



KUAN KRENG PEAT SWAMP FOREST

A NATURAL WONDER FOR COMMUNITY LIVELIHOODS

Maximizing Carbon Sink Capacity and Conserving Biodiversity through Sustainable Conservation, Restoration and Management of Peat-swamp Ecosystems Project





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United Nations Development Programme (UNDP) Thailand



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INTRODUCTION

The Maximizing Carbon Sink Capacity and Conserving Biodiversity through Sustainable Conservation, Restoration and Management of Peat-swamp Ecosystems Project was implemented through collaboration between the United Nations Development Programme (UNDP), Office of Natural Resources and Environmental Policy and Planning (ONEP), Asia-Pacific Community Forestry Training Center (RECOFTC), Kasetsart University, Prince of Songkla University, Thailand Environment Institute (TEI), other governmental agencies involved in the project's Landscape Task Force, and other local Administrative Organizations (namely, the Kreng Tambon Administrative Organization, Ban Tul Tambon Administrative Organization, Cha-uat Tambon Administrative Organization, Bor Lor Non-Hunting Area, Thale Noi Non-Hunting Area), Office of Nakhon Si Thammarat Province, Office of Phatthalung Province, Office of Songkhla Province, Thaksin University, the Love Homeland Association, Thailand Youth Biodiversity Network and community members in Kuan Kreng area. All organizations made the project possible through budgetary support from the Global Environment Facility (GEF). The project targets the Kuan Kreng Peat Swamp Forest, which spans the three provinces of Nakhon Si Thammarat, Phatthalung and Songkhla.

The main goal of this project is to conserve and restore peatlands in order to increase their capacities to act as: carbon sinks, habitats for globally important species, and as sources of ecosystem services for improved community livelihoods. The project's three objectives are 1) Expanding the protection of high conservation value peat swamp forests and demonstrating their sustainable use within the broader landscape; 2) Implementing technologies to avoid peat swamp forest degradation and to restore degraded peat swamp forest; and 3) Improving policies, standards, and enforcement mechanisms for the conservation and sustainable use of peat swamp forests.

Throughout the project, cross-sectoral collaboration with communities at the local, provincial, regional and national levels have resulted in working models for the conservation and restoration of the Kuan Kreng Peat Swamp forest that are consistent with community approaches and values. Furthermore, through established cross-sector collaboration, communities and local agencies will be able to continue the conservation and restoration of the Kuan Kreng Peat Swamp Forest into the future.

This report aims to compile the experiences and lesson learned of local communities, people working in the government, universities, and non-governmental organizations, obtained through the “Maximizing Carbon Sink Capacity and Conserving Biodiversity through Sustainable Conservation, Restoration and Management of Peat-swamp Ecosystems Project”. It also hopes to show readers the value of peat swamp forests and share information on the project’s implementation, which may encourage readers to initiate conservation and restoration of not only the Kuan Kreng Peat Swamp Forest, but also of other peat swamp forests in Thailand in the future.

According to the Kuan Kreng Forest Fire Control Administration, in 2019 alone, 87 separate incidents of forest fires were reported in the Kuan Kreng Peat Swamp Forest, resulting in a total forest loss of nearly 5,000 rai.



WORKING MODELS

The Kuan Kreng Peat Swamp Forest is the second largest in Thailand, located in the Southern part of the country and covering three provinces: Nakhon Si Thammarat, Phatthalung and Songkhla. It is a tropical rain forest, which occurs in lowland areas that experience continuous exposure to water continuous over a prolonged period of time. The Kuan Kreng Peat Swamp Forest is considered to be an important area of outstanding natural significance. The peat swamp landscape provides a large ecosystem that supports a clear relationship between all living creatures (e.g. humans, animals, plants and microbes) and the environment (e.g. soil, water, light and temperature).

The Kuan Kreng Peat Swamp Forest is an area of natural diversity. The important natural resources within the landscape include various types of plants, such as Krajoed, Orange Champak and Mahogany, as well as an abundance of wildlife and aquatic animals, including the Bronze Featherback fish, Giant Snakehead fish, the Malayemys turtle, and the Red Junglefowl, etc. The peat swamp forest provides both direct and indirect benefits to humans, from being a source of livelihood for the local communities through their use of the swamp's biodiversity (plants and animals), to acting as a reservoir for rainwater and runoff, and also as a buffer area to reduce the impact of flooding.

Additionally, the 'peat' (or 'pru' as it is known in Thai) or peat soil itself, which is formed of layers of slowly decomposing plant and animal remains, is a vital carbon sink for combatting global warming. Peat swamps have the capacity to store carbon from the atmosphere in the deep layers of peat, preventing humans from breathing this carbon gas into their bodies. The thicker the peat soil, the greater the carbon storing capacity. The Kuan Kreng Peat Swamp Forest, however, remains under constant threat from various factors including forest encroachment – resulting in the conversion of peatland into palm oil plantations, drainage and forest fires. These threats are likely to only increase in the future.



Forest fires are the main cause of the widespread degradation of the Kuan Kreng Peat Swamp Forest. These forest fires are the result of natural causes, such as drought and rainfall shortage. This is exacerbated by the natural El Niño-Southern Oscillation, as well as by human action or greatly decreased levels of underground water, all of which cause the plant and animal remains that typically sit under the water level to dry up and act as fuel for forest fires.

Data collected in 2020 as part of this project found that the Kuan Kreng Peat Swamp Forest has a total area of peat covering approximately 86,942 rai, or 13,911 hectares (Associate Professor Prasong Sanguantham, Kasetsart University)

The clearest impact of forest fires is the degradation of the ecosystem as young seedlings in the forest are burned, eliminating any chance for them to grow into large trees. Older trees also stop growing as a result of this burning as the quality of the tree's wood is degraded. The peat layer, which acts as the carbon sink, can also be burned down, resulting in the release of the carbon stored in the swamp.

Not only do forest fires degrade the peat swamp forest and impact community livelihoods dependent on this land, the smoke produced by these fires is also toxic to humans.

“Destroying peatlands with carbon absorption potential will result in releasing carbon dioxide being released into the into the atmosphere. This is equivalent to the emission of toxic fumes from industrial factories to humans.” – Dr. Raweevan Phuridet, Secretary General of the Office of Natural Resources and Environmental Policy and Planning (ONEP)

“To generate a seven- to eight-centimeter-deep peat layer, it takes about 100 years, so it would take thousands of years for the forest to generate a layer that was meters-deep. The thicker the peat layer is, the more carbon that is stored; the more carbon that is stored, the less carbon that is released into the atmosphere, reducing dust. This minimizes the problem of global warming, or simply solves global issues that we as humans are facing now.” – Assist. Prof. Dr. Kobsak Wanthongchai, Dean of Faculty of Forestry, Kasetsart University.

In addition to forest fires, water drainage and forest encroachment, the improper use of forest resources is also a threat to the Kuan Kreng Peat Swamp Forest. An analysis to understand the causes of degradation of peat swamp forests showed that Thai society still lacks:

1. Continuous efforts to raise awareness and understanding on the value and importance of peat swamp forests in relation to their role in carbon sequestration and global warming reduction, alongside other benefits related to supporting the livelihoods of surrounding communities;
2. Appropriate and integrated guidelines and approaches for the conservation and restoration of peat swamp forests; and
3. Advanced technologies on peat swamp forest management, including effective forest fire management, in accordance with local community ways of living.

“We need to work on forest fires in the rainy season. This is because if preparation during the rainy season (or in other words, preparation before the fire) is good – such as the management of available fuels in the swamp, checking or maintaining the water levels, working with the community – we will be able to cope well with the forest fires that occur in the dry season. Working in the rainy season is proactive and a clear defense...”
– Asst. Prof. Dr. Kobsak Wanthongchai, Dean of the Faculty of Forestry, Kasetsart University.

To address the above challenges, three working models were implemented in line with the project’s objectives:

Project Objectives: Three Working Models

1

Objective 1:

Expanding the protection of high conservation value peat swamp forests and demonstrating their sustainable use within the broader landscape

- Increasing community awareness and capacity to conserve peat swamp forest

2

Objective 2:

Implementing technologies to avoid peat swamp forest degradation and to restore degraded peat swamp forest

- Using technological tools adapted to the local community’s way of life for the restoration of the peat swamp forest

3

Objective 3:

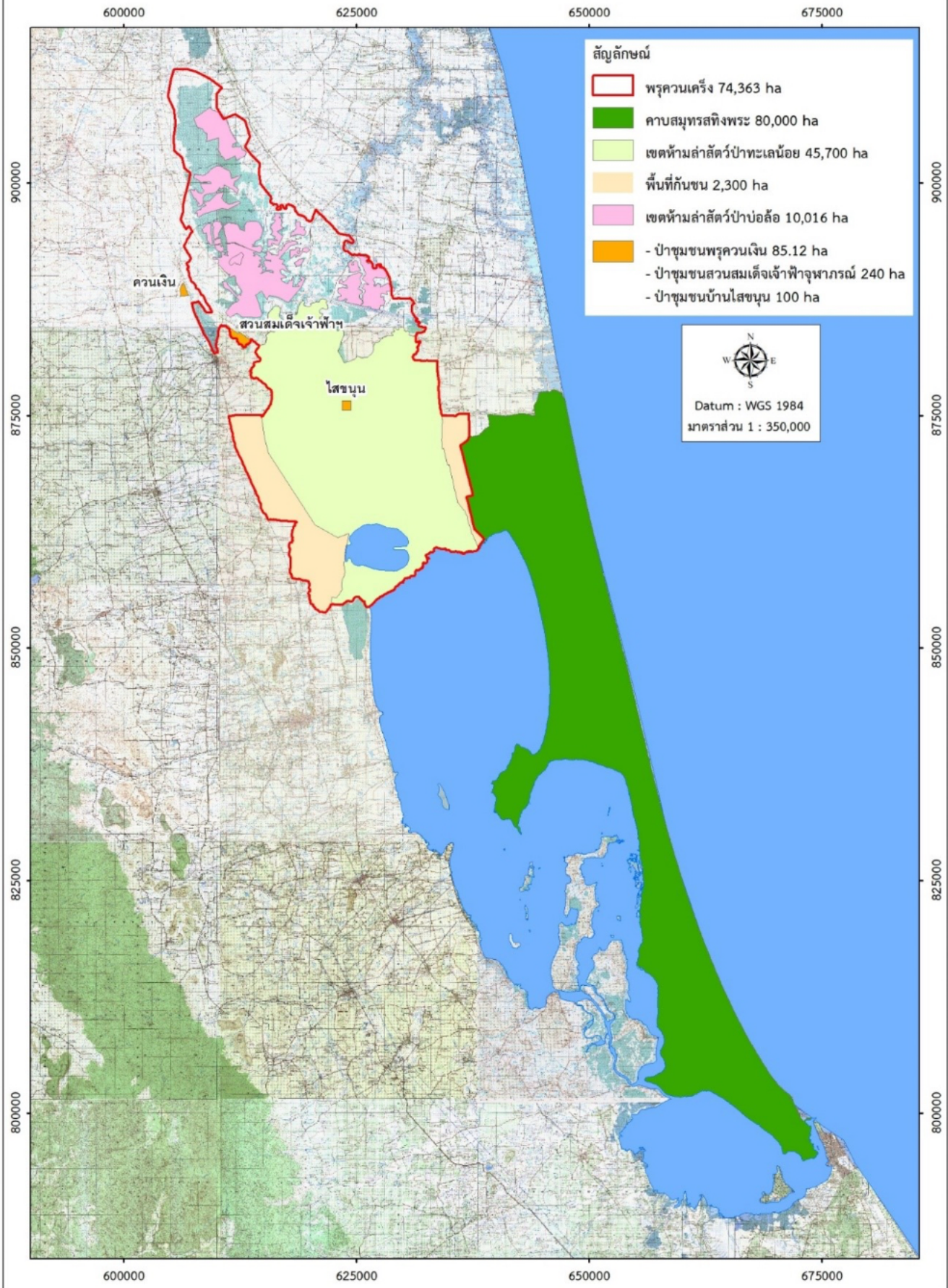
Improving policies, standards and enforcement mechanisms for the conservation and sustainable use of peat swamp forests

- Developing strategic information for planning the conservation and restoration of peat swamp forests in Thailand

All three working models produced positive results and opportunities for learning. The significant efforts of the local community, alongside collaboration between community members, the government and NGOs, were a main driver behind the successful implementation of the three working models.

Map of the Kuan Kreg Peat Swamp Landscape

แผนที่แสดงขอบเขตพื้นที่ดำเนินโครงการ Peat Swamp ทั้งหมด 154,363 ha



WORKING MODEL 1: Increasing community awareness and capacity to conserve peat swamp forests

“Nature is something that affects our lives. Just because you can’t see it or you can’t touch it, doesn’t mean that it has no impact on your life.” – Mr. Ananda Everingham, Actor



Raising the community’s knowledge and capacity in relation to the conservation of the Kuan Kreng Swamp Forest was achieved through collaboration between the community and local agencies in expanding relevant knowledge and skills, such as forest fire prevention, and raising awareness on the importance of the Kuan Kreng Peat Swamp Forest. Participants included a network of 42 local forest fire management voluntary groups, the Forest Fire Control Station, Operation Center under the Conservation Area Administration Office 5, officials from the Bor Lor and Thale Noi Non-Hunting Areas, and the ‘Rak Pa Pru’ Forest Conservation Youth Club.



The project supported the expansion of pre-existing work by local community members. For example, youth from the local community involved in the 'Rak Pa Pru' Forest Conservation Youth Club acted as 'carbon monitoring volunteers' to measure and track the amount of carbon stored in the peat swamp, and also served as 'community research volunteers', trained to collect information on the surrounding communities, including data on occupation, income, as well as recording plant species in order to explore the degradation of the peat swamp forest. In addition, increasing the awareness of community members on peat swamp conservation led to the development of an Integrated Peat Swamp Local Curriculum, aimed at raising awareness and knowledge among the youth to develop their understanding, pride, love and appreciation towards the Kuan Kreng Peat Swamp Forest. This curriculum can be used for both formal and informal education, beginning at the primary school level of Grade 1, up to the secondary equivalent of Grade 9, in accordance with the educational standards and indicators of the 2008 Basic Education Core Curriculum (revised in 2017).



Establishing community learning centers in the Kreng Sub-district, Ban Tul Sub-district and Cha-uat Sub-district of Cha-uat District, Nakhon Si Thammarat Province, is another of the project's key accomplishments related to promoting awareness on the importance of the Kuan Kreng Peat Swamp Forest. The three learning centers are managed by members of the community and have been used to organize activities that provide knowledge and increase understanding relating to the conservation of the peat swamp forest in a systematic way that is sustainable for both the local community as well as members of the wider Thai society.



In addition, success in raising awareness on peat swamp forest conservation and restoration among the wider society was due to the power of the local and national media in publicizing and sharing communications through the use of various media including videos, photos, articles, the 'Pru Kuan Kreng' Facebook page and the website: <https://prukuankreng.org>. A creative media development contest on the topic of "Sustainable use of resources in the peat swamp forest" was also organized to promote awareness among young people.

Knowledge and awareness on the Peat Swamp Forest was also publicized through the website, <http://www.peatswamps.com>, in addition to other online platforms such as Facebook and YouTube, under the name 'Peat Swamps Thailand'.



A series of incentive measures for balancing conservation with the utilization of the peat swamp area of the Kuan Kreng Landscape were developed to promote sustained awareness of peat swamp forest conservation. The aim was to create incentives for communities to continue to conserve and restore the swamp. These measures cover legislative, regulation, economic, and social support, targeted towards the Kuan Kreng Peat Swamp Forest. This included the development of policy recommendations and mechanisms to support the implementation of the conservation incentive measures. In addition, equipment to help control and combat forest fires was provided to local agencies under the Department of National Parks, Wildlife and Plant Conservation, as well as to local government organizations. Five incentive measures have been developed for the project's pilot area:

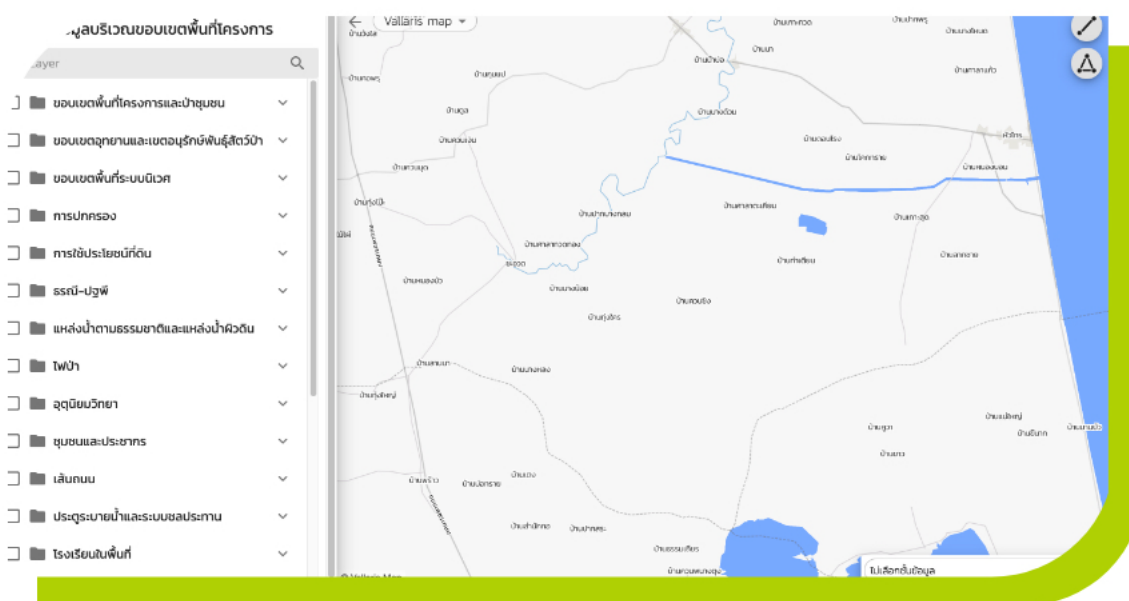
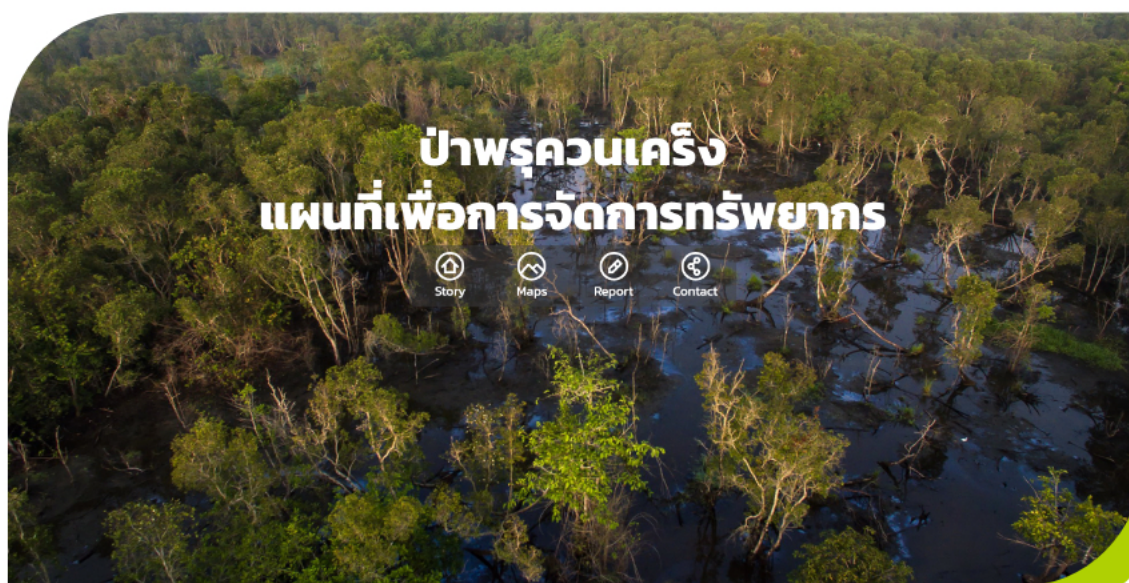
1. Measure to support the use of biological resources
2. Measure on knowledge management for conservation
3. Measure on funding
4. Measure to ensure rights to the land for settlement and agriculture
5. Measure to further develop the capacity of existing mechanisms to support peat swamp management

In addition, the project also recognizes the importance of managing strategic information for the benefit of developing a conservation plan in the Kuan Kreng Peat Swamp forest that is in line with the local community's way of life. Consequently, a study and review of information associated with the Kuan Kreng Peat Swamp Forest was conducted to develop conversation and restoration plans. For example, the community forest management plans in the three pilot community forests (Ban Khuan Ngern Community Forest, Princess Chulabhorn Garden Community Forest and Ban Sai Khanun Community Forest), were developed to ensure the appropriate use of the forests by community members. The Kuan Kreng Landscape Strategy and Land Use Plan was also developed for the Kreng Sub-district in order to comply with new zoning.

The Strategic Plan for Participatory Swamp Management in the Kuan Kreng Landscape Area is subdivided into six parts:

1. Peat Swamp Forest Fire Management and Carbon Balance Plan
2. Integrated Water Management Plan
3. Forest Ecosystem Restoration Plan
4. Raising Public Awareness on Peat Swamps through Youth and Local People in the Kuan Kreng Landscape Plan
5. Peat-Swamp-Based Livelihood Development Focusing on Sustainable Production Plan
6. Policy and Law Enforcement Focusing on the Integration of Policies and Legal Implementation Plan

A Geographic Information Database (Geo database) was also prepared in order to manage data related to the boundaries of the Kuan Kreng swampland and community forest, parks, and wildlife reserves/Non-Hunting Areas; land use; geotechnics; satellite and aerial imagery; natural and surface water bodies; forest fires; surrounding communities and populations; floodgate and irrigation systems; local schools; permanent sample plots for carbon stock measurements; and the location of natural resources (e.g., Krajoed, honey and wasps).





Community Learning Center, Krong Sub-district

1. Scenic spot
2. Krajoed field station
3. Local fishery station
4. Krajoed basketry making station
5. Pickled catfish making station
6. Local beliefs station ("Nai Bua"
Monk, Khuan Pom Temple)
7. Forest fire management
station
8. Peat swamp forest station

Community Learning Center, Ban Tul Sub- district

1. Ban Khuan Ngoen Community
Forest station
2. Kuan Krong Swamp
watermelon station
3. Sago station
4. Basketry making
station
5. Local cultural station
(using 'Song story', a local
tradition of storytelling through
music)
6. Ancient medicine and herbs
station

Community Learning Center, Cha-uat Sub- district

1. Somdej Chaofa Chulabhorn
Community Forest station
2. Small sized shrimp paste
making station
3. Rapo straw making station
(similar to bamboo straws)
4. Beekeeping station
5. Local cultural station ('Manora'
traditional dance drama)
6. Adding value to Krajoed
products station

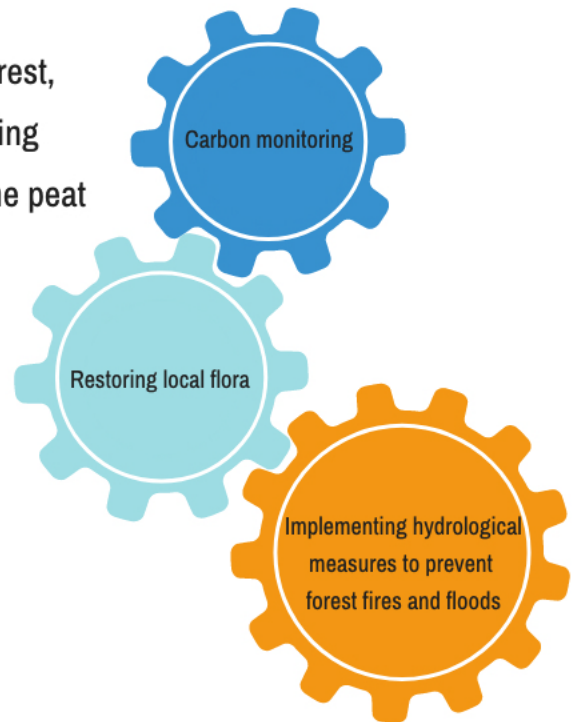
WORKING MODEL 2: Using technological tools adapted to the local community's way of life for the restoration of the peat swamp forest

When speaking about the restoration of the peat swamp forest, people tend to think only about replanting. However, restoring the peat swamp forest involves improving the balance of the peat swamp forest's entire ecosystem. This is achieved by making the swamp environment hospitable to all flora and fauna, whether they be trees, plants, herbivores, predators or humans, so that they can all rely on one other in a sustainable way. In this condition, when a creature or plant dies, new ones can emerge naturally in order to maintain the order of the forest ecosystem.

The project's activities were implemented based on the principle of 'balancing the ecosystem of the peat swamp forest' by controlling the damage from forest fires. This was done with the use of technology to perform water monitoring in addition to management to maintain appropriate water levels within the landscape throughout the year. With the necessary water levels, the forest ecosystem can be balanced sustainably. In addition to this, technologies relating to plant restoration and monitoring forest fires and encroachment were also used.

Adopting these new technologies was done through collaboration with the community and local agencies; obtaining their opinions in order to ensure that the technologies adopted would be fit in with people's livelihoods. There were four applications for these adopted technologies:

1) Water management model: A MIKE SHE hydrological modelling application was developed by a research team from the Faculty of Engineering in Kasetsart University. Data obtained from this model and opinions from the community and local agencies were analyzed and used to develop a water management model/guideline for the Kuan Kreng Peat Swamp Forest. The model/guideline focuses on maintaining an appropriate water level in the forest in order to reduce forest fire rates. This can be done through linking canal networks or surrounding irrigation systems together, building a water barrier at the water exit, or by dredging canals. In addition, criteria and indicators for sustainable water management in the Kuan Kreng peat swamp were developed to enable local authorities to conduct water management monitoring by themselves in a sustainable manner.



2) Carbon measurement and monitoring: permanent sampling plots were set up to measure carbon sequestration in the Kuan Kreng peat swamp. Data obtained from carbon monitoring was used to inform restoration plans. ‘Young scientists’ were educated in collaboration with local educational institutions to help conduct community-based carbon measurement and monitoring. The data obtained from this monitoring was recorded in the carbon sequestration measurement application and forwarded to the carbon monitoring web application. This application allows users to view and incorporate information into effective planning for restoration in the Kuan Kreng peat swamp.

ข้อมูลการเติบโตของไม้รุ่น

ขนาดแปลงสำรวจ (4 X 4 ตารางเมตร):
แปลงย่อยที่:

ลำดับ	ชนิด	เส้นรอบวงที่ระดับ 130 ซม. (ซม.)	ความสูง (ม.)
1	เสียด <input type="text" value="เสียด"/>	<input type="text" value="14"/>	<input type="text" value="6"/>
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เปลี่ยนแปลงย่อยถัดไป

แก้ไขแปลงที่เลือกก่อนหน้านี้

รายงานการสำรวจ

3. ปริมาณคาร์บอนในมวลชีวภาพรวม (กก.)

133.38

3.1 ปริมาณคาร์บอนในมวลชีวภาพเหนือดิน (กก.)

97.36

3.2 ปริมาณคาร์บอนในมวลชีวภาพใต้ดิน (กก.)

36.02

เริ่มใหม่

3) Restoration of local plant species: this was done to increase the biodiversity of the forest. Today, many of the plants that used to be found in the Kuan Kreng peat swamp have been destroyed. In order to improve the forest’s biodiversity, nurseries were constructed in four communities: Ban Khuan Pom, Ban Khuan Ngoen, Ban Sai Khanun and Ban Noen Inkaew. Each nursery is used as a seedling center for various local plant species before transplanting them into the swamp. This project worked with the local communities to provide relevant knowledge on areas such as characteristics of quality seedlings and how to identify the strain of seedlings.



Monitoring the growth and survival of planted seedlings.

It also helped to develop the community's nursery management skills using modern processes, including techniques on seed cultivation, transplanting and monitoring the growth and survival of the planted trees, etc. An experiment on supplemental planting in the peat swamp forest of roughly 25–30 plants per rai (0.16 hectares) was conducted in order to develop future replantation plans. Demonstration plots have also been established to restore the ecosystem through restructuring the tree clusters and restoring forests using the seed ball technique.

4) Forest fire monitoring and peat swamp forest management: 'Drones' were provided to Bor Lor Non-Hunting Area and Thale Luang Non-Hunting Area, Songkhla and the use of drones and/or GPS (Global Positioning System) has been also promoted as a main tool for forest fire monitoring and forest management. Knowledge and skills related to the use of these technologies was provided to the community and local authorities. Drones and GPS are essential tools, as they are very suitable for surveying the condition of the forest, especially in areas that are otherwise difficult to reach. Using these devices also helps to save the time and costs (e.g. personnel costs) associated with exploring the forest by person. These devices are also used to assist in patrols, and the monitoring of forest fires and encroachment.

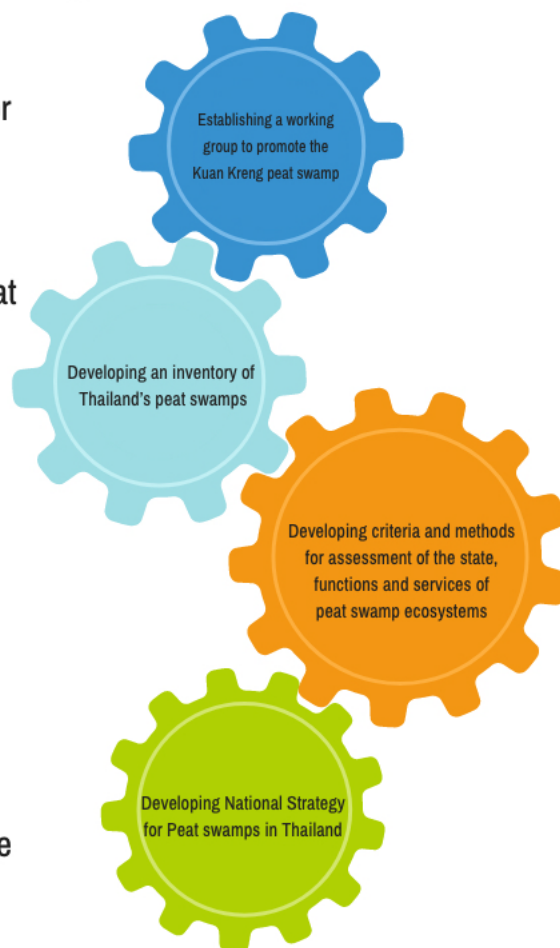
A numbers of manuals related to topics such as peat swamp forest ecosystems restoration, nursery management, and carbon monitoring and measurement were developed to be used as guidelines for the community and local authorities in the future. In addition, the use and applications of the above mentioned technologies are still continuously being improved by the community and local authorities in order to ensure that they are being used effectively and in a way that is appropriate to community's lifestyle, which may change in the future.





WORKING MODEL 3: Developing strategic information for planning the conservation and restoration the peat swamp forests in Thailand

The Landscape Task Force, chaired by the Deputy Governor of Nakhon Si Thammarat, has been formed to work on an Integrated Landscape Management Strategy Plan in the Kuan Kreng area. The Director of Nakhon Si Thammarat Provincial Office of Natural Resources and Environment, was serving as the Secretary of the Task Force, while associated agencies from the government sector, NGOs, universities and community representatives formed members of the working group. In addition, three technical working groups were formed on Kuan Kreng Forest and Ecosystem Restoration; Forest Fire and Carbon Management; and Water Management in the Kuan Kreng peat swamp. The aim of these working groups is to facilitate a more efficient plan for the conservation and restoration of the Kuan Kreng Peat Swamp Forest.



In addition to the establishment of these working groups, an economic valuation of the Kuan Kreng landscape peat ecosystem was conducted to enable policymakers to understand and recognize the benefits of the ecosystem services and natural resources in the area. The data from this assessment can also be used to inform measures targeting the conservation and restoration of the natural resources within the peat swamp ecosystem. In addition, the data obtained from the assessment was used to develop a method and criteria for assessing all peat ecosystems in Thailand.

Prince of Songkla University updated data being managed in the existing peat swamp inventory/database in Thailand, which was developed in 2009. As part of this update, additional information was collected on the following key areas: carbon storage, the health status of the swamp, assessing swamp threats and the level of importance of all peat swamp forests in Thailand.

The information in the database covers 27 swamp forests in Thailand and also includes data on swamp area boundaries, physical characteristics, soil resources, water systems, functions and services of ecosystems, land use, and carbon sequestration.

Prince of Songkla University also developed a draft national strategy with six sub- strategies for peat swamp management in Thailand. The strategic plan was developed based on information learned over the project duration in addition to drawing on Thailand's pre-existing policy framework and relevant national conventions related to conservation and restoration. The main focus of the national strategic plan is to resolve peat swamp degradation and reduce threats and restore the peat swamps in Thailand for the benefit of carbon storage.

Strategy 1: Prevention of direct and indirect loss of peat swamp areas.

Strategy 2: Conservation and restoration of peat swamp areas.

Strategy 3: Expansion of knowledge and awareness related to the value and importance of the peat swamp area by the general public.

Strategy 4: Promotion of education and research on the status of peat swamp areas and peatland conservation, as well as on the sustainable use of peat swamp natural resources for added value.

Strategy 5: Continuous monitoring and measurement of the status of swamp areas.

Strategy 6: Increase the readiness of the associated organizations on peat swamps management and promote the participation of local stakeholders.



EXAMPLES OF ACCOMPLISHMENTS: SUCCESS STORIES

**COMMUNITY AWARENESS AND
SENSE OF OWNERSHIP**

PEOPLE AND KNOWLEDGE

**ACHIEVEMENTS OF
SUSTAINABLE
CONSERVATION AND
RESTORATION OF THE
KUAN KRENG PEAT SWAMP**

TECHNOLOGY/PROTOTYPES

**CROSS-SECTORAL
COOPERATION**

The project's success in meeting the goals and objectives can be assessed using benchmarks laid out in the project's target indicators. Such an assessment alone, however, would not reflect the success of all other, more qualitative aspects of the project's work, such as the success of the strategies used, or positive changes influenced in the thoughts and attitudes of Thai people at both a local and national level.

STORY 1: Local Forces Change the Life of the Kuan Kreng Peat Swamp Forest

“Peat”, called in Thai as “Pru” refers to wetland filled with water all year round or most of the year, and various plant and animal remains are decomposed together to form a thick layer of soil.

Although there are many peat swamp forests in Thailand, the Kuan Kreng Peat Swamp Forest is the second largest in the country after the Toh Daeng Peat Swamp Forest in Narathiwat Province. The Kuan Kreng Peat Swamp Forest currently has a total peat coverage of approximately 86,942 rai (13,911 hectares) (Assoc. Prof. Prasong Sanguantham). Degradation of the swamp has been a continuing issue and has been exacerbated by problems such as natural disasters, in the form of forest fires, as well as encroachment by humans.

In 2019, there were 87 recorded incidences of forest fires in the Kuan Kreng Swamp Forest, resulting from both natural and human causes. As a consequence of these fires, nearly 5,000 rai (800 hectares) of peat swamp forest were destroyed, impacting the livelihoods of the local communities.



Mr. Sawai Thongkham, Chief of Tambon Administration Organization, Kreng Sub- district, commented that, “Most of the destruction of the swamp has been the result of only a few causes such as forest fires, which may occur naturally or as a result of people’s carelessness. If the fire is able to make it underground, it will take a very long time to extinguish it. Sometimes if it is windy, this can cause the fire to reignite. We are in trouble now because we have always benefitted from the peat swamp, for example, by taking food from the forest to eat and sell. What do we do now when the forest is steadily declining?”

“We need to look at the needs of the community in order to develop an efficient plan for forest management.”

– Mr. Praphaisak Sukyoi, Chief of Thale Noi Non-Hunting Area

Local Forces: The Wheels Driving Sustainable Conservation

Although work on peat swamp conservation and restoration never stops, one barrier that remains relates to a lack of continuity of systematic peat conservation and restoration work.

The Maximizing Carbon Sink Capacity and Conserving Biodiversity through Sustainable Conservation, Restoration and Management of Peat-swamp Ecosystems Project realized the importance of sustainable conservation and therefore emphasized community engagement through community approval throughout the project, as well as working to engender a sense of ownership and full community engagement with the project's work. The community also took part in making decisions regarding the implementation of swamp conservation and reforestation activities, in order to help seamlessly incorporate these actions into the community's daily routines.

The first step in this process was therefore to establish collaboration with members of the local community, community leaders, community-based organizations, schools (including local youth) and local government agencies. The project adhered to the principle of listening to opinions of all sectors in every step of the process. Communities and local authorities were allowed to engage in decision-making to ensure that the conservation and restoration practices are in fit with the community lifestyles and livelihoods. The project aimed to foster a sense of ownership within the local community toward the Peat Swamp Forest in order to encourage them to be active in its conservation and restoration. Following this principle has resulted in cooperation from the local community through a number of 'Local Forces'. These forces, discussed below, are the wheels driving the community's participation in swamp conservation and restoration and are proof of the project's success in this regard. More importantly, now that the wheels have started spinning, they will not stop, even in the absence of external support.

The 'Local Forces':

1) Young Scientists: Youth from local schools gathered together to jointly measure and monitor the carbon in the swamp, this was done in collaboration with the local educational institutions.



2) 'Rak Pa Pru' Forest Conservation Youth Club: This club carries out activities to promote awareness and a sense of social responsibility related to the conservation and restoration of the peat swamp among youth in their own community.

3) Community Learning Center Committee: This is a group of community members who have been selected to manage the learning centers, which were established to promote the conservation and restoration of the swamp forest within the community as well as to external visitors.

4) Community Researchers: Youth in the community who have been trained in data collection serve as community researchers by collecting information from the local community. Data collected is used to inform further planning related to peat swamp conservation and restoration.



“One of the activities we do every month as community researchers is to go into the swamp to learn together and explore the degradation. Data was collected and we planted seedlings as well.”

– Mr. Thanawat Thongsuk, President of the 'Rak Pa Pru' Forest Conservation Youth Club

5). Patrol: This force consists of community volunteers, staff from the Tambon Administrative Organizations, Local leaders and staff from the Nakhon Si Thammarat Forest Fire Operation Center. The aim of the established patrol is to improve the local community's capacity in doing their own patrolling, including education on skills such as water level monitoring, forest fire prevention and the use of GIS.



6) Forest Teachers: Governmental officials from the Bor Lor Non-Hunting Area have engaged in organizing educational activities relating to peat swamp conservation and restoration for youth in local schools.

Changing the Life of the Kuan Kreng Peat Forest: Success in Swamp Conservation

“[The local community] also tried to conserve the Kuan Kreng Peat Swamp Forest before, but we did not yet have a clear working approach. For example, if we wanted to grow seedlings, each of us would do it in our own way. This is the same with creating fire buffering zones, we would each build it using our own knowledge. However, since we all joined the project, everyone now has the same understanding and we also have guidelines we can follow, so conservation has become easier. It is easier to communicate with one another as well and we can see better results, faster than before. These methods tend to be more sustainable too.” – Mr. Sanan Kongkaew, Head of Moo 11 Village, Kreng Sub-district.

Key successes of Kuan Kreng Swamp Forest conservation, resulting from cooperation from local forces, can be summarized according to the following main project indicators:

1. 74,363 hectares (102,169 rai) of the Kuan Kreng Peat Swamp Forest is managed and protected under Kuan Kreng Landscape Strategy, which is being adopted as appropriate by the relevant agencies.
2. A total of 430 hectares (2,719 rai) of the Kuan Kreng Peat Swamp Forest in the three community forests: Ban Khuan Ngern Community Forest (562.5 rai), Princess Chulabhorn Garden Community Forest (1,500 rai) and Ban Sai Khanun Community Forest (625 rai), has been prepared to be managed as a community forest in accordance with the participatory community forest management plans developed by each community.
3. The level of efficiency of Kuan Kreng swamp management has increased by using the Management Effective Tracking Tool (METT) to conduct efficiency measurements and evaluations. Thale Noi Non-Hunting Area recorded an efficiency level of 69 (an increase from 64) and Bo Lor Non-Hunting Area had an efficiency level of 61 (significantly improving from its initial score of 42).
4. The Ecosystem Health Index (EHI) tracking system was developed and implemented in the Kuan Kreng Peat Swamp Forest. During a review it was found that the ecosystem health index in the Thale Noi Non-Hunting Area improved, with a score of 0.78 (up from an initial score of 0.76). This was due to an increase in the score related to habitat and living conditions. The Bor Noi Non-Hunting Area also improved, with a score of 0.75 (up from 0.71), due to an increased score related to the health of living conditions.

Apart from these indicator achievements, successes were also shown during the project implementation, including increased awareness and more systematic knowledge management within the community. As Mr. Thanawat Thongsuk, President of the 'Rak Pa Pru' Forest Conservation Youth Club, commented, "I think people in our community are more aware of conservation. I noticed this from the fact that there was more discussion on conservation because of the knowledge that people in the community have learned. This knowledge will continue to expand, and will make them more aware. They have done more systematic conservation work."

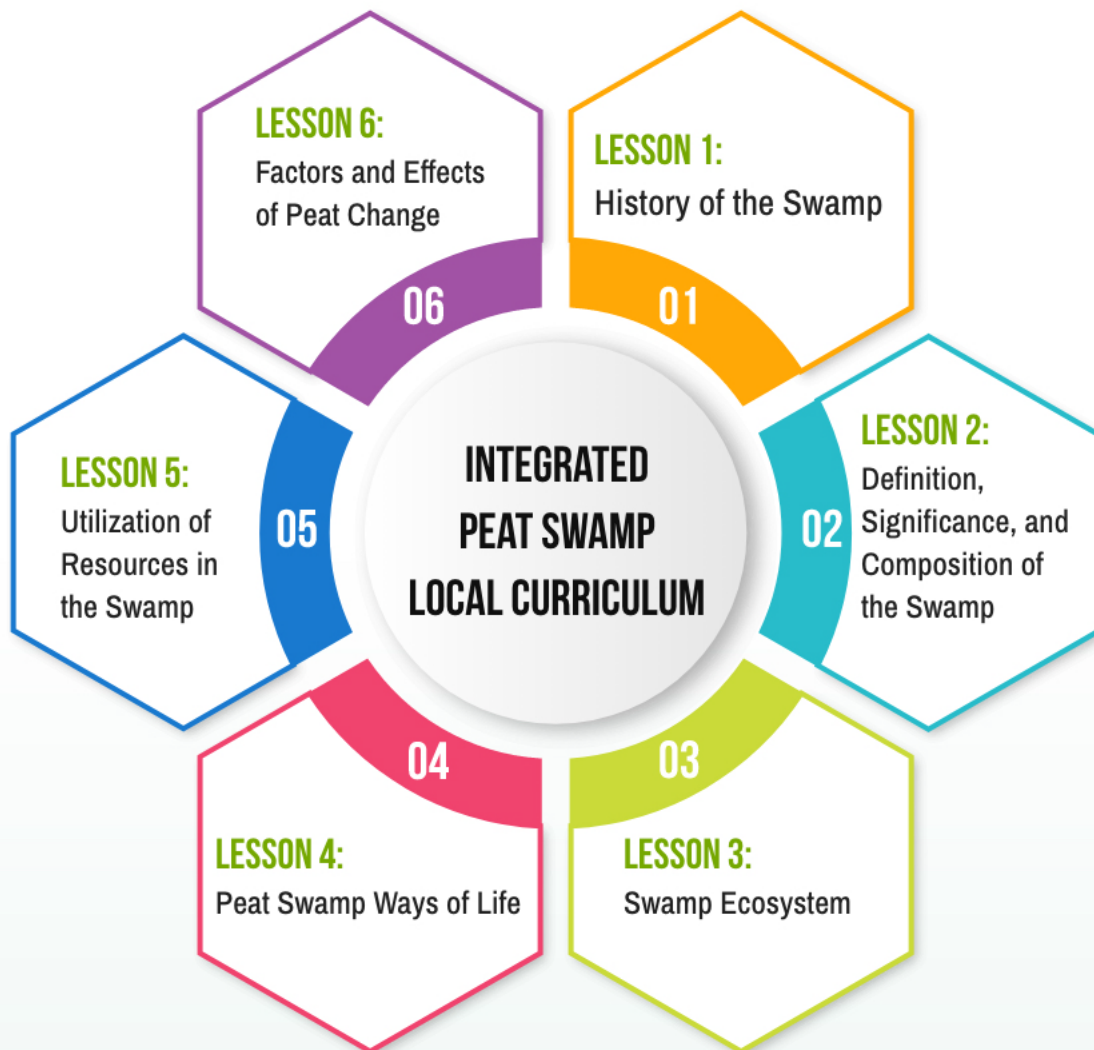
A number of more concrete outputs were also developed. This includes three learning centers, four nurseries, a swamp forest inventory database, carbon tracking guidelines, a nursery management manual and the creation of an Integrated Peat Swamp Local curriculum on Peat Swamp Conservation. These outputs can be further used and extended by community and local government agencies.

Whether it be an indicator achievement or a physical product of the project's activities, all of these are considered important steps towards achieving the project's goals and objectives. The Kuan Kreng community will not stop, and will only work to extend these successes with the help of the local forces in order to 'change the peat swamp's life' to be better and sustainable forever.

"We will continue to do conservation work even though there is no longer support from outside agencies because conservation work is like a part of life that we do every day on a regular basis. The work that we find important and that we will work on continuously, is to raise awareness on returning the balance of swamp's ecosystem, with a focus on the proper management of the water levels in the swamp forest."

– Mr. Chainarong Kongkue, Secretary of the Love Homeland Association, Nakhon Si Thammarat.





STORY 2: Reviving the Kuan Kreng Peat Swamp Forest Restores Prosperity to the Community

When thinking of the benefits of peat swamps, people tend to understand that peat swamps are like other types of forests, which help to produce oxygen for humans. Indeed, peat swamps have the capacity for carbon sequestration, storing carbon from the atmosphere in wood of the trees and more importantly in the thick soil layer of 'peat', formed of decayed animal and plant remains. In addition, the peat swamp also serves as a reservoir to control forest fires, as a source of biodiversity for both plant and animal species, as a buffer from natural disasters, and as protection against coastal erosion as the peat swamp traps sediment and minerals. Most importantly, these peat swamps are a source of food and income for people in the communities living around the swamp forest.



Kuan Kreng Peat Swamp Forest is an ecosystem that serves and promotes the livelihoods of the local community. As Mr. Sanan Kongkaew, Head of Moo 11 Village, Kreng Sub-district, says, the Kuan Kreng Peat Swamp Forest is “like a pantry where people in the community can always find food. It is also like an office, where people in the community can go and work there by using the swamp’s natural to generate income for themselves and their families.”

When the swamp is restored, the way of life of the surrounding communities will prosper as well, as people can gain both direct and indirect benefits from the use of swamp’s resources to



feed their stomachs and to generate income from selling these resources or by promoting community tourism. The peat swamp even has the benefit of producing cleaner air to breathe, which leads to improved physical and mental health.

Peat Swamp Forest Restoration: Carbon Sequestration – Reducing Global Warming

Peat swamp forests have ten times the carbon sequestration capacity of common tropical forests. Peat soils with a minimum thickness of one to ten meters, are capable of storing large amounts of carbon. The Kuan Kreng Peat Swamp Forest has peat soils ranging from 0.5–5 meters deep (data from the project's database system is available at <https://swampforest.i-bitz.co.th/>)

Throughout the implementation of this project, a central aim has been to build an understanding of the value of peat swamps in terms of carbon storage, targeted not only at the local community, but at wider society more generally. This was done by disseminating information through various media that was communicated through the 'Pru Kuan Kreng' Facebook page and the project website (<https://prukuankreng.org>), as well as through public relations engagement with mass media, targeting the wider public. This project highlighted that the essence of good communication is not just dissemination via a variety of channels, but also an easily understandable message.



“If we talk about carbon and greenhouse gases, sometimes it's hard to understand and it's not clear. On the other hand, telling me that the layers of vegetation, animal remains, or peat will absorb and store air pollution, causing less pollution in the air that we breathe every day is easy to understand. This kind of message is easy and direct. The people in the community can understand and realize that they need to hurry to restore the peat. To me, the project has succeeded in raising awareness on carbon storage. If you compare it to the past, some of us really did not know about this at all.”

– Mr. Thanawat Thongsuk, President of the 'Rak Pa Pru' Forest Conservation Youth Club.



Carbon measurement and monitoring was conducted in four sample plots. The carbon was measured in the morning and afternoon on a monthly basis.

People's Prosperity: Krajood – a Local Plant and the Main Income of Women

Some people refer to 'Krajood' as the 'emerald of the Kuan Kreng swamp'. It is a valuable resource that does not require any money to acquire. Instead, it can be used to generate income to support one's family.

Krajood is from the same plant family as 'Kok' (sedge), and it is considered to be a weed that is very easy to grow. Krajood trees tend to grow in areas that are constantly waterlogged, especially in 'peat', or what people in Thailand's southern region call 'Proe'. The Kuan Kreng peat swamp is one of the most abundant areas in the country for Krajood and is consequently a main source of Krajood exports in the form of raw material or Krajood products.

Through the project implementation, a 'Krajood Press Machine' was provided to benefit women's group in Kreng and Ban Tul sub-districts, under the management of TAOs of these two sub-districts, to assist in the production process. In addition, the local community was given advice on how to cut Krajood properly in order for it to continue to grow after harvesting. The marketing of Krajood has also been promoted by taking product samples from the community accompanied by a tag with information on the product's story, including production locations. Photos of the



Krajood products, including woven bags and mats, were uploaded to the AIS 'Farmsuk' project website (<https://www.ais.co.th/farmsuk/>), which sells agricultural products made by community enterprises. Interested consumers are also recommended through the website to contact the Krajood Women's Basketry Group directly to purchase additional products. In addition, the Women's Group was also given advice on popular designs of products on the market. Mrs. Suphap Kongkaew, Head of Krajood Women's Basketry Group in Kreng sub-district, commented that "In the past, we would just weave and sell it to others to paint or to decorate beautifully and then they would sell it for a higher price. But now we understand that we should do the whole process, so that we can sell the products at a higher price."

Mrs. Suphap also said that “Krajood has been with [our community] since our ancestors. For many generations, the communities around the swamp used Krajood in the family, for example, to weave into mats or for use as sacks filled with salt. In the past, these sacks with 50 centimeters wide and two meters long were sold for only two to three baht per piece. More recently, we’ve started to weave Krajood into fashionable bags and hats to sell for higher prices and it is now the main income for a family. This can relieve family burdens and can even support our children’s educations.”



After receiving support from the project in terms of integrated production and marketing, Mrs. Suphap has increased her income from 2,000–3,000 baht to 4,000–5,000 baht per month. This is because she has a greater understanding of the product designs that current with market trends. She has also learned how to use social



media, such as Facebook and Line (an online messaging application) to directly contact customers and is also contacted by customers who saw the group’s products advertised on the ‘Farmsuk’ project website.

Every morning, she goes into the swamp from 7 a.m. to collect Krajood and other plant species because the sun is not yet hot at that hour and more bunches can be cut. Around noon, she will come back from the swamp forest. In four to five hours, a day’s work, up to five large bundles of Krajood can be collected. Each bundle will be divided into 15–20 smaller bundles, to be sold separately. This results in an income of approximately 600–700 baht per day, which is quite high.



The process of making Krajood products begins with collecting new Krajood and mixing it with white mud to enhance its durability. After drying it in the sun for about three days, the Krajood is then washed to



remove the mud and then air dried for one night before being rolled with a mortar roller several times. The final step before weaving is to flatten the Krajood again using a machine roller.

Currently, the Kreng Sub-district's Women's Basketry Group has ten members, consisting of housewives, children, and youth. As a result of the project implementation, the group has received more orders from consumers, which has resulted in each member earning a higher income. In addition, women are also encouraged to have more opportunities to engage in community activities, to have the opportunity to express their opinions, and to make joint decisions on various issues relating to the conservation and restoration of the peat swamp forest.

People's Prosperity: Community Tourism – Income for the Community

Community Learning Centers in three pilot sub-districts of Cha-uat District, Nakhon Si Thammarat Province: Kreng, Ban Tul, and Cha-uat, were established as centers for organizing activities in a systematic and continuous way, aimed at disseminating knowledge and understanding on peat swamp forest conservation within both the community and wider society. The centers are managed by members of the local community. One of the main missions of each center is to promote community tourism, which has the potential to generate income from tourists when they visit the various learning stations offered by each center, for example, the Krajoed Basketry Station. Each learning center has developed at least 20 such stations for tourists to visit and participate in activities in each sub-district.

The Kreng Sub-district Community Learning Center is chaired by the Chief of the Kreng Tambon Administrative Organization. A business plan for the center was also developed with support from experts at the Nakhon Si Thammarat Rajabhat University and relevant local agencies, including the Nakhon Si Thammarat Tourism Office and the Agricultural Tourism Network, in addition to many other local stakeholders. Following the creation of this business plan, a group of tourists visited the learning center to take part in its learning activity as a pilot implementation in order to prepare to welcome more tourists in the future.



As the condition of the peat swamp continues to improve, the direct and indirect benefits of the Kuan Kreng Peat Swamp Forest to the livelihoods of the people in the local community will also be multiplied and sustained. These benefits will furthermore be extended more widely to encompass all the people in Thai society.



Using Geographic Information System (GIS) mapping or a Global Positioning System (GPS) device is essential to navigating and geo-locating on the Earth's surface for forest resource field surveys, forest resource reconnaissance, and the prevention of forest fires or other offenses against forest resources (e.g., poaching, illegal logging and forest encroachment).

The cultivation of quality seedlings in the nursery through the use of standard quality nursery management techniques such as seeding techniques, reprocessing, and monitoring of the growth and survival of the nursery and its plants.

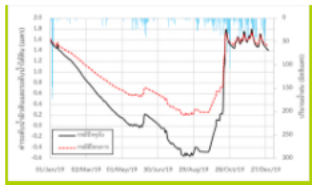


Geographic Information System Mapping

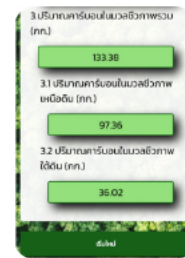


Nursery and Cultivation Techniques

Technologies / innovations used in the conservation and restoration of the peat swamp



MIKE SHE Model



Carbon Monitoring and Sequestration App

The MIKE SHE model simulates the entire process of the hydrological cycle and calculates surface water and groundwater flow. The objective of the model is to understand the water balance of the Kuan Kreng Peat Swamp area in order to plan for water management, and to prevent flooding or forest fires as a result of excessive drought.

Carbon monitoring and carbon sequestration measurement applications were developed to support the measurement and monitoring of carbon content in the Kuan Kreng Peat Swamp area by the community through tracking and data entry through an app installed on a regular smartphone.

STORY 3: Strengthened Cross-sectoral Cooperation between Communities, the Public Sector and Non-governmental Organizations Leads to the Sustainable Conservation and Restoration of Peat Swamp Forests

‘Listening to all stakeholders’ is the message that sits at the heart of working together. It is undeniable that cross-sectoral cooperation has the power to drive successful work related to the conservation and restoration of the Kuan Kreng Swamp Forest.

Such cross-sectoral cooperation, combined with community knowledge and input from local agencies, has resulted in the project’s success. This can be seen through more systematic knowledge management in the community and the establishment of a participatory management mechanism.



Mr. Ronnakorn Triraganon, Senior Strategic Advisor, RECOFTC remarked that, “The knowledge of building a participatory management mechanism has been developed. This includes the process of consolidating and compiling data on community knowledge, communication with the government sector, and determining economic incentives for improving community participation. These are all examples of an effective process of building community and government cooperation. This knowledge has also been applied to further work, used to develop guidelines for participatory work for staff at the College of Local Wisdom at Thaksin University to follow.”

The work of the Tha Chin Forest Fire Network in Ban Tul Sub-district is another achievement resulting from the cross-sectoral cooperation that was facilitated through this project.

The Tha Chin Forest Fire Network consists of around 20–30 members of the local community who work to monitor and surveil forest fires which is considered very important work. Since joining the project, a new role of ‘Forest Fire Teacher’ has been developed to work with the Bor Lor Non-Hunting Area and the Forest Fire Control station in Kreng Sub-district (governmental agencies)

to provide relevant knowledge and skills to students in local schools. These Forest Fire Teachers were given the opportunity to participate in various training and other learning and knowledge sharing activities organised by the project. This resulted in an improved collaboration between the community and local authorities on forest fire prevention activities.

Mr. Somchai Polsawat, President of the Tha Chin Forest Fire Network, commented that, “What I have noticed is how the project has acted as an intermediary to strengthen the work between the government and the community. For example, before the project, through our Forest Fire Network, we would work to monitoring and surveille forest fires with just our own group. Now, however, we are planning to work together with the Forest Fire Teachers. We will join hands as a team to teach students in the school together. This kind of work is better and more proactive for forest fire prevention.”

Mr. Somchai furthermore noted that this active and preventative work not only educates teachers and students, but also raises awareness around the issue of forest fire prevention for other people in the community, encouraging their participation and cooperation. This is because students and teachers in schools spread their knowledge to their families, which creates more opportunities for people to join in the Network’s work on fire monitoring and surveillance. This makes the work more successful.

The project’s focus on promoting cooperation between the public and the community also helped to bridge gaps and mitigate conflicts between the local community and the government. As Mr. Songwut Yiumveth, Chief of Bor Lor Non- Hunting Area, observed, “The Forest Teachers have been in operation since 2015. After we joined this project in 2019, we were provided with additional training and received teaching materials for us to use at the schools. This has all made the work of our Forest Teachers more efficient. Not only does this work educate children and the community, but it also helps to reduce conflicts between people in the community and government officials because the children we teach act as mediators to help the adults to understand each other.”

The success of government-community cooperation resulted not only in more efficient and sustainable work on peat swamp conservation and restoration, but it also enabled the achievement of the project’s key indicators, such as 4,600 hectares (28,750 rai) of the Kuan Kreng peat swamp was maintained according to appropriate water management practices, which were developed according to the analysis of the MIKE SHE model by local authorities.

CONCLUSION:

Carrying forward the conservation and restoration of the Kuan Kreng Peat Swamp and other peat swamp forests in Thailand

The forests can live without people, but people cannot live without the forests

The Maximizing Carbon Sink Capacity and Conserving Biodiversity through Sustainable Conservation, Restoration and Management of Peat-swamp Ecosystems Project focused not only on work related to the impacts of peat swamp degradation on biodiversity and climate change, but it also highlighted the importance of the ecological linkage between the swamp forest and local community livelihoods; addressing both the needs of people in the community and the surrounding environment. Therefore, integrated cross-sectoral cooperation – through the encouragement of participation from all sectors in expressing their thoughts, working on joint planning and developing guidelines – was a key strategy in this project that highlight the ways to ensure the continuation of systematic and sustainable conservation and restoration work by the community and local authorities of the Kuan Kreng Peat Swamp Forest. Evidently, such continuation of conservation and restoration by community and local authorities will be made possible, using the project's outputs such as the Strategic Plan for Participatory Swamp Management in the Kuan Kreng Landscape Area, various manuals/guidelines and technologies including drones and the Krajoed Press Machine and, especially shared experiences.

Nationally, the United Nations Development Programme also saw the possibility of extending this work in the conservation of 27 swamp forests in Thailand. This began by considering the possibilities of extending the lesson learns or outputs obtained from the project such as the Peat Swamp inventory, the draft national strategic plan on peat swamp conservation and restoration, the Peat Swamp Youth Challenge Project and the incentive measures that were initiated over the course of this project. In addition, the United Nations Development Programme has implemented a feasibility study on the selection of financial instruments suitable to the Kuan Kreng peat swamp. This study aims to generate impact investments from the private sector in the conservation and restoration of the Kuan Kreng Peat Swamp Forest. Various financial instruments were explored, and it was found that there are several instruments suitable for the Kuan Kreng Peat Swamp Forest, including carbon credit markets and high-end ecotourism. Results from the study will be applied in the future.

In addition to the initiatives planned by the project stakeholders to continue the conservation and restoration work in the target area, and the approaches to facilitate the work's sustainability at the policy level, as mentioned above, the United Nations Development Programme also hired two independent evaluators to assess the project overall and to provide recommendations for further implementation at both the local and national levels. The recommendations obtained from these independent evaluators will be considered and applied, as appropriate, to the various approaches to expand the project's work developed by the project stakeholders.

The United Nations Development Programme hopes that project information compiled in this report will be useful in promoting wider and ongoing cooperation related to the conservation and restoration of peat swamps. These swamps are important ecosystems with abundant biodiversity that provides a variety of ecological services to local community livelihoods. The peat swamps also help to prevent climate change, reduce pollution, and reduce global warming for the wider society. Therefore, maintaining the balance of these peat swamps can provide both direct and indirect benefits not only to our generation but also the generation of our children and grandchildren. Creating a sustainable future requires cooperation from all sectors starting from the individual, up to the family, community, local, and finally the regional, and national levels.

The project would like to thank all of the project's participants, including all of the sectors that cooperated diligently in the work and the exchanging of knowledge throughout the project period. We hope to have the opportunity to work together again in the future.

Working together with all sectors is the heart and power of conserving, restoring and developing the peatlands in Thailand to provide endless benefits for our children.

Recommendations: Completing, applying and socializing project deliverables

- Water management - Further apply the MIKE SHE Model for real testing of water management
- Carbon monitoring – Support a critical technical review of the project-supported methodologies and results on carbon monitoring
- Strengthen the sustainability of livelihoods and expand the network to Thale Noi and Songkhla Lake areas
- Link some ongoing activities in KKL area to the GCF readiness support project
- Test the integrated landscape approach linking climate change and biodiversity through the Innovation Accelerator Policy Lab
- Locate additional external funding to support the sustainability of project outcomes
- Disseminate completed project deliverables and lessons learned to all relevant national and provincial government agencies and other stakeholders and hold further workshops to generate co-learning
- Foster cooperation with the private sector on peat swamp management as businesses can benefit from peat swamp carbon restoration
- Support further work on indirect economic valuation of ecosystem services of Kuan Kreng Peat Swamp

Recommendations from Independent Evaluators

Recommendations: Facilitating outcome sustainability – Policy actions

- Water management - Further apply the MIKE SHE Model for real testing of water management
- Complete the process for government review and endorsement of the National Strategy on Peat Swamps (the draft to be considered by Wetland Technical Committee and subsequently submitted to the Wetland Management Sub-Committee, then National Environment Committee, and finally Cabinet for endorsement)
- Integrate the National Strategy on Peat Swamps into relevant national action plans and seek endorsement from Cabinet
- Propose an amendment to the Cabinet Resolutions on 1 August B.E. 2543 and 3 November B.E. 2552 to
 - Revise and prioritize the list of wetland areas by adding the peat swamps listed in the PSU inventory of peat swamps
 - Revise the list of critical wetland areas urgently requiring restoration and conservation, based on the PSU and project's works specifying the peat swamp areas that are under threat
- Propose to the Cabinet to designate Kuan Kreng Peat Swamp and other peat swamps as Wetlands of International Importance under the Ramsar Convention
- Expand Kuan Ki Sien Ramsar Site to cover Thale Noi NHA
- Propose to the Cabinet to designate To Daeng Peat Swamp as an ASEAN Heritage Site

PROJECT'S INDICATOR ACHIEVEMENTS

GOAL: To conserve and restore peatlands to increase their capacities to act as carbon sinks, as habitats for globally important species, and as sources of ecosystem services for improved livelihoods.

TARGET INDICATOR	ACHIEVEMENT (AS OF DECEMBER 25, 2020)
<p>The total target area of the project (154,363 ha or 964,769 rai) will be under the management of an integrated mosaic of various appropriate land categorization and sustainable co-management regimes. Songkhla Lake Basin will remain as a 'benefit area' of Kuan Kreng Peatswamp conservation practices.</p>	<p>The total target area of the project (154,363 hectares or 964,769 rai) is under the management of an integrated mosaic of various appropriate land and sustainable co- management regimes through various guideline/tool such as community forest management, Strategic Plan for Participatory Swamp Management in the Kuan Kreng Landscape Area and technologies in the conversation and restoration. In addition, the Sathing Phra Peninsula area has also benefited from the conservation and restoration of Kuan Kreng because Kuan Kreng serves as a water source for the Sathing Phra area. As a result, successes in Kuan Kreng directly affect the Songkhla Lake area and Sathing Phra Peninsula. Moreover, the project also worked to exchange knowledge and experiences learned from Kuan Kreng with those in the Songkhla Lake area and the Sathing Phra Peninsula.</p>

PROJECT'S INDICATOR ACHIEVEMENTS

OBJECTIVE 1: Expanding the protection of high conservation value peat swamp forests and demonstrating their sustainable use within the broader landscape.

TARGET INDICATOR	ACHIEVEMENT (AS OF DECEMBER 25, 2020)
<p>A total area of 16,347 ha (102,169 rai) is protected through an integrated mechanism.</p>	<p>A total of 74,363 ha has been protected under an integrated mechanism, the Strategic Plan for Participatory Swamp Management in the Kuan Kreng Landscape Area. Currently, relevant local agencies have implemented the plan as possible and appropriate.</p> <p>Participatory Swamp Management in the Kuan Kreng Landscape Area consists of six plans:</p> <ol style="list-style-type: none"> 1. Peat Swamp Forest Fire Management and Carbon Balance Plan 2. Integrated Water Management Plan 3. Forest Ecosystem Restoration Plan 4. Raising Public Awareness on Peat Swamps through Youth and Local People in the Kuan Kreng Landscape Plan 5. Peat-Swamp-Based Livelihood Development Focusing on Sustainable Production Plan 6. Policy and Law Enforcement Focusing on the Integration of Policies and Legal Implementation Plan
<p>Enhanced management effectiveness at existing Protected Areas (Non-Hunting Areas – NHAs) and Songkhla and Kuan Kreng peat swamp landscapes as measured by METT (Management Effective Tracking Tool)</p> <p>METT target Thale Noi NHA: 75 Bor Lor NHA: 70</p>	<p>METT efficacy levels increased but have not met target indicators.</p> <p>Thale Noi NHA: 69 (increased from 64) Bor Lor NHA: 61 (increased from 42)</p> <p>A possible cause for not meeting the targets relates to 2019 incidences of forest fires, which impacted the management of the Kuan Kreng Peat Swamp Forest.</p>

<p>Incidence of violations of NHA regulations</p> <p>Target Bor Lor NHA: 0 Thale Noi: less than 6</p>	<p>Incidence of violation was not reduced as targeted:</p> <p>Bor Lor NHA: 8 Thale Noi: 33</p> <p>Possible causes for not meeting the targets relate to unclear boundaries of land use and oil palm planting by the private sector.</p>
<p>Incidence of forest fires burning on average 480 ha (2,550 rai) per year</p>	<p>Incidence of forest fires was not decreased as targeted. Total of 2,394 ha (14,963 rai) per year were impacted by forest fires.</p> <p>Possible causes for not meeting the target relate to the severity of the dry season and fuel stored underground for 10 years, reigniting forest fire easily.</p>
<p>11 units trained for patrolling, managing water levels, fire protection, and enforcement of regulations.</p> <p>Target 3 units in Kreng, Cha-uat and Ban Tul sub-districts 2 units in Bar Lor NHA 6 units in Thale Noi NHA</p>	<p>More than 11 units trained for patrolling, managing water levels, fire protection, and enforcement of regulations.</p> <p>Units trained include:</p> <ul style="list-style-type: none"> ● 6 units in Thale Noi NHA ● 2 units in Bor Lor NHA ● 1 Kreng TAO ● 1 Cha-uat TAO ● 1 Ban Tul TAO ● 14 local schools
<p>435 ha (2,719 rai) of peat swamp forests in Kuan Kreng landscape is managed under participatory community forestry management plans or co- management</p>	<p>A total of 430 hectares (2,719 rai) of the Kuan Kreng Peat Swamp Forest in the three community forests: Ban Khuan Ngern Community Forest (562.5 rai), Princess Chulabhorn Garden Community Forest (1,500 rai) and Ban Sai Khanun Community Forest (625 rai), have been prepared to be managed as a community forest in accordance with the participatory management plans developed by each community</p>
<p>Ecosystem Health Index (EHI) monitoring system for monitoring peatland health is developed and in place for 2 NHAs in order to ensure good quality habitat for Yellow-headed Tortoise, and Fishing Cat.</p>	<p>The Ecosystem Health Index (EHI) tracking system was developed and implemented in the Kuan Kreng Peat Swamp Forest. During a review it was found that the ecosystem health index in the Thale Noi Non-Hunting Area improved, with a score of 0.78 (up from an initial score of 0.76). This was due to an increase in the score related to habitat and living conditions. The Bor Noi Non- Hunting Area also improved, with a score of 0.75 (up from 0.71), due to an increased score related to the health of living conditions.</p>

PROJECT'S INDICATOR ACHIEVEMENTS

OBJECTIVE 2: Implementing technologies to avoid peat swamp forest degradation and restore degraded peat swamps forests

TARGET INDICATOR	ACHIEVEMENT (AS OF DECEMBER 25, 2020)
4,600 ha (28,750 rai) of peat swamp area in KKL is under effective water table management regime	4,600 hectares (28,750 rai) of the Kuan Kreng peat swamp was maintained according to appropriate water management practices, which were developed according to the analysis of the MIKE SHE model by local authorities
At least for 25% of the area (1,150 ha), the water level will never drop more than 20 cm below surface.	Although this indicator has not been evaluated yet, it is considered to be a success at some level. The MIKE SHE model, which was successfully used based on the participation of various parties from the government sector and the community, has resulted in the development of a sustainable water management strategy. Currently, the relevant local agencies are in the process of planning to implement this strategy in the future. This indicator can be evaluated once this model and plan has been implemented and in use for long enough to measure its success.
Reduced GHG emissions at 4,600 ha (28,750 rai) of pilot sites of peat swamp forest from 2.793 Mt CO ₂ -eq to 1.959 Mt CO ₂ -eq	Due to Covid-19, data collection could not be completed as data collection team could not visit the target area. Thus, there was not enough information to evaluate the results of this indicator.
Peat swamp ecosystem restoration manual is developed.	The manual on peat swamp ecosystem restoration was developed and used in the community.

PROJECT'S INDICATOR ACHIEVEMENTS

OBJECTIVE 3: Improving policies, standards, and enforcement mechanisms for conservation and sustainable use of peat swamp forests

TARGET INDICATOR	ACHIEVEMENT (AS OF DECEMBER 25, 2020)
Cross-sectoral working group for promoting a landscape approach to peatlands conservation and sustainable use is formed.	The Landscape Task Force, chaired by the Deputy Governor of Nakhon Si Thammarat, has been formed to work on an Integrated Landscape Management Strategy Plan in the Kuan Kreng area. Associated agencies from the government sector, NGOs, universities and community representatives formed members of the working group. In addition, three technical working groups were formed on Kuan Kreng Forest and Ecosystem Restoration; Forest Fire and Carbon Management; and Water Management in the Kuan Kreng peat swamp. The aim of these working groups is to facilitate a more efficient plan for the conservation and restoration of the Kuan Kreng Peat Swamp Forest.
Criteria and methodologies for assessment of the state, function and services of peatland that take into account the full range of ecosystem services, is developed.	Criteria and methodologies for the assessment of peatland ecosystems suitable to Thailand have been developed.
Inventory of all peatlands is developed.	Inventory of all 27 swamp forests in Thailand was developed/updated. The information in the database includes data on swamp area boundaries, physical characteristics, soil resources, water systems, functions and services of ecosystems, land use, and carbon sequestration.
New 20-year strategy that takes economic and ecological benefits into account in determining use of peatlands is developed.	Draft national strategy with six sub- strategies for peat swamp management in Thailand was developed. Strategy 1: Prevention of direct and indirect loss of peat swamp areas Strategy 2: Conservation and restoration of peat swamp areas

Strategy 3: Expansion of knowledge and awareness related to the value and importance of the peat swamp area by the general public

Strategy 4: Promotion of education and research on the status of peat swamp areas and peatland conservation, as well as on the sustainable use of peat swamp natural resources for added value

Strategy 5: Continuous monitoring and measurement of the status of swamp areas

Strategy 6: Increase the readiness of the associated organizations on peat swamps management and promote the participation of local stakeholders