landscape approach considering sustainable agriculture, forestry management, and natural resources management.

Guiding Principles for Peatland Management

This Guideline is based on some core guiding principles as follows:

a) Maintain natural hydrology and hydrological linkages

This Guideline emphasizes the need to maintain natural hydrology and hydrological linkages as far as possible within peatlands, as an integral part of the management process. Managers must recognize both the linkages within the peatland system and the natural, seasonal water table fluctuations that may be present. Without natural hydrology, any peatland system will ultimately be compromised. Any activity that drains the peatlands, or lowers the natural water table will have a negative impact on the peatland. Likewise, excess flooding and raising of the water table will negative impacts too. Dams and barriers that prevent, reduce or modify natural cycles of inundation and water level fluctuation need to be avoided.

b) Use a catchment or basin approach

A second emphasis of this Guideline and strategies is the need to consider the “unit of management” within a landscape context. In most cases, it is recommended and recognized that a catchment or basin approach to ecological management is desired. Thus, a peatland cannot and should not be managed in isolation of its surrounding landscape. The intrinsic ecological, hydrological and social linkages between peatlands and their catchment must always be considered in this process. The maintenance of ecological functions within the system should be a major management target.

Large and contiguous areas of peatland should not be divided and developed in a piecemeal way. The best options for remaining large and contiguous areas of peatland are for conservation of the ecosystem services and functions, and protection against future developments.

c) Ecosystem-based approach

Peatlands are critical and unique ecosystems which need to be managed using an ecosystem-based approach. This means that the management and rehabilitation of the peatland ecosystems must be in line with the natural characteristics of that ecosystem. The specific plants and animals within a peatland are dependent on natural hydrological and temporal balances – adapted to changing water levels or different ecological niches within the system. In order to manage and maintain peatlands, there is a need to establish and maintain the

appropriate natural conditions suitable for the growth and survival of peatland species. The water regime (flooding/drying) should not be changed, nutrient balance or species assemblage from the natural situation and through rehabilitation bring the system back towards a near natural situation. If we do not follow this, the peatland ecosystem will not survive or thrive. If we can restore the natural processes and water regime, a peatland can often start to recover itself. These should be no introduction of exotic or invasive plants and animal species that could upset the natural balance.

An important consideration in the management of peatlands is the need to apply the **“Precautionary Principle”**. In other words, policy-makers should proceed with caution when making interventions in sensitive and natural environments such as peatlands, to prevent unexpected and severe future costs as a result of a badly planned project.

d) Stakeholder and community participation approach

Effective **community and stakeholder participation** is an essential element of peatland management process. Community participation and stakeholder involvement will provide the best option for ensuring management actions are sustainable and maintained over a long-time frame. Stakeholders' tenure and use rights must be well defined and secure, or else fully compensated if lost.

In addition, the **values** of peatland products and services (both over the long-term and short-term) need to be adequately assessed and considered as an integral part of the management planning process. Managers also need to fully understand the **multiple-use approach** in peatland management – identifying which uses are compatible, which may be prioritized and which may be reduced will be an important part of the management planning process. Environmental and conservation objectives must be incorporated into the economic decision-making process.

e) Protect all natural peatlands and restore or rehabilitate degraded peatlands

Peatlands in the Mekong sub-region are extremely rare and important for a conservation purpose. Therefore, any remaining natural peatland should be protected and not developed for agriculture, settlement or other purposes. It is also important to restore and rehabilitate damaged peatlands as far as possible especially when they are linked to intact peatlands, have high potential for rehabilitation or are of a rare or unique type. Full ecosystem restoration is mostly impossible in the short term, but restoration of the hydrology of the peatland and rehabilitation of vegetation cover may be an option. Hydrological linkages can be (at least partially) restored through blocking and damming of drains and other channels that contribute to the drying of the peat soils. Prevention of fire during the restoration process will be an important consideration, to prevent gains made being wiped out in a short period.

In addition, the natural cycles of seasonal hydrology should be restored whenever possible. Regeneration of natural vegetation and supplementary planting of appropriate tree and shrub species will be a secondary consideration after restoration of hydrology. Options to include agro-forestry and other forestry uses of the peatland following rehabilitation should be considered to enable long-term recovery of the hydrology first.

CHAPTER 3: GUIDELINES FOR CONSERVATION, REHABILITATION AND SUSTAINABLE USE OF PEATLANDS

This chapter provides guidelines for conservation, sustainable use and rehabilitation of peatlands. There are three (3) main steps in order to reach the sustainable practices and best management practices (BMPs) in managing peatland landscape.



Figure 3: Three main themes to sustainably manage peatlands in Mekong sub-region.

In the first step, conservation of the peatlands, the document explains practices in peatland mapping and inventory in Mekong sub-region and shares ASEAN experiences. Emphasizing the significance of peatland identification, establishment of peatland management units, and implementation of CEPA programmes for raising awareness.

The second theme, sustainable use of peatlands, addresses the current uses of peatlands in the sub-region. It will be supported by sustainable practices from various lesson learnt from AMS. This includes natural resources management, fisheries, timber and non-timber forest products, ecotourism and potential livelihood activities to enhance community development together with protection of the peatlands.

The third theme, on rehabilitation of the degraded peatlands, focusses on the main causes of degradation, principles of rehabilitation and lessons learnt. Additionally, it emphasizes the importance of incorporating multidisciplinary practices in stakeholder engagement, coupled with a landscape-scale approach.

3.1 Theme 1: Conservation of The Peatlands

3.1.1 Value of Peatlands for Conservation

Peatlands play a crucial role as climate buffer in mitigating impact of climate changes. This is due to their capacity to store vast amount of carbon through accumulation and preservation of dead plants and animals over time. According to Intergovernmental Panel on Climate Change (IPCC) special report in 2020⁸, Agriculture, Forestry and Other Land Use (AFOLU) activities accounted for around 13% of carbon dioxide (CO₂), 44% of methane (CH₄), and 81% of nitrous oxide (N₂O) emissions from human activities globally during 2007-2016, representing 23% of total net anthropogenic emissions of greenhouse gas (GHG).

Sustainable management of peatland ecosystems is critical in the reducing emissions from the AFOLU sector. Peatlands globally are the most important carbon store on the planet storing twice as much carbon as the biomass of the world's forests on only 3% of the land area. Peatlands are concentrated spots for carbon storage with peatlands in many areas storing 10-20 times more carbon per ha than adjacent land areas. This also means that when peatlands are degraded, they have the potential to release much more GHG than adjacent areas. In the Mekong Sub-region, peatlands where present need to be protected for their carbon store and sink function, as well as other values.

⁸ Climate Change and Land: An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems
<https://wedocs.unep.org/bitstream/handle/20.500.11822/29261/IPCCLand.pdf?sequence=1&isAllowed=y>

Peatlands in the Mekong Sub-region are also very important for biodiversity conservation as they support a variety of rare and endemic species of plants and animals. Table 3 shows some endemic species found in Lao PDR based on the biodiversity assessment report.

Peatlands in the Mekong Sub-region play a crucial role in biodiversity conservation, they support a variety of rare and endemic species of flora and fauna. In Cambodia and Lao PDR particularly, these unique ecosystems provide vital habitats for a diverse range of species. Among the flora, numerous endemic plant species thrive in the peatland environments, including various orchid species, pitcher plants and rare tree species. Similarly, numerous endemic and endangered fauna species living in these peatland ecosystems. The presence of iconic species underscores the importance of preserving and restoring peatland ecosystems in the Mekong countries to safeguard their biodiversity and ecological integrity for future generations. **Table 3** provides a snapshot of some of the endemic species found in the Lao PDR, highlighting the unique biological heritage in the peatlands.

Table 3: Some endemic species found in peatland area in Lao PDR (SUPA-Lao Project)

No	Family	Species names/scientific names	IUCN Red List
Plant species			
1	Datisceae	Saph / <i>Tetrameles nudiflora</i> R.Br.	LC
2	Dipterocarpaceae	Resin tree / <i>Dipterocarpus alatus</i> Roxb. Ex G.Don	VU
3	Dipterocarpaceae	Ironwood resin tree / <i>Hopea odorata</i> Roxb.	VU
4	Orchidaceae	Callus Paphiopedilum / <i>Paphiopedilum callosum</i>	EN
5	Fabaceae	Siamese Rosewood / <i>Dalbergia cochinchinensis</i>	CR
Mammals			
1	Cercopithecidae	Laotian Langur / <i>Trachypithecus laotum</i>	EN
2	Hipposideridae	Thailand Leaf nosed Bat / <i>Hipposideros halophyllus</i>	VU
3	Microhylidae	Irrawaddy Narrowmouth Frog / <i>Microhyla irrawaddy</i>	DD
4	Rhinolophidae	Thai Horseshoe Bat / <i>Rhinolophus thailandensis</i>	LC
5	Tragulidae	Silver-backed Chevrotain / <i>Tragulus versicolor</i>	DD
Fish			
1	Clariidae	Broadhead catfish / <i>Clarias macrocephalus</i>	DD
2	Osphronemidae	Mekong fighting fish / <i>Betta smaragdina</i>	DD
3	Cyprinidae	Javaen barb / <i>Systomus rubripinnis</i>	DD
4	Bagridae	Catfish / <i>Hemibagrus filamentus</i>	DD
5	Pangasiidae	Mekong Giant Catfish / <i>Pangasianodon gigas</i>	CR
Birds			
1	Cisticolidae	Cambodian Tailorbird / <i>Orthotomus chaktomuk</i>	NT
2	Dicaeidae	Cambodian Flowerpecker / <i>Dicaeum cambodianum</i>	LC
3	Phasianidae	Annamite Crested Argus / <i>Rheinardia ocellata</i>	CR
4	Stenostiridae	Grey-headed Canary-Flycatcher / <i>Ulicicapa ceylonensis</i>	CR
5	Scolopacidae	Wood Snipe / <i>Gallinago nemoricola</i>	VU
Amphibians			
1	Bufonidae	Siamese Stream Toad / <i>Ansonia siamensis</i>	EN
2	Dicoglossidae	Chiang Mai Rain-Pool Frog / <i>Minervarya chiangmaiensis</i>	LC

No	Family	Species names/scientific names	IUCN Red List
3	Dicroglossidae	Khammouan Fanged Frog / <i>Limnonectes khammonensis</i>	DD
4	Megophryidae	Spotted Litter Toad / <i>Leptobrachella maculosa</i>	EN
5	Salamandridae	Khammouan Crocodile Newt / <i>Tylototriton notialis</i>	VU
Reptiles			
1	Agamidae	Orlov's Forest Lizard / <i>Bronchocela orlovi</i>	DD
2	Colubridae	Cambodian Kukri Snake / <i>Oligodon mouhoti</i>	LC
3	Gekkonidae	Chiang Mai Dwarf Gecko / <i>Hemiphyllodactylus chiangmaiensis</i>	LC
4	Geoemydidae	Myanmar Brown Leaf Turtle / <i>Cyclemys fusca</i>	LC
5	Scincidae	Laotian Water Skink / <i>Tropidophorus laotus</i>	EN

IUCN Red List (RL): EN-Endangered; VU-Vulnerable; NT-Near Threatened; LC-Least Concern; DD-Data Deficient; and CR-Critically Endangered

There are many frameworks that were initiated under the ASEAN Agreement on Transboundary Haze Pollution (AATHP) to support peatland conservation as well as to address the challenges of transboundary haze, including ASEAN Peatland Management Initiative (APMI), ASEAN Peatland Management Strategy (APMS), and ASEAN Haze-Free Roadmap. ASEAN has taken initiatives to further enhance the conservation of peatlands with the development of ASEAN Task Force on Peatland (ATFP) established in 2013 to guide the implementation of the APMS. The APMS 2006-2020 was reviewed in 2021 and a new APMS 2023-2030 was adopted in August 2023.

Table 4: Focal Areas and their respective Goals for APMS 2023-2030

 Key Focal Areas;  Supportive Focal Areas

No	Focal Area	Goal	Objectives
1	Inventory, Mapping and Assessment	All peatlands are mapped according to their characteristics and hydrological regime.	1.1 Peatlands in all of ASEAN are mapped based on their Peatland Hydrological Units (PHU) and management status. 1.2 Management of peatland ecosystems is based on PHU level carbon balance in relation to land use change and changing environmental conditions.
2	Restoration and Rehabilitation	30% of degraded peatlands in ASEAN have been or are under rehabilitation by 2030 as agreed under the Global Biodiversity Framework.	2.1 Legal frameworks that support strict conservation (preferably IUCN Category 1a) of remaining pristine peatlands are approved by all Member States. 2.2 Degraded peatlands are restored, and non-drainage-based agriculture systems are being applied on all peatlands used for agriculture.
3	Community Livelihoods	Sustainable management of peatlands has significantly progressed across sectors, improving livelihoods for and empowerment of local communities.	3.1 Local community livelihoods and socio-economic development in peatlands that is drainage-free are developed. 3.2 Land tenure conflicts on peatland are minimized. 3.3 Existing agriculture on peatlands has adopted drainage-free agriculture models with no further conversion of peatland. 3.4 Stakeholder engagement (in both government, NGO, community and private sector) is strengthened [improved]. 3.5 Community based no drainage sustainable agriculture techniques, including paludiculture, is the main agriculture method being implemented on ASEAN peatlands.
4	Peatland Biodiversity and Ecosystem Conservation	Peatland biodiversity is preserved in-situ and ex-situ with 30% of peatlands in ASEAN included in protected areas and Other effective area-based conservation measures (OECMs) by 2030 in agreement with the Global Biodiversity Framework.	4.1 Conservation management of peatland biodiversity is data driven and aiming for international standards across ASEAN. 4.2 Management plans to improve conservation status of species- and/or habitat are designed and implemented across ASEAN. 4.3 Halt the conversion and degradation of any part of intact peatlands, to avoid further negative impact on the ecohydrological and climate stabilisation character of the entire peatland. 4.4 Protected areas and OECMs are expanded in numbers and/or size to CBD targets.

No	Focal Area	Goal	Objectives
5	Fire Prevention, Control and Monitoring	Transboundary haze from peatland fires is eliminated.	5.1 The ASEAN Guidelines on Peatland Fire Management, which includes the integrated fire management (IFM) approach, is fully implemented across ASEAN. 5.2 Improved environmental education among all levels of stakeholders on the importance of intact peatlands and the fire risks involved of drained peatland. 5.3 Improved fire information and early warning system is developed and applied. 5.4 Adaptive community-based fire management (CBFiM) framework for fire free community programmes in ASEAN is adopted by Member States.
6	Peatland and Climate Change	Peatlands protected and rehabilitated to enhance resilience to climate change and reduce emissions towards a target of net zero emissions by 2050.	6.1 Synthesis of data and knowledge to develop management plans for peatland ecosystems management based on PHU level carbon balance in relation to land use change, and changing environmental conditions. 6.2 Peatland ecosystems and communities' resilience to climate change is improved based on PHU management. 6.3 Reduced GHG emissions from peatland to help meet the ASEAN Target of Net Zero Emission by 2050.
7	Integrated Peatland Management (IPM)	To ensure integrated multi-stakeholder management of peatlands at a PHU level with the involvement of private sector, agriculture, plantation, forestry and environment sectors.	7.1 All agriculture, plantations and forestry on peatlands are managed in a sustainable manner 7.2 Non-drainage based agriculture techniques, including paludiculture, is the main agriculture method being implemented on ASEAN peatlands. 7.3 Monitoring and evaluation of the implementation of sustainable peatland management at the national level is improved. 7.4 Peatland ecosystems management is based on PHU level carbon balance in relation to land use change and changing environmental conditions. 7.5 Multi-stakeholder partnerships to support IPM are developed. 7.6 IPM is incorporated into national development plans - which include national climate mitigation and adaptation plans.
8	National Policies and Legislation	AMS have adequate regulations, policies and plans to ensure peatlands are	8.1 Policies that specifically addresses and supports alternatives to local community livelihoods and socio-economic development in peatlands are developed.

No	Focal Area	Goal	Objectives
		managed sustainably at the national level.	8.2 Strengthen relevant legislation, policy or regulations specifically related to peatlands, their biodiversity, hydrology, agriculture and preservation, as required. 8.3 Legal tools and regulations of biodiversity conservation and peatland protection is improved.
9	Research	Research in ASEAN is enhanced to support peatland biodiversity conservation, rehabilitation and sustainable management.	9.1 Sustainable Peatland Management (SPM) is widely studied and results readily shared leading to improved management of peatlands in ASEAN.
10	Information Sharing, Awareness & Capacity Building	Awareness/Capacity on par with management needs and requirements	10.1 Raised awareness of sustainable management of peatlands in both government, private sector and communities. 10.2 Awareness on IPM is raised throughout ASEAN. 10.3 Improved technical knowledge and skills among relevant government officials and other managers of IPM. 10.4 Improved knowledge sharing between institutions of higher learning, NGOs, development agencies and governments. 10.5 Awareness of improved fire information and early warning system is widespread and applied.
11	Regional Cooperation	AMS working together to share best practices and collaborate to enhance sustainable peatland management throughout ASEAN	11.1 Cross-sectoral collaboration programmes among relevant stakeholders involving biodiversity, wetland agriculture, fire prevention and climate change in ASEAN are developed and adopted. 11.2 Regional frameworks specifically related to peatlands, their biodiversity, hydrology, agriculture and preservation are identified. 11.3 Existing frameworks on environment and peatland related agreements and regional cooperation mechanisms are strengthened.
12	Sustainable Financing	Sustainable financing of peatland protection and management is ensured.	12.1 To have established a Peatland Sustainable Management and Development Fund. 12.2 To have established national and regional partnerships with private companies for carbon offsets and other investments. 12.3 Operationalise the ASEAN Investment Framework (AIF) for Haze-free Sustainable Land Management to generate resources to support APMS implementation. 12.4 National budgets specific to peatlands is developed by 2030.

Six AMS, namely Brunei Darussalam, Indonesia, Malaysia, Thailand, Philippines and Vietnam have developed their own National Action Plan for Peatlands (NAPP). This highlights their commitment to preserve the peatland which hold significant values for the climate, biodiversity, nation and its people.

The extent of peatlands in the Mekong subregion is not very large compared to AMS in southern ASEAN – however the peatlands are critical at regional and global levels for unique biodiversity and they play an important role at national and local levels for key ecosystem services and values. These peatlands possess huge values of unique habitat for endemic species and specific livelihood dependency.

The Mekong countries are thus encouraged to initiate inclusion of peatland elements into existing policies and plans, or develop specific laws or legislations for peatlands, along with their NAPP, as appropriate, to support peatland conservation efforts.

3.1.2 Peatland Inventory, Mapping and Demarcation

In the development of a framework or guidelines to conserve specific sites such as peatland and wetland, it is advisable to prioritise the size of the coverage areas. Determining the coverages of the specific areas is crucial in order to start implementing any sustainable management plans and establish a network of stakeholders, including local communities. Determining the extent and status of peatlands in the Mekong sub-region is also crucial to harmonise the inventory and assessment of peatlands. Below are the recommended steps to be undertaken.

Inventory of Peatland

Peatland inventory is an important step before identifying the areas suitable for rehabilitation. This section outlines four steps that countries can consider to effectively manage peatlands.

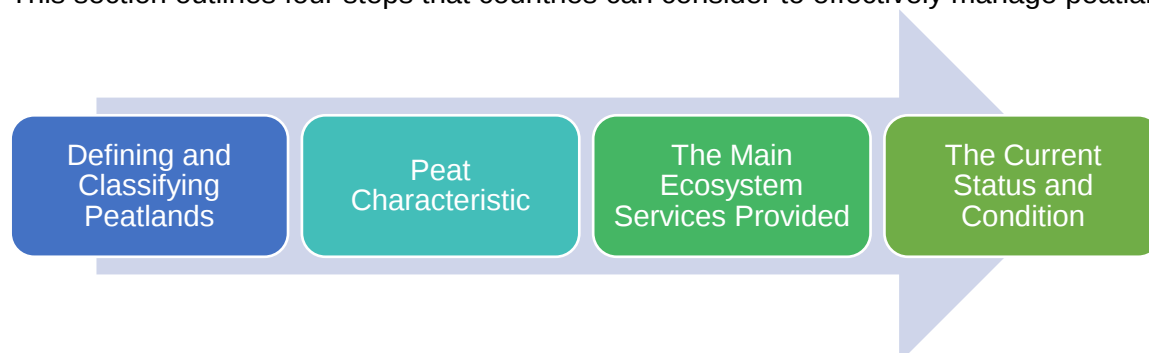


Figure 4: Focus checklist activities for peatland inventory in Country⁹

In order to properly perform peatland inventory, information must be gathered on key factors notably (1) catchment area, (2) peatland area, and (3) detailed site to be surveyed.

⁹ Guidelines on Integrated Management Planning for Peatland Forest in Southeast Asia, 2014

CATCHMENT AREA

- Catchment area is defined as the area of land within which water flow to a major river.
- The boundary of the catchment area is identified by the hill ridges that separate flows to different rivers.
- In the Mekong Sub-region, many peatlands occur in lake or river basins and so the mangement of their respective catchment is important to secure the integrity and conservation of the peatland ecosystems

PEATLAND HYDROLOGICAL /ECOSYSTEM UNIT

- Various lowland peat areas in the Mekong sub-region form between rivers and often shows a dome-shape structure with water input primarily from rainfall. These systems need to be managed as a separate hydrological unit - separate to the river basins.
- For peatlands in lake and river basins, it is importants to delineate the peatland ecosystem boundary i.e. the interface between peat or organic soils and the surrounding mineral soils

DETAILS SURVEY ON PEAT AREA

- Detailed field work should focus on the peatland ecosystem but take into account the catchments
- A broad range of parameters should be assessed including vegetation, hydrology, peat depth and peatland characteristics as well as functions and values

This section emphasises to provide details on surveying peat area through specific assessment methods. These methods can be categorised into two parts namely; (1) desk study, and (2) field works¹⁰. The desk study focuses on pre-assessment data collection to perform a gap analysis, whilst field work is undertaken to collect specific information on the ground to address the gaps identified during the initial analysis.

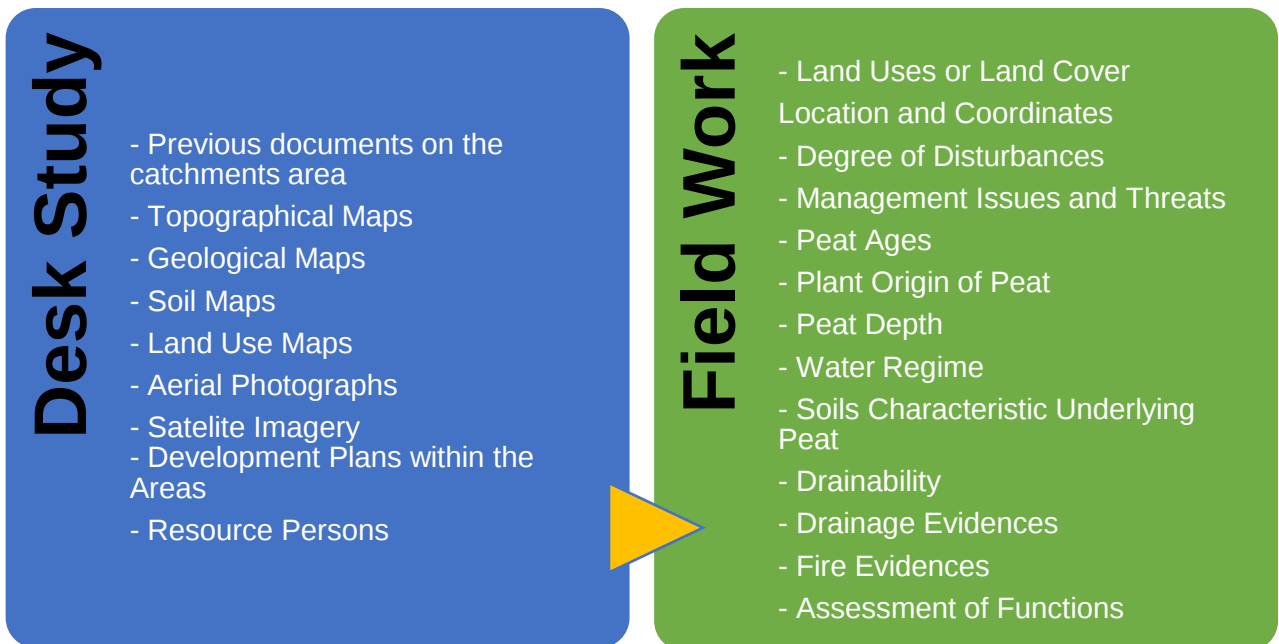


Figure 5: Assessment methods.

Mapping

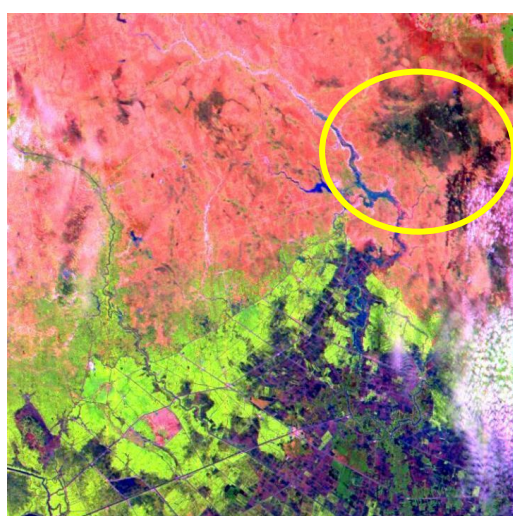
Various technologies, including remote sensing analysis and GIS interpretation, play a crucial role in the mapping process. As per conducted under SEApeat Project in 2011-2015 in Cambodia, Lao PDR and Myanmar, a group of collaborators used the combination of the

¹⁰ Training Module on Peatland Assessment and Management, 2011

methods for peatland assessment, ground verification and mapping to produce an interim peatland map.

In the following years, various Regional Programme such as GEF-Mekong Peatlands Project, EU-SUPA Project and IFAD-MAHFSA Programme, have been providing training programmes and introduced advance techniques in integrating remote sensing for satellite image analysis and GIS applications to prepare country- and/or site-based peatland map.

To effectively apply remote sensing for peatland identification, users must possess an understanding of soil science and biology¹¹. This knowledge supports ground truthing to verify the findings from remote sensing analysis. Different band combinations in satellite data, such as from Landsat 8, can highlight specific materials such as water bodies and buildings, contributing to a comprehensive analysis. In 2022-2023, a multi-temporal satellite image interpretation was conducted and successfully identified a significant potential area of organic soil in the lower Mekong River Basin of Cambodia and in highland areas (Figure 8 and 9).



Peat/organic materials that was extracted for fertilizer production in Cambodia

Figure 6: Utilising Remote Sensing to undertake peat soils analysis in preparing potential peatland for ground verification (Photo credit: Quoi, L.P)

Furthermore, an essential tool for mapping preparation is Global Positioning System (GPS) device. This device can guide finding locations that were imported earlier based on desktop analysis or information gathering, and stores data for tracking purpose. The collected GPS information can be translated and digitized into a map using GIS applications. In addition, use of applications on mobile smartphone such as Avenza Map is recommended for offline mapping, it facilitates navigation and supports surveys, especially in areas with limited signal.



Figure 7: Utilisation of Avenza map smartphone application for limited coverage areas (Photo credit: GEC)

¹¹ Training Module Application of Remote Sensing (RS) and GIS for Peatlands Mapping, 2020

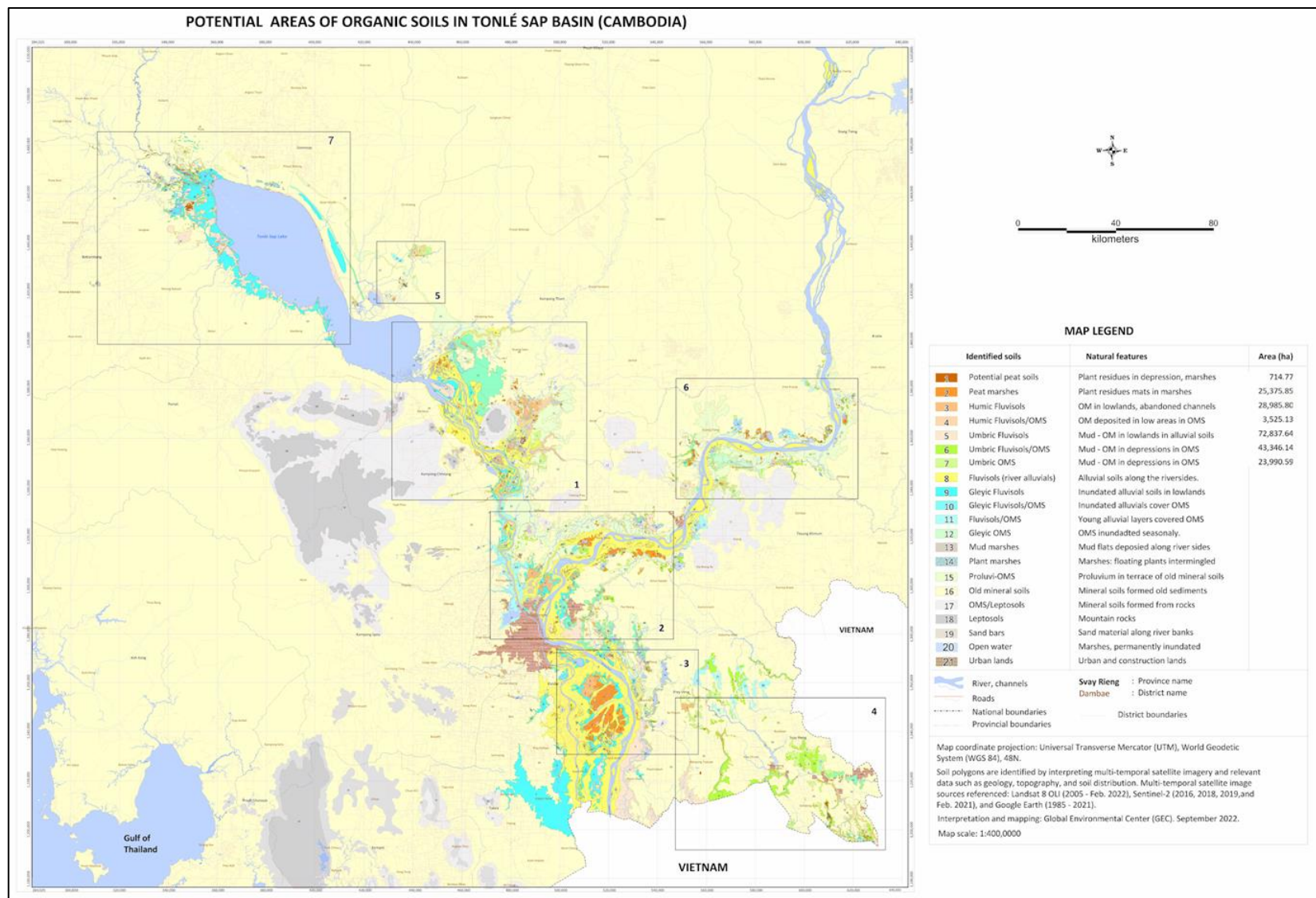


Figure 8: Potential organic soils in Lower Tonle Sap Basin and Lower Mekong River corridor, Cambodia identified from remote sensing assessment

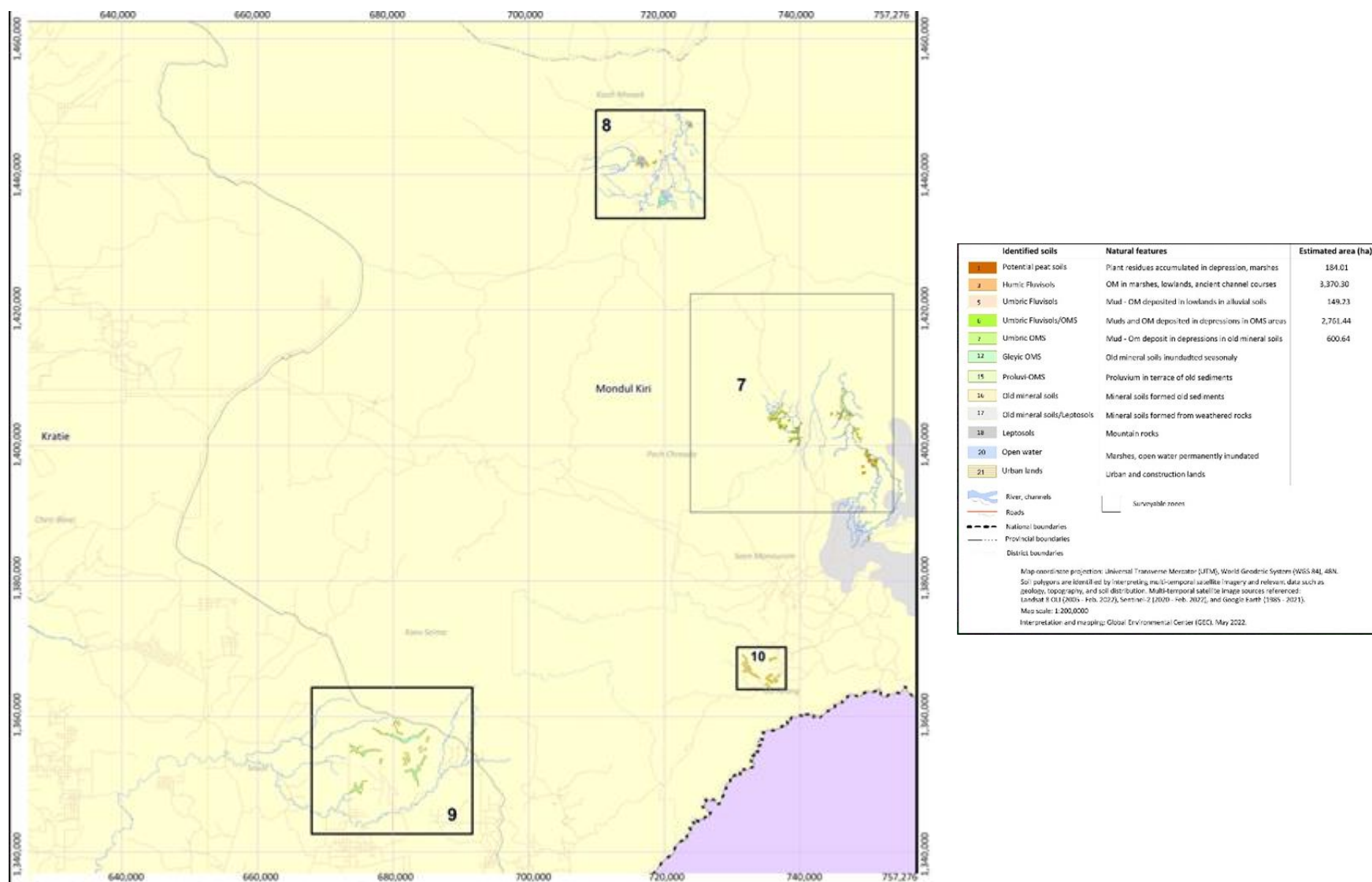


Figure 9: Distribution of potential areas of organic soils in highlands, Cambodia

Demarcation

After completing the mapping of peatland areas, the agency or management unit should prioritise a proper demarcation plan by installing signboards or demarcation stones on the ground. This measure is crucial to inform stakeholders within the designated areas to raise awareness on the conservation works and through multi-stakeholder partnership¹² to strengthen the working relationship of the stakeholders, local authorities and communities for integrated management.

Furthermore, the demarcation plan should be strategically implemented within the context of protected areas and buffer zones, with define limitation on commercial uses. This is essential to prevent further degradation of ecosystem services.



Site demarcation in Koh Kapik, RAMSAR Site, Cambodia (Photo credit: Department of Freshwater Wetlands Conservation, Cambodia)



Demarcation in Nong Fang Dang Peatland, Lao PDR



Demarcation in Thong Pa Pue Peatland, Lao PDR

Figure 10: Example of demarcation activities carried out in Cambodia and Lao PDR (Photo credit: DWR, Lao PDR)

¹² Strategy for Responsible Peatland Management, IPS, 2019

3.1.3 Establishment and Management of Conservation Area for Peatlands (Government Protected Area, Community Conserved Area)

Establishing conservation peatland areas involves coordination across multiple departments or ministries, particularly within national management of ASEAN Region. Indonesia is the only country in ASEAN to have specific national regulations on peatlands (Regulation on Protection and Management of Peatland Ecosystems - 2014 revised 2016). Indonesia also established the Directorate of Peatland Degradation Control (DPDC) under the Ministry of Environment and Forestry in 2014 to implement the regulations and in 2016 established a Peatland Restoration Agency (BRG)¹³, through a Presidential Decree. These agencies work with the Directorate of Forest and Land Fire Control (DFLFC), the Community Disaster Brigade (*Masyarakat Peduli Api*)¹⁴, Peat Care Village Programmes (*Desa Makmur Peduli Gambut* and *Desa Peduli Gambut*) to jointly establish community conservation initiatives for peatlands.

However, peatland management is relatively a new area for countries in Mekong sub-region, the countries can draw valuable lessons from case studies in the Southern ASEAN sub-region, particularly Indonesia in establishing relevant policies and plans to sustainably managing the peatlands.

BOX 1

Peatland Management in Thailand

The peatland management in Thailand is operated under various frameworks such as National Forest Policy, Wetland Policy and Wetland Management Action Plan. Peatlands in Narathiwat and Nakhon Sri Thammarat Provinces are managed under the Royal initiated projects. All management of peatlands is operated in line with the existing laws of the nation, including the Constitutional Code 1997, The National Reserved Forest Act 1964, The National Park Act 1961, The Wildlife Preservation and Protection Act 1992, and The National Environmental Quality Act 1992, as well as laws pertaining to agricultural and fishery activities.

The conservation and sustainable management of peatlands represents a multifaceted challenge that necessitates collaboration across diverse sectors and agencies. Within the Ministry of Natural Resources and Environment (MONRE), multiple departments are responsible to overseeing, maintaining and protecting of peatland in the reserve areas. These departments are responsible with safeguarding these areas from encroachment and forest fires, as well as conducting research to facilitate peatland rehabilitation efforts. Additionally, several departments operating under different ministries, such as agriculture, irrigation, and socio-economic development, also play integral roles in peatland management, each contributing unique perspectives and expertise to ensure the holistic preservation of these invaluable ecosystems.

Based on the National Action Plans for Peatlands in Thailand, Philippines and Vietnam, the steps outlined in Table 5 are important to establish and manage the conservation peatlands area.

¹³ In 2020, the Peatland Restoration Agency is upgraded to Peatland and Mangroves Restoration Agency

¹⁴ Previously was called as Community Fire Brigade or Masyarakat Peduli Api (MPA)

Table 5: Strategies and steps in establishing conservation area's management¹⁵

	Steps	Strategies
1	Determine the Extent and Status of Peatlands	This initial step is essential to define the area to be managed. Utilise tools such as satellite imagery and field surveys to gather comprehensive data for effective decision making
2	Evaluate Constraints	Once the area has been identified, it is important to assess its ecological values, including any management constraints within the area
3	Develop a Management Plan	Plan shall include strategies for maintaining the ecological value of the peatland, ensuring sustainable management practices
4	Implement the Management Plan	Engagement with relevant stakeholders is needed to effectively implement the management plan, that may involve cost-sharing where working on a same landscape or peatland area
5	Monitor and Evaluate (M&E)	This involves regular survey from site and collect feedback from stakeholders, analyse data, compare the progress against the planned indicators, to monitor and evaluate the effectiveness of the implementation. If there are challenges and issues arise during the implementation, there should be steps to identify potential solutions or next steps to overcome the issues, then to re-evaluate the implementation.

Through the information exchange sessions, most of the countries in Mekong sub-region share common challenges in peatland management. Even though each country has specific and unique peatland types, but they had to deal with impacts and consequences for being unaware of the peatland existence and the peatlands were allocated for developments. Below are the common threats on peatlands faced by countries in Mekong sub-region¹⁶.

¹⁵ Strategy for Responsible Peatland Management, IPS (2019)

¹⁶ Peatland Status and Management in Thailand (2009), Vietnam National Action Plan for Peatland (2011). Best Management of Peatland in Myanmar: Experience of Agriculture on Peatland: A Case Study of Taung Poe Gyi Village (2014)

Lack of information, knowledge and awareness on peat in the overall view

Lack of capacity for fire and hydrology management on peatland

Lack on sectoral approaches in land use planning in peatland area

Lack on multi- and inter-sectoral cooperation of sustainable use and management of peatlands

Poverty and community dependency on peatland natural resources

Illegal encroachment and felling on protected peatland areas

Large scale development projects and urbanisation

Forest fires

Drainage for agricultural uses

Sediments deposition due to erosion

Climate changes

Approaches

As suggested by Thailand's Environmental and Natural Resources Research Center from Rangsit University¹⁷, there are several approaches need to be undertaken by government or management unit of peatland to ensure the long-term sustainable conservation of peatland.

These are:

- i. Review of land use zoning for management and conservation
- ii. Rehabilitation effort to be maintained or improved
- iii. Intensively protect degraded areas
- iv. Strengthen and promote awareness
- v. Establish a technical working group on peatland management
- vi. Conduct a national peatland inventory
- vii. Create database on peatlands
- viii. Formulate national policies, measures and guidelines for peatland management; and
- ix. Collaborate and work closely with the local community, other countries and relevant international organisations.

¹⁷ International 'Seminar on Wise Use and Sustainable Management of Peatland' (2003)

3.1.4 Recognition of Peatlands in Existing and New Policies and Regulations

As per date, only two countries in Mekong sub-region have developed standalone National Action Plan for Peatlands (NAPP) – i.e. Thailand and Vietnam. Developing a NAPP to formulate strategy and establish a workable institutional framework with relevant agencies to oversee the implementation of the NAPP. While waiting for the NAPP to be developed, the countries may consider to integrate the peatland aspect into their existing national policies or plans that support ongoing conservation initiatives. Cambodia and Lao PDR have made efforts to mainstream peatland aspect into the national policies addressing them under various sectors such as forestry, water resources, land use law and wetlands conservation initiatives¹⁸. The following are several frameworks and policies in Cambodia and Lao PDR that have identified and incorporated peatland considerations.

Cambodia



- ☐ Pentagonal Strategy Plan
- ☐ Environmental Code
- ☐ National Strategy and Action Plan for Protected Area Management.
- ☐ Circular Strategy plan on Environment
- ☐ Site Management Plan
- ☐ Enhancing Community Protected Area Livelihood
- ☐ Ecotourism and Livestock Raising

Lao PDR



- ☐ National Water Resources Strategy 2030
- ☐ Decree on Wetland endorsed by Prime Minister
- ☐ Beung Kiat Ngong Ramsar Site Management Plan
- ☐ Forestry Law 2019
- ☐ Protected Area Decree 2023
- ☐ Land Law 2019
- ☐ Wildlife Law 2023
- ☐ Water and Water Resources Law 1996

BOX 2

Protected Areas Management in Cambodia

To date, there has been no specific action plan dedicated to peatland management in Cambodia. However, relevant laws governing wetland management, such as the Protected Area Law, mandates the formulation of a National Protected Area Strategic Management Plan (NPASMP). This plan serves as a comprehensive framework to guide the future planning and management of individual protected areas. In response, the Royal Government of Cambodia (RGC) has issued the National Protected Area Strategic Management Plan 2017 – 2031. This strategic blueprint is designed to support the management of protected areas across the nation, ensuring the preservation of a network of sites that significantly contribute to Cambodia's economy and sustainable development. By prioritizing the conservation and sustainable utilization of biological, natural, and cultural resources, as well as other ecosystem services, the plan underscores the RGC's commitment to safeguarding Cambodia's invaluable natural heritage for present and future generations.

¹⁸ Under implementation of The Mekong Peatlands Project

3.1.5 Special Protection and Management Measures for Peatlands in Protected Areas

It is important to conserve the tropical peatlands, it is very important of conserving the remaining tropical peatlands, the governments should avoid new peatland conversion to other land uses. Instead, the focus should be on restoration efforts, particularly rewetting degraded peatlands. In cases where peatlands have already been drained, possible actions should be exploring options for rewetting, conservation, and alternative sustainable uses.

In addition, some key measures for peatland protection and management that are derived from practices in other AMS are shown below¹⁹:

Key measures	Conduct fire risk assessment and mapping
	Analyse root causes and implement mitigation measures
	Establish monitoring programmes for hotspots, water table, patrolling and weather
	Enhance capacity, competency and resources
	Engage with local communities and stakeholders
	Collaborate with authorities
	Develop an action plan with time-bound commitments

Peatland serves as an important hydrological unit and important component of global wetlands, play a significant role in regulating water sources within ecosystems. Peatlands that serve as a freshwater reservoir, stabilising water levels and reducing peak-flow shall be considered for inclusion in special protection management plan. It is important to understand the location and nature of the area related or connected to peatland hydrological unit (PHU) to determine management in landscape level with specific policies. Some landscapes might contain multiple peatlands which might vary in nature – such as protected peat swamp area, private sector’s cultivated peatlands with commodity crops, and community cultivated peatlands with agricultural crops, thus appropriate integrated management plan is needed in order to effectively manage the landscape with stakeholder involvement.

3.1.6 Education and Interpretation in Peatland Protected Areas

Promoting and integrating peatland into public awareness is crucial to ensure the public understanding and awareness on the importance of integrated management of peatland conservation, rehabilitation and its sustainable use. In order to achieve significant impact in delivering education and public awareness, countries should adopt a Communication, Education, Participation and Awareness (CEPA) approach. This CEPA framework has been discussed at a high-level platform, including Ramsar Convention’s CEPA 2009-2015.

It is important to understand the meaning of the acronym “CEPA”²⁰.

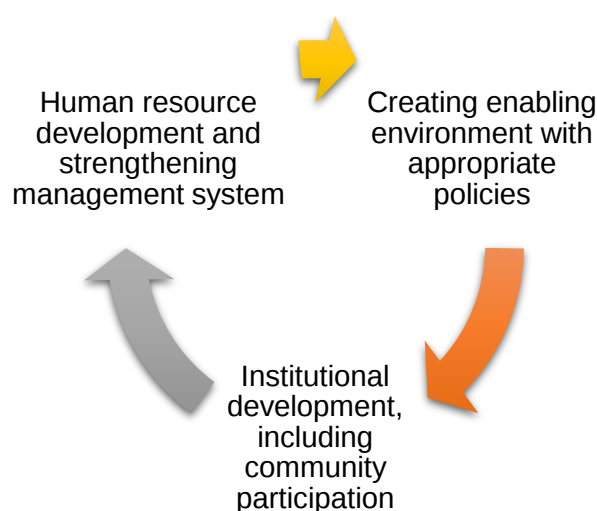
¹⁹ Peatland conservation and restoration, Wetland International (<https://malaysia.wetlands.org/our-approach/peatland-treasures/peatland-conservation-and-restoration/#read-more>)

²⁰ Guidelines of Integrated Management Planning for Peatland Forests in Southeast Asia (2014)



In addition, developing a National Peatland CEPA Action Plan is encouraged that can be focused on increasing awareness and understanding about the importance of, and need for, integrated management planning for peatland forests. Ideally, it could be a subset strategy of NAPP that has been developed by countries in Mekong sub-region.

Moreover, effective communication is a key aspect of public education, aiming to build trust among all stakeholders to ensure transparency in decision-making and the implementation of actions. Following this, countries should prioritise capacity building in peatland management, which need to content on these following elements.



The communication for capacity building is essential and need to include all relevant stakeholders since the process is quite complicated. These stakeholders are listed as bellow²¹:

Type of the Stakeholders	Research organisations and universities
	International, national and regional government organisations, acting as the principal funding agencies, also beneficiaries of the peatland
	Private companies: As co-developers and beneficiaries of the peatland
	Communities and NGOs: as co-developers and beneficiaries of the peatland

3.2 Theme 2: Sustainable Use of Peatlands

3.2.1 Sustainable Agricultural Practices on Peatlands

Peatlands have been used for agricultural activities, globally, including Mekong sub-region. While agriculture provides numerous benefits, it poses risks due to anthropogenic changes in the land use.

Southeast Asia is well known with its palm oil supplies which majority of the supplies come from Indonesia and Malaysia. In the Mekong sub-region, sugar cane farm, maize farm and rice cultivation are prevalent. Some of these crop farms have become a spark for fire outbreak²² that led to transboundary haze pollution. With a global pressure, oil palm farming and production has undergone a strict review and had developed numerous Best Management Practices (BMPs) in cultivation of the oil palm under Roundtable on Sustainable Palm Oil (RSPO), as industry driven requirement. This pressure has caused palm oil production is strictly monitored and certified in global market, which triggered the development of mandatory national standards i.e. Indonesian Sustainable Palm Oil (ISPO) and Malaysian Sustainable Palm Oil (MSPO). The strict laws and rules have reduced the chances for oil palm sectors to instigates with forest and peatland fire issues that can lead to transboundary haze pollution. However, there are less strict regulations in the Mekong sub-region for adopting sustainable practices, particularly in maize and sugar cane cultivation. Recent fire incidents in late 2022 and early 2023, have highlighted the impact of unsustainable agricultural practices,

²¹ Guidelines of Integrated Management Planning for Peatland Forests in Southeast Asia (2014)

²² Maize, Land Use Change, and Transboundary Haze Pollution (2020) [Maize, Land Use Change, and Transboundary Haze Pollution - Greenpeace Southeast Asia](#)

contributing to transboundary haze pollution. To address this, it is crucial to monitor the agricultural practices through bottom-up approaches to get inputs at community levels, encouraging them to adopt sustainable practices. It is also crucial for multi-disciplinary roundtables or meetings with relevant agencies and private sector in particular rural development, agriculture, local government and commodity companies to work together for tackle the issues.



Figure 11: Transboundary haze pollution dominated Mekong in March 2023

Taung Poe Gyi Village in Myanmar has provided valuable insights into implementing BMPs²³ that could be implemented on various types of peatlands in Mekong sub-region. While drained peatlands have significant global impacts, sustainable management can support community livelihood in agriculture and forestry. Consideration of these practices is important to reduce the impacts. Below are recommendations on sustainable agricultural uses on peatlands.

²³ Best Management of Peatland in Myanmar: Experience of Agriculture on Peatland: A Case Study of Taung Poe Gyi Village (2014)

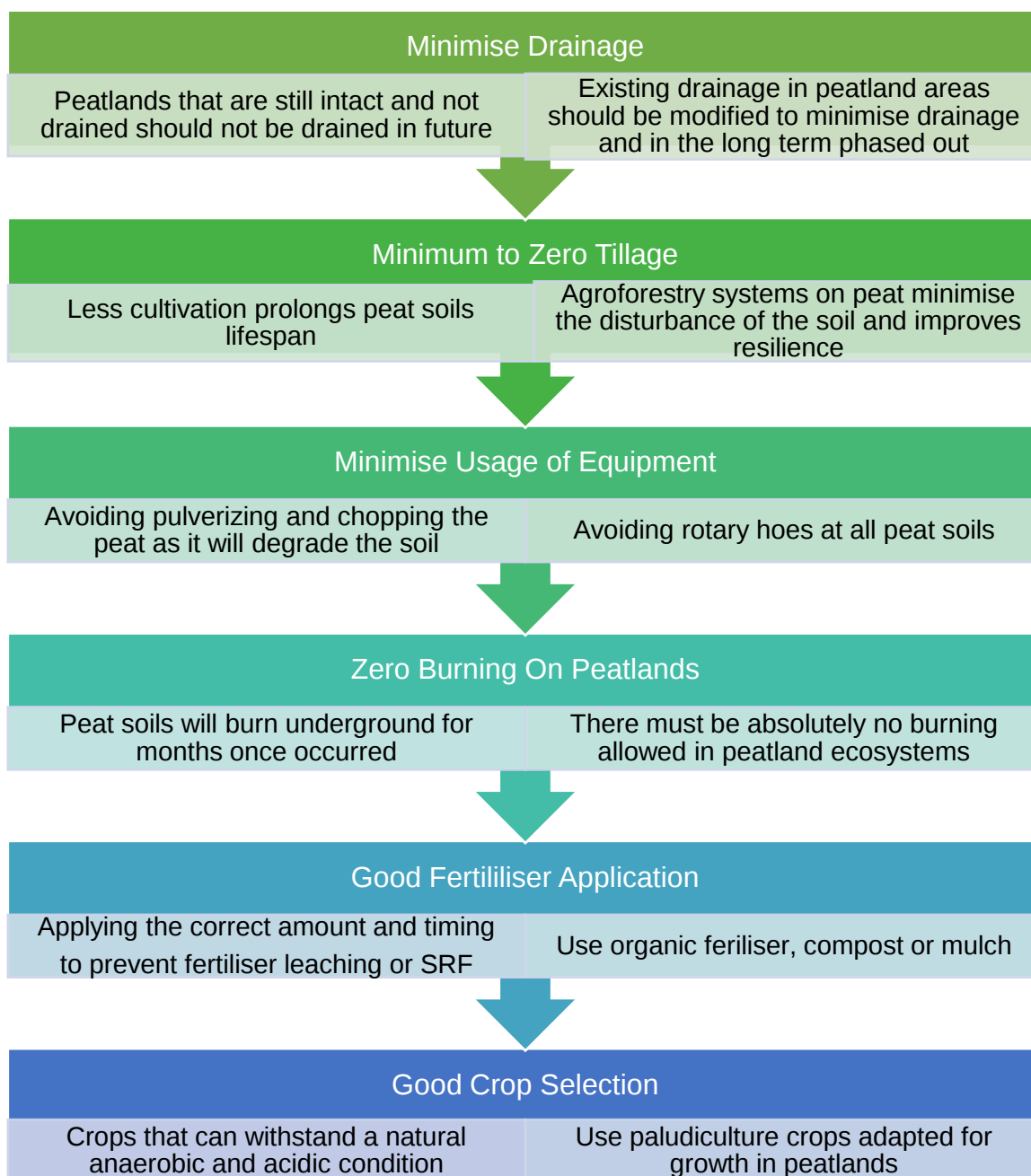


Figure 12: Simple guides on sustainable agriculture on peat soils

There are several examples in sustainable agriculture practice in Mekong sub-region which contributes to the conservation of biodiversity and ecosystem through payment for conservation programmes such as Sarus Crane Rice²⁴ Project and Ibis Rice²⁵ Programme from Cambodia. These projects promote BMPs by incentivise farmers with various benefits. Similar incentives have been adopted with sugarcane production in Thailand²⁶ aiming to reduce slash and burn activities. While incentivising farmers has shown positive outcome, it may face challenges in sustaining due to limited funding or completion of projects. Payment

²⁴ Farmers tempt endangered cranes back – by growing their favourite food (2021) [Farmers tempt endangered cranes back – by growing their favourite food | Environment | The Guardian](#)

²⁵ The Ibis Rice Story ([Our Story - Ibis Rice](#))

²⁶ Cabinet Approves Incentives for Farmers to Avoid cane burning (2023) [THAILAND: Cabinet approves incentives for farmers to avoid cane burning - Sugaronline](#)

for conservation programmes, though beneficial in short-term, may not substitute permanent interventions and habitat preservations.

BOX 3

IBIS Rice Programme in Cambodia

The IBIS Rice Program promoted the cultivation of premium-quality organic rice in remote communities inside the Kulen Promtep Wildlife Sanctuary in Cambodia's northwestern province of Preah Vihear. The project has expanded to nearby areas in Stung Treng, Ratanakiri and Mondulakiri Provinces. These areas are home to a unique savanna ecosystem that is the habitat of the critically-endangered Giant Ibis, Cambodia's national bird.

The Programme provides a meaningful opportunity for rural households to earn living incomes, while discontinuing these harmful activities. The Programme provides agronomic support to farmers, which includes training and demonstrations on organic and wildlife-friendly standards and practices. IBIS Rice is grown by hand on Cambodia's northern plains wetland. In this unique environment, the farmers plant just one crop per year, allowing it to mature slowly into the finest quality, fragrant, long-grain jasmine rice.

The key of this arrangement is conservation agreements with individual farmers that stipulate their commitment not engage in land clearing, logging, or wildlife poaching, nor use harmful agrochemicals on their fields. The rice then is sold at premium prices, farmers are paid an average of 70% more than standard market price for their harvest.

3.2.2 Water Resources Management in Peatlands

Hydrological management is important on peatlands to prevent degradation in particular links to fire risk. Despite the variations of peat soils type within ASEAN region, peat is susceptible and prone to fire when dry. The degradation of peatlands through combustion and oxidation will have high potential to the following listed impacts and consequences, not limited to:

- Increasing carbon emissions into atmosphere that accelerating climate changes;
- Unique ecosystem and function of the peatland disappeared;
- Transboundary haze pollution that caused by peatland and forest burning;
- Inducing peat fire that burnt underground for months;
- Water scarcity for community livelihood;
- Lack of flood riparian zone; and
- Reduced yield from agricultural activities

To prevent the above negative impacts, careful and sustainable water resource management within the peatland is important. In normal condition, tropical peatlands are formed by accumulation of partially decomposed materials in between two rivers by forming a peat dome that elevates the groundwater level. Disruption of this natural function will cause the hydrological system shutdowns and invites disastrous consequences.

There are several suggestions can be implemented and adopted by Mekong countries to manage water resources in peatland area by zoning according to land use types. These zones can be monitored as, (1) conservation zone, (2) development and residential zone, and (3) agriculture zone. The zoning system will distinguish which practice is best to be undertaken which will be able to conserve the area without causing human-environment conflict.

Conservation Zone

Conservation zone must be high value in biodiversity, serve its functions in regulating water sources, act as water basin or climate regulator and possibly important ecosystem for

migratory birds and other wildlife. Possible options that can be undertaken within conservation zone include the following:

- i. Start doing demarcation for buffer zone and conservation zone based on High Conservation Value Areas (HCVAs);
- ii. Limit entry from outsiders to reduce any misuses of the area;
- iii. Monitor and manage water level in the peatland to maintain desired levels;
- iv. Monitor ecology and species to develop management strategies;
- v. Facilitate visitor, education and research activities in a manner to minimise ecological impact
- vi. Undertake necessary protection and restoration measures
- vii. Develop peatland patrolling and monitoring team.



Figure 13: Assessment of conservation zone in Lao PDR (Photo Credit: DWR, Lao PDR)

Sustainable Use Zone

There are various types of crops that are being cultivated on peatlands in the Mekong Sub-region including oil palm, maize, rice and other cash crops including tomatoes. Proper water management systems are needed to ensure favourable water flow and maximise growth. For sustainable agriculture on peatlands, it is commendable to prioritise water management not only in the agriculture plots but also in the surrounding buffer areas. Below are suggestions to manage water level in agriculture zone for Mekong sub-region.

1. Plan water management systems to prevent over drainage and maintain appropriate hydrological regime
2. Frequent monitoring water level ground using piezometers and water gauges;
3. Maintain water level in the ditches by using water gate or check dams;
4. Storing water by retention pond for dry spell and fire prevention;
5. Avoid utilising slash and burn technique and do not start open burning;
6. Promote composting of waste products;
7. Consider utilising degraded peatland area for timber production;
8. Avoid degradation of intact peatland areas for agriculture development.



Figure 14: Paddy field on peatlands areas within Lao PDR (Photo credit: DWR, Lao PDR)

3.2.3 Sustainable Forest Management in Peatland

Each country has its specific strategy in managing forest sustainably, aiming to support biodiversity and ecosystem services for future benefits. Forests provide valuable economic benefits from ecosystem services including timber extraction. Most countries now recognise the importance of sustainable forest management (SFM) as a future way in managing forest.

SFM involves the responsible use and stewardship of forests, maintaining their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, relevant ecological economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems²⁷. Peatland on the other hands do exist in most type of land including forested area. Any activities within the area will promptly accelerating the aftermath impacts which will possess danger to local areas and potentially threatening neighbouring countries.

²⁷ Forest Europe (<https://foresteurope.org/workstreams/sustainable-forest-management/#:~:text=According%20to%20the%20Helsinki%20resolution,and%20social%20functions%2C%20at%20local>)

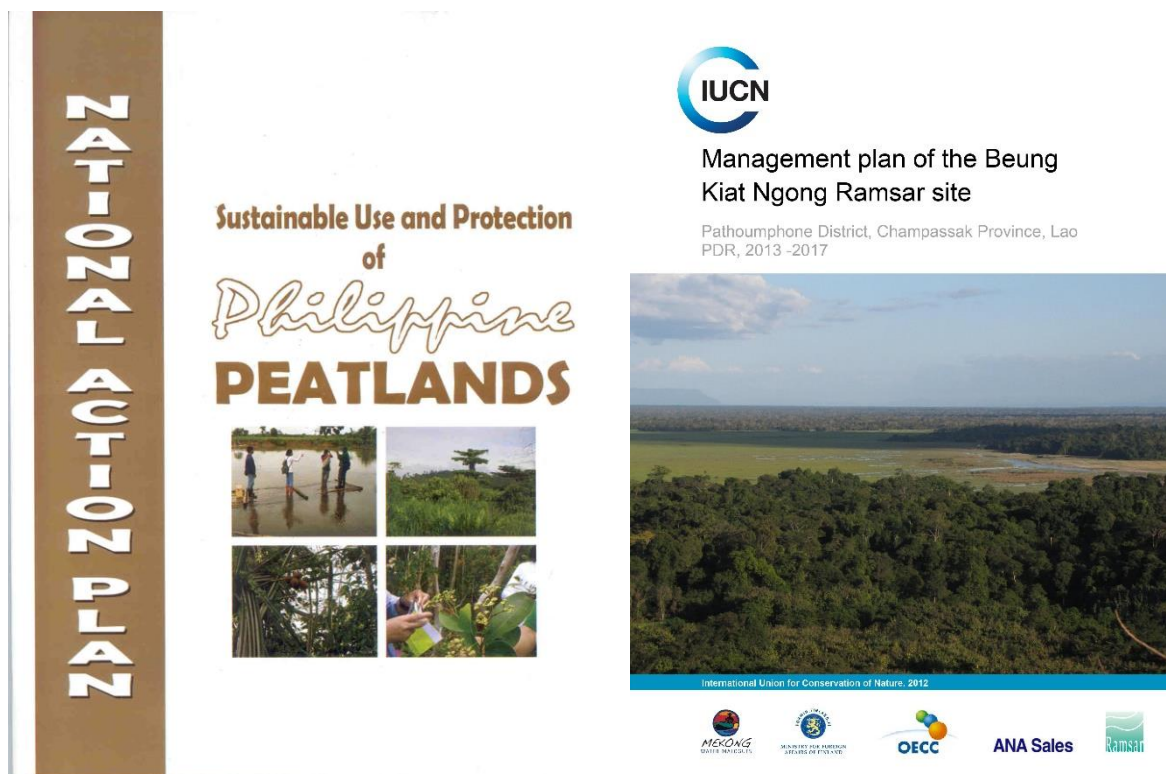


Figure 15: Example of framework that support local sustainable peatland management

In order to reduce the threat of regional impacts such as forest fires and cross-border haze pollutions, it is commendable to reserve the selected forest areas through zoning under forest protection areas such as Ramsar Site or permanent forest reserve which inclusive to wetlands and peatlands that has High Conservation Values (HCVs).

3.2.4 Fishery on Peatlands

Fishes and other aquatic animals are important dietary requirement for people that are living in and around peatlands. Local communities are well accustomed with fishing activities to sustain themselves. However, due to the growing needs from the market, the fish population is depleting in rapid rate. Main reason for this to occur is due to the unsustainable management in harvesting natural resources.



Figure 16: Fishery is a subsistence that essential to peatland community (Photo credit: GEC)

Any damaging fishing method is contributing to the reduction of fishes or aquatic animals within the areas. Additionally, any excess of fertiliser and pesticides also have a significant effect on the water body which eventually poisoning the living organism inside. Further degradation will cause more harm to the community reside the area. Thus, banning and reducing on these unsustainable practices is important to ensure the biodiversity and fishes resources are being conserved in the long run.



BOX 4

Sustainable Fisheries Practice from Lao PDR²⁸

Due to wide variety of habitats and abundance of fish, local villagers from the main villages around the wetlands annually harvest about 227 tons of fish, 187 tons of other aquatic resources. Fishing techniques have not changed much in recent years, but now there are more people living in the area thus more competition for natural resources. One particular importance is a large number of semi-natural fish trap ponds (*loum pa*) owned by the villagers in the area. These trap ponds located in area that dry out during the dry seasons. They are filled with vegetables by fishers. As the wetlands dry, usually in March or April, villagers remove the vegetation from the ponds, scoop out the water, and harvest the fish (including swamp eels). In practice, some families do own a number of these traps to sustain their livelihood,

Aside, during wet season, the wetlands provide passage for a variety of fishes to move upstream along the rivers and streams, as well as providing spawning grounds. The wetlands also form an especially important habitat for fish during the low water of dry seasons. Integration of local knowledge in sustaining the continuous spawning of fishes is considered as best practice that can be taken as example of management on sustainable practice on peatland.

3.2.5 Grazing and Livestock

Peatland grass bed is often being utilised for herd ruminants such as buffaloes and cattle. Some countries in the Mekong Sub-region have raised animals traditionally on peatland due to the niche and suitable ecosystem of the areas toward the animals. The local knowledge in certain countries such as Lao PDR and Thailand, in raising swamp buffaloes has received recognition in global platforms where it does give various selling points to the conservation world. This including;

- (i) agrobiodiversity,
- (ii) food and livelihood security,
- (iii) local and traditional knowledge systems,
- (iv) cultures, value systems and social organisations,
- (v) landscape and waterscapes features.

²⁸ Management Plan of the Beung Kiat Ngong Ramsar Site

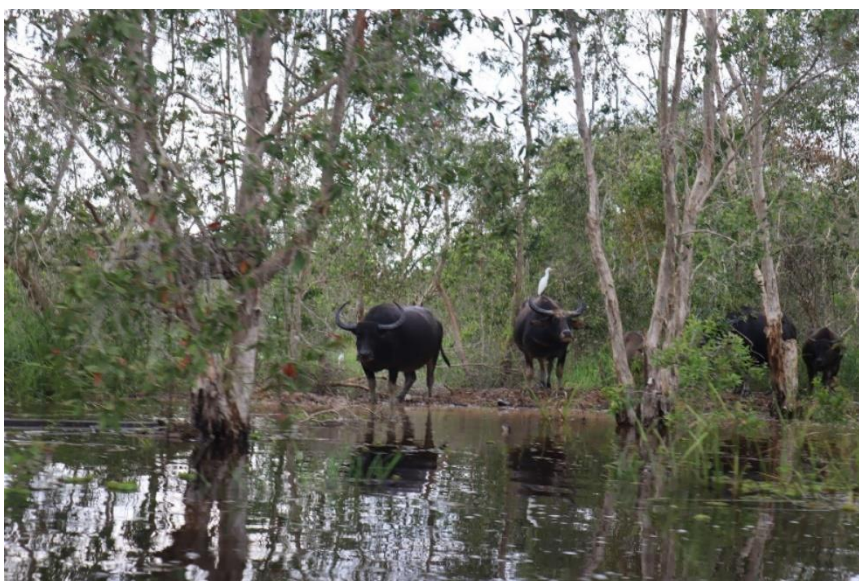


Figure 17: Swamp buffaloes on its niche ecosystem on peatlands (Photo Credit: GEC)

Despite being an important traditional practice in some specific areas of Mekong sub-region, this practice could lead to the negative impacts with uncontrolled increase in numbers of buffaloes and cattle. The habitat degradation will occur once the numbers of the animals increase which could lead to generation of more pressure on the soils and promoting subsidence. In addition, some peatland and swamp areas are routinely burnt – to stop the growth of woody vegetation and enhance the regrowth of grass for the cattle. This is one of the major causes of peatland degradation in parts of the region. Aside, the increasing number of ruminants will directly contribute to the releasing of methane gas (CH₄) – a significant contributor to climate change.

Country shall monitor the cattle or buffaloes raising activities, through law enforcement which to ensure the balance to the protected area or peatland specifically.

BOX 5

Swamp Buffaloes Raising Practice from Thailand²⁹

Thailand has large swamp buffalo population which comprises of 60% that are owned by local farmers. The buffaloes are raised at these farmer's backyard through small-scale farming system which be part of integral in crop production system. The buffaloes in principle are let roam grazing with minimal monitoring which may resulting in unplanned breeding especially during harvesting seasons of paddy field. In other hand, since buffaloes are used in some oil palm plantations, it will be tied up and fed with rice straw for almost 4 months. This could hinder the breeding process and contribute to harvesting of oil palm which temporarily inhibiting the spawning of new calves during crucial harvesting seasons.

In addition, the survival of Thale Noi's wetland ecosystem relies on collective access to limited resources. In the context of buffalo husbandry, the community practices communal sharing and coordination. Pastoralists collaborate by forming groups of 2 to 10 members, allowing them to herd animals together. These groups adhere to a set of mutually agreed-upon rules and regulations that guide the sustainable use of natural resources and the shared responsibilities in the field³⁰.

²⁹ Na-Chiangmai, A. (2000). Development of Buffalo breeding scheme in Thailand. ICAR Technical Series – No 4

³⁰ GIAHS (2022), Thale Noi Wetland Buffalo Pastoral Agro-Eco-System, Thailand

(<https://www.fao.org/giahs/giahsaroundtheworld/designated-sites/asia-and-the-pacific/thailand-thale-noi/detailed-information/en/>)

3.2.6 Non-Timber Forest Products (NTFP)

People who are living within peatland areas are mostly villagers who are dependent on natural resources of the peatlands. The natural resources are including Non-timber Forest Products (NTFP). Common NTFPs that have been harvested are krajood (saltmarsh bulrush), honey, nypa fruits, melaleuca, mushroom, wild vegetables and ornamental flowers.

Case from Thailand in Phru Khuan Khreng shows the depletion of krajood due to the lack of alternative livelihood which causing most households to only focus on one particular source of income. This causing the market value of the products drop significantly. In Lao PDR especially in Beung Kiat Ngong Ramsar Site, the unsustainable harvesting procedure that causing overexploitation of *Malva* nut has destroyed the niche of the vegetation and reduced the income generation³¹.



Figure 18: Krajood in Nakhon Si Thammarat Province, Thailand (Photo credit: GEC)

BOX 6

Good Practice for Management of Non-Timber Forest Product (NTFP) on Peatland from Indonesia

Paludiculture practice that grow timber and non-timber forest species on wetted peatland is a way of BMP to prevent peatland fires and minimise carbon emission. These practices also could potentially compete with production of oil palm and fast-growing pulp paper tree species in term of economic from the planting of native tree species. There are several quick-gain species which mainly herbaceous that produce quick results. This including purun, water chestnut, pare/ bittergourd, gambir and edible ferns. However, this input on economy values may vary and it is still in its initial stage of economic assessment. Paludiculture practices which mainly focusses on wet-agriculture also suitable for places that impacted with seasonal flooding.

Setting up a clear boundaries and limits is the authority responsibilities to ensure there is no overexploitation by local communities and private sectors. Demarking clear boundaries will enforce the law on which will restricting the movement and limit the resources gathering. This needs to involve the land uses and land management including allocation.

In addition, to reduce the dominance dependency on the NTFPs, agriculture department shall help to improve cultivation practices that is sustainable to produce long term income. This could be undertaken with multiple capacity building and training with the villagers and relevant stakeholders without discriminating other private parties. Introducing a diversification on the

³¹ Country Report: Peatland Status and Management in Thailand (2009)

crop cultivation such as rotational cropping mechanism will flourish the yield in long run as well as retaining soils nutrient.

3.2.7 Ecotourism in Peatlands

There is a steady trend of ecotourism activities that has been undertaken within various places on wetlands and peatlands especially in Mekong sub-region. This shows that the ecotourism activities are not an uncommon practice to be implemented especially within protected areas such as Koh Kapik Ramsar Site, Bueng Kiat Ngong Ramsar Site and Inle Lake Ramsar Site. Beside ecotourism, there are community-based tourism that were implemented in Myanmar where local community are being empowered by providing skills and resources for them to manage their own tourism activities.

While ecotourism can contribute to conservation and community livelihood, ecotourism activities might possess negative impacts if poorly managed. The impact of unsustainable ecotourism³² will lead to the depletion of natural resources, pollution, waste, habitat destruction, displacement of local communities, loss of traditional practices and culture, and inequitable distribution of benefits. Below are the steps and practices that is acceptable to be implemented sustainably³³:

(i) Choose an Eco-friendly Accommodation

- Look for accommodation that is eco-friendly and has sustainable practices such as recycling, energy conservation and water conservation.

(ii) Support Local Business

- Support local business such as restaurants, shops, and tour operators. This helps to support the local economy and preserve local culture.

(iii) Reduce Carbon Footprint

- Consider taking public transportation, walking or cycling instead of renting car.

(iv) Respect the Environment

- Respect the environment by not littering, staying on designated trails and not disturbing wildlife.

(v) Conserve Water

- Conserve water while taking showers, reduce change of towels.

(vi) Reduce Plastic Usage

- Bring reuseable water bottle, shopping bags and metal straw.

(vii) Learn About the Local Culture

- This will help to shows respect for the local community and can enhance travel experience.

(viii) Support Conservation Efforts

- This action will help to support conservation efforts and preserve natural habitats

³² Uncovering the dark side of ecotourism: Exploring the negative impacts (2023)

<https://www.holdinghandsnature.com/2023/09/29/uncovering-the-dark-side-of-ecotourism-exploring-the-negative-impacts/>

³³ The difference between ecotourism and sustainable tourism ([Ecotourism and Sustainable Tourism | GSTC](https://www.gstcouncil.org/))



Figure 19: Ecotourism activities at Thale Noi Non-hunting Area (Photo credit: GEC)

BOX 7

Example of Ecotourism in Peatland with Example of Positive Practices³⁴

There are few examples that can be taken into consideration such as ecotourism from Maludam National Park (MNP), Sarawak, Malaysia. MNP is a peat swamp area that is protected. It offers broad selection of attractions derived from its rich and unique natural resources. The activities including Village Homestay Programme, Boat Cruise, Bird Watching, Re-banded Langur Sighting, Proboscis Monkey encounters.

Aside, there are several BMPs that need to be considered as an implementor in order to not harming environment while benefiting in tourism sectors: The practices as stated as below³⁵:

a) Understanding Ecotourism

- **Sustainability:** Focus on minimizing negative impacts on the environment and maximizing benefits for local communities.
- **Local Engagement:** Support local businesses and immerse in authentic experiences.

b) Promoting Strategies

- **Awareness Campaigns:** Educate travellers about ecotourism principles and responsible behaviour.
- **Collaboration:** Engage with stakeholders, including governments, NGOs, and local communities.
- **Marketing:** Highlight unique ecotourism experiences through websites, social media, and travel agencies.

c) Sustainable Practices

- **Low-Impact Activities:** Promote nature walks, wildlife observation, and cultural immersion.

d) Community Involvement

- **Local Partnerships:** Collaborate with local communities for mutual benefit.
- **Cultural Exchange:** Encourage interactions between travellers and locals.

e) Environment Protection

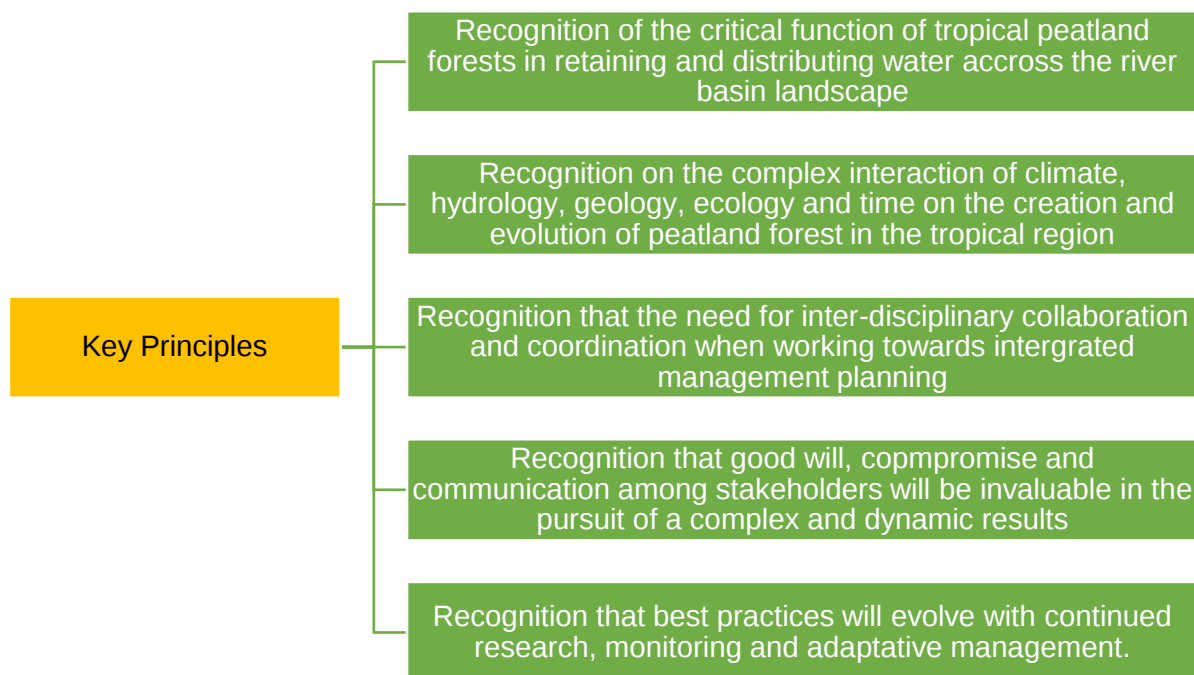
- **Preserve Natural Heritage:** Emphasize the importance of protecting ecosystems.
- **Wildlife Conservation:** Avoid disturbing wildlife and their habitats.
- **Carbon Footprint Reduction:** Promote sustainable transportation options.

³⁴ A Study on Ecotourism Products Development and Community Involvement of the Maludam National Park, Betong Division Sarawak.

³⁵ Storey, D., (2023) How to Promote Ecotourism: retrieved from <https://www.touristsecrets.com/travel-guide/sustainability/how-to-promote-ecotourism/>

3.2.8 Integrated Management or Landscape Approach with Multi-stakeholder Engagement

Integrated management is a crucial step to take into account on various factors in management planning and strategy. This is to ensure the long-term sustainable management of the peatland landscape which individuals' stakeholders can link their conservation efforts in managing peatland effectively. These are the key principles for the integrated management of peatlands that is derived from Integrated Management Planning for Peatland Forests in Southeast Asia (D'Cruz, 2014):



In other way, integrated peatland management (IMP)³⁶ could be documented as a strategy for local authorities in specific landscape to guide stakeholders to participate in the discussion or working group. The preparation will be involving various stakeholders that is providing impacts on the landscape. There are multiple aspects needed to be taken into consideration in order to draft a strategy.

1. Plan shall strategize a specific approach as well as identify the stakeholders or players within the landscape;
2. Land uses shall be monitored and survey to set clear boundaries and directions;
3. Monitor and check for the forest or peatland degradation aspects;
4. Asses the hydrology of the system and water sources and outlets and movement of water within the site
5. Assess vegetation types and ecosystems within the site and how they interrelate
6. Identify management zones that needed to be strengthen;
7. Planning for stakeholder participation in site management and fire prevention initiatives;
8. Provide a details recommendation for cooperative fire management plan
9. Provide a rehabilitation plan for the landscape
10. Set up a buffer zone management area for effective governance.

³⁶ RSPO Manual on BMPs for Management & Rehabilitation of Peatlands Vol 2 (2019)

BOX 8

Management Plan of the Beung Kiat Ngong Ramsar Site

Beung Kiat Ngong Wetland, in Champassak Province in Lao PDR, was formally recognized by the Ramsar convention as holding important value for conservation in September 2010, the one of only two Ramsar sites in the country. The wetland is a unique and precious site because it contains diverse wetland types (swamps, lakes, marshes, and peatland); with high biodiversity value and supports the livelihoods of approximately 11,500 people. The Government of Lao PDR and conservation partners have taken key steps to implement the convention. National, provincial and site levels committees have been set up to manage the site. Site boundaries have been demarcated, regulations have been developed and approved. In 2011-2012, workshops were held to build support for Ramsar implementation among community members at Beung Kiat Ngong. This dialogue between community members and the Ramsar Provincial Committee on the long-term management of the Ramsar site led to the drafting of a comprehensive 5-year (2013-2017) management plan with a workplan and budget.

3.3 Theme 3: Rehabilitation of Degraded Peatlands

3.3.1 Root Causes of Degradation

The root causes of peatland degradation mostly caused by transformation of natural peatlands for various purposes. This involves:

- i) **The conversion of natural peatland to other land uses.** Particularly conversion for crops like oil palm, rubber, forest plantations, rice, vegetables, and tomatoes cultivation (**Figure 20**). The conversion also includes repurposing them for urban settlements and infrastructure such as roads.



Figure 20: Agriculture on peatland and floating peatland (Photo credit: L.P Quoi)

- ii) **Hydrological mismanagement** that involves constructing drainage canals, drains, and sluice gates. These activities leading to soil drying, shrinkage, and oxidation, therefore heightening the risk of peat fires. Disrupting natural water cycles, whether through flood control or water storage schemes, can negatively impact peatland ecology and species.
- iii) **Peatland fires** that are often triggered by human activities, particularly during the clearing of vegetation for agriculture, especially after draining and drying peat soils. In the Mekong sub-region, fires may occur during channel clearing for fishermen's access, as observed in Inle Lake, Myanmar (**Figure 21**). The use of fire is also noted in Lao PDR to eliminate woody vegetation in peatlands for water buffalo grazing. Accidental

fires can result from activities such as discarding cigarettes or leaving campfires unattended.



Figure 21: Examples of setting fires by fishermen or farmers at Inle lake Myanmar (Photo credit: GEC)

- iv) **Harvesting of trees** for extraction of timber and wood. Wood extraction for timber and fuelwood has been reported from swamp forests in central and southern Lao PDR (Claridge, G.F. (1996). An Inventory of Wetlands of the Lao PDR). Harvesting of poles has also been recorded in the mangrove peatlands of Cambodia.
- v) **Mining in peatlands.** This can involve either a) mining of the peat resource itself which has taken place extensively in Viet Nam and Lao PDR (**Figure 22**) to extract the peat for use as substrate for horticultural uses, organic fertilizer or for soil improvement; or b) the stripping of peat soils to get to the resources below – e.g. sand mining in the estuary and mangroves of Koh Kong Province, Cambodia (**Figure 23**) which is leading to river and coastal erosion and loss of mangroves and associated peatland.



Figure 22: Peat mining ponds in Lao PDR (left, Photo credit: GEC) and in Ngong Phommalu (right, Photo credit: IUCN).



Figure 23: Sand mining in Koh Kong mangroves and peatland, Cambodia (Photo credit: GEC).

- vi) **Climate change.** Ongoing changes to the climate in the Mekong sub-region, as a result of global climate change, are predicted with reduced rainfall during dry season as well as increased temperature. These two factors will lead to drying out of peatland and increase fire risk. In addition, rising sea levels will also have a negative impact on mangrove peatlands. The degradation of all peatlands will lead to an increase in GHG emissions from the decomposition of the peat. This will contribute to further degradation and enhanced climate change impact.

3.3.2 Principles and Planning for Rehabilitation

Peatland restoration should be done aiming to restore the original form and function of peatland habitats though it takes a lot of time and costs a lot of money.

Principles for peatland rehabilitation are³⁷:

	Adaptive Management	Implement adaptive management practices that allow for flexibility in the rehabilitation strategy, considering the dynamic nature of peatland ecosystems.
	Integrated Approach	Develop integrated peatland management approach that address multiple aspects, such as hydrology, vegetation, and land use, for a holistic approach to rehabilitation
	Planning and Implementation at a Landscape Ecosystem Scale	Consider the entire landscape as interconnected components. Embrace a landscape-based approach in the rehabilitation program.
	Community Engagement	Involve local communities in the rehabilitation process, fostering a sense of ownership and ensuring that their traditional knowledge is considered.

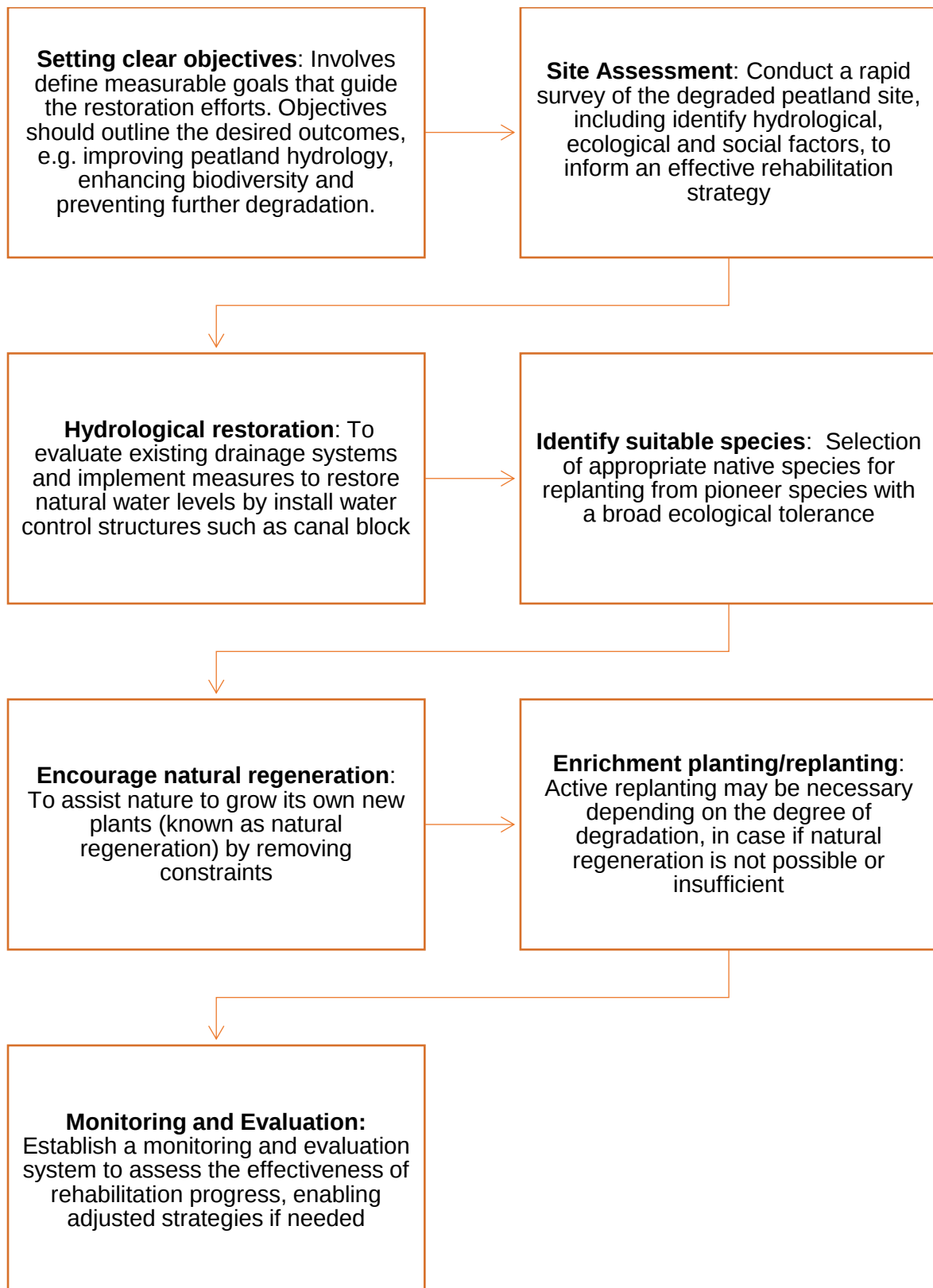
³⁷ Convention on Wetlands. (2021). Global guidelines for peatland rewetting and restoration. Ramsar Technical Report No. 11. Gland, Switzerland: Secretariat of the Convention on Wetlands.
(chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ramsar.org/sites/default/files/documents/library/rtr11_peatland_rewetting_restoration_e.pdf)

	Socio-economics	Where possible, species which bring benefits to local communities should be used in rehabilitation without harming biodiversity. These include species producing timber, species producing NTFPs, and multi-purpose trees (timber plus NTFPs).
	Beneficial species	Emphasize the importance of selecting plant species that contribute positively to the ecological balance of peatlands that provide NTFP and are important as food species for key wildlife in rehabilitation area such as orangutan, gibbon and hornbills.
	Hydrology/drainage	Implement measures to restore natural hydrological conditions, including monitor water table levels and seasonal water fluctuations, to prevent further peat degradation
	Biodiversity Conservation	Prioritize the conservation of biodiversity by restoring natural vegetation cover and creating habitats suitable for peatland flora and fauna
	Exotic tree species	Only native species should be used in restoration
	Costs	The rehabilitation programmes must opt for most cost-effective solutions
	Measuring success	Implementers should be accountable for the survival and health of replanted areas, emphasizing monitoring and maintenance as integral components. The use of advanced technologies like satellite remote sensing can enhance monitoring efforts and contribute to measuring success.

The planning for peatland rehabilitation

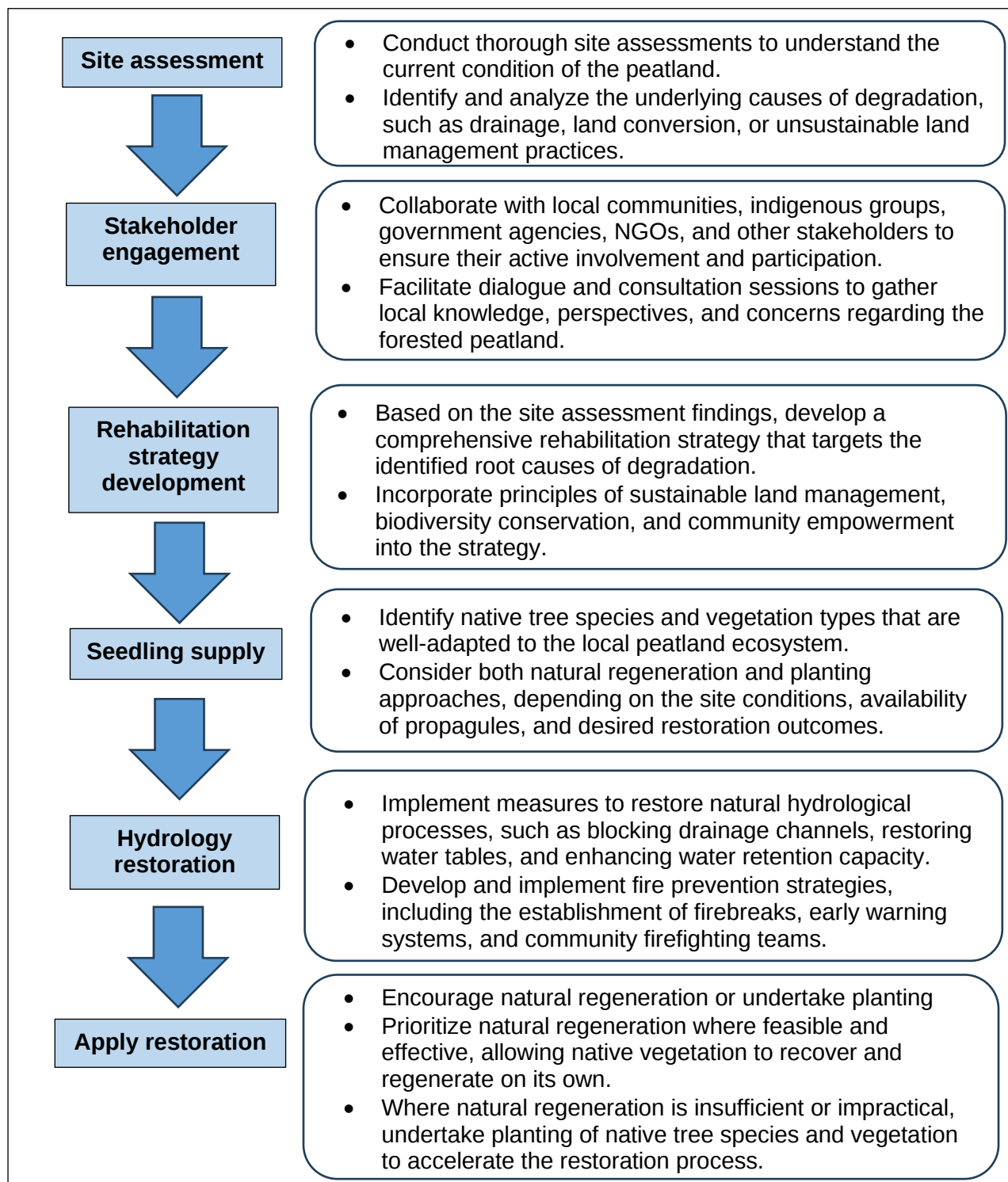
Planning for peatland rehabilitation is a crucial phase that involves careful consideration and strategic decision-making. This section outlines the essential steps to be taken in planning rehabilitation efforts. It includes assessing the root causes of degradation, understanding the unique characteristics of the peatland, and setting clear objectives for the rehabilitation process. Proper planning ensures that rehabilitation activities are targeted, effective, and aligned with the specific needs of the peatland ecosystem³⁸.

³⁸ Guidelines for Peat Swamp Forest Rehabilitation of Degraded Peat Swamp Forests in Central Kalimantan
<https://edepot.wur.nl/175467>



3.3.3 Rehabilitation of Forested Peatlands

The implementation of peatland rehabilitation involves careful plan of objectives into actionable steps. This phase includes on-the-ground activities, seedlings preparation, replanting with native species and improving hydrological conditions. Implementation efforts aim to restore peatland functions, mitigate further degradation, and contribute to the overall well-being of the ecosystem. Below are recommended approach in implementation of rehabilitation or forested peatlands³⁹.



³⁹ Parish, F., Lew, S.Y., Faizuddin, M. and Giesen, W. (Eds.). 2019. RSPO Manual on Best Management Practices (BMPs) for Management and Rehabilitation of Peatlands. 2nd Edition, RSPO, Kuala Lumpur.

3.3.4 Rehabilitation Experiences and Case Studies

i) Partnership programme in conservation and rehabilitation of North Selangor Peat Swamp Forest

The North Selangor Peat Swamp Forest (NSPSF) is the largest peat swamp forest on west coast of Peninsular Malaysia. The forest plays a critical role in the economy and ecology of the region – providing non-timber forest products (NTFP) and playing a key role in flood control and water supply to adjacent areas (e.g. Tanjung Karang Rice Schemes and towns such as Tanjung Karang, Sekinchan and Sabak Bernam), as well as playing a very significant role of global importance in storing huge amounts of carbon in the soil and acting as repositories for unique and important biodiversity.

The FR has been continuously impacted by forest fires caused by illegal encroachment for agriculture activities and past unsustainable forestry practices. Such activities have caused excessive drainage making the peat susceptible to fire outbreaks especially during the dry season. Almost every year since 1992, there have severe fires which generate serious smoke haze affecting adjacent areas as well as much of the Klang Valley. Therefore, the prevention of peatland fires and haze, and reduction in GHG emissions from forest and peat degradation is a very important issue in this area.

A project was undertaken between May 2014 – May 2019 by Sime Darby Foundation and Global Environment Centre to strengthen the efforts for fire prevention and water management, rehabilitation and conservation of the Raja Musa Forest Reserve (RMFR) adjacent to Sime Darby Plantations - Raja Musa Division. The main activities undertaken between 2014-2019 included:

Objective 1: Project Site Demarcation and Assessment

- a) Survey and marking of boundaries of the rehabilitation site/ degraded forest area
- b) Placement of signboards highlighting initiative
- c) Assessment and mapping of the existing vegetation, water levels and soil depths
- d) Assessment of adjacent lands developed by communities to assess drainage, peatland and plantation (agronomic) management and fire risks

Objective 2: Water Management and Fire Prevention through BMPs Application in the Buffer Areas

- a) Assessment of all drainage canals in the project site and install blocks to manage water levels to maintain optimal levels for PSF growth and prevent the area from drying up in the dry season and reduce fire risk and GHG emissions
- b) Support for good peatland management through sustainable livelihood development and/or BMPs for adjacent communities
- c) Strengthen capacity of State Forestry Department and local community and landowners to prevent peatland fires by promoting the fire danger and warning system and undertaking collaborative patrolling

Objective 3: Forest Rehabilitation

- a) Seedling cultivation in community nursery
- b) Land preparation, and planting of 20 ha with indigenous PSF pioneer species with the involvement of local communities, school children and plantation staff and workers
- c) Maintenance of the planted seedlings/trees (20 ha)
- d) Encouragement of natural regeneration of less degraded portions of the forest

Objective 4: Enhancing awareness and understanding of the ecosystem approach for North Selangor Peat Swamp Forest Management among the key stakeholders at National, State and Local Levels

- a) Holding regular public awareness events and/or forums to support the SHGSU peatland water management and forest rehabilitation activities;

- b) Enhance the engagement of school children in peat swamp forest conservation (Junior Peatland Forest Ranger (JPFR) Programme). It has approval from Kuala Selangor District Education Office and the Ministry of Education to organise the JPFR program;

The project has been very successful in enhancing understanding of key stakeholders including the plantation, local community and government agencies on the importance of peatland forests. It has also demonstrated appropriate approaches to preventing fires and rehabilitating the degraded forest area. A key element has been the raising of water levels in the boundary canal of the plantation and blocking the smaller drains earlier dug in the forest by local community. Almost 50 ha of degraded forest along the border have been rehabilitated through fire prevention, higher water tables and a further 20 ha of severely degraded forest has been replanted. As the result, forest fire incidents have been significantly reduced and the forest has recovered enhancing wildlife habitat and further reducing fire risk.



a) Peatland assessment



b) Tree planting in the degraded area



c) Canal blocking construction



d) FDRS signboard installation

Figure 24: The activities carried out in conservation and rehabilitation of North Selangor Peat Swamp Forest

ii) Conservation in U Minh Thuong National Park

U Minh Thuong National Park covers a total area of 21,800ha and is divided into a core zone and a buffer zone. The core zone covers an area of 8,509 ha, consisting of 2,851ha of melaleuca forest and Melaleuca mixed with Phragmites grassland, 2,428ha of grasslands and 1,737ha of Melaleuca in various stages of re-growth after fire. The remaining 493ha is made up of open water areas. The buffer zone, surrounding the core zone and covering an area of 13,291ha, is largely cleared agricultural land, but it contains a water-bird breeding colony in the north-western corner where there is a small forest area covering 1,200ha that is home to 11,000 water birds. Due to its ecological significance, U Minh Thuong National Park was recognized by UNESCO as a World Natural Heritage Site in 2002⁴⁰.

U Minh Thuong supports one of the last two significant areas of peat swamp forest remaining in Vietnam (the other one being U Minh Ha), and is recognised as one of the three highest priority sites for wetland conservation in the Mekong Delta. The U Minh Thuong peat swamp forest also plays a crucial role in the prevention of acidification of topsoil and surface water, storing fresh water, serving as a spawning and nursery area for fish and shellfish, and filtering surface water. As such, it also provides significant environmental and livelihood benefits for surrounding communities.

The main threats to U Minh Thuong National Park can be grouped into four categories namely forest fire, peatland degradation, illegal hunting and unsustainable tourism development. Due to fire risk, the National Park management recommends that a hydrological management regime that avoids drying out of the peat layer and maintains the hydrological value of the site as a source of freshwater for local agriculture be introduced, and that no new canals be constructed in the national park, as these will cause will further drying out of the peat swamp, increasing the risk of fire at the site, and facilitating access by poachers, who are responsible for many accidental fires. It is also important that habitat rehabilitation efforts at the national park rely on natural regeneration not plantation, in order to mitigate the risk of alien invasive species⁴¹.



Figure 25: U Minh Thuong National Park in Vietnam (Photo credit: thiennhien.net)

⁴⁰ Thai, L.T. et al (2024). Peatmass Change and Water Level Influencing Regenerated Melaleuca Forest after a Fire in U Minh Thuong National Park, Vietnam. <https://www.mdpi.com/2071-1050/16/2/620>

⁴¹ <https://vietnamnationalpark.wordpress.com/2016/06/20/u-minh-thuong-national-park/>

3.4 Monitoring and Evaluation

Monitoring and Evaluation (M&E) is a systematic process that organizations use to assess the progress of their programs and projects. It involves the continuous assessment of programs based on early detailed information on the progress or delay of the ongoing assessed activities. Evaluation involves the examination of the relevance, effectiveness, efficiency, and impact of activities against specified objectives.

The M&E process can be managed by the donors financing the assessed activities, by an independent branch of the implementing organization, by the project managers or implementing team themselves, and/or by a private company. The credibility and objectivity of monitoring and evaluation reports depend very much on the independence of the evaluators.

The process is also growing in popularity where the governments have created their own national M&E systems to assess the development projects, the resource management, and the government activities or administration. They also use this process to assess their own development and cooperation agencies.

The proposed guideline suggests that the monitoring and evaluation (M&E) process should be conducted at a single level by the respective country based on the developed national framework. The M&E process should be undertaken regularly, ranging from quarterly to semi-annually, by the framework implementers. This process could be annexed as part of annual reports to ensure technical progress and identify gaps that need to be filled.

Baseline data should be collected in the beginning of the implementation, and it should be reviewed periodically for room of improvement in the management. This comparison should be included into the Mid-term Review to update the progress status of the framework.

Below are the essential components of an M&E plan⁴²:

No	Components	Details
1	Project outcomes	Clearly define the level and outcome statements for your project. What changes do you expect to see as a result of your interventions?
2	Monitoring and Evaluation Questions	Develop specific questions related to project outcomes. These guide data collection efforts and help measure progress.
3	Indicators	Identify relevant indicators that reflect project success. These could be quantitative (e.g., number of beneficiaries reached) or qualitative (e.g., improved community resilience).
4	Data Sources and Collection Methods	Specify where you will collect data from Choose appropriate methods for data collection
5	Timing of Data Collection	Determine when data will be collected
6	Responsibility for Data Collection	Assign roles and responsibilities to team members or partners involved in data collection.
7	Data Collection and Usage	Describe how data will be collected, analyzed, and used for decision-making. Consider data quality, validation, and storage.

⁴² Developing Monitoring and Evaluation Plans: A Guide for Project Design (2020)

<https://www.sprep.org/sites/default/files/documents/publications/developing-monitoring-evaluation-plans-guide.pdf>