COMPONENT 2

INTEGRATION OF NATURAL CAPITAL ACCOUNTING INTO LOCAL DEVELOPMENT PLANNING AND OPERATIONS

OUTPUT 2.2.6

DEVELOP A BUSINESS CASE FOR THE PILOTING OF THE SELECTED MARKET-BASED INTRUMENT IN KRABI PROVINCE

OUTPUT 2.3.1

PILOT THE IMPLEMENTATION OF THE SELECTED MARKET-BASED INSTRUMENT IN KRABI PROVINCE

OUTPUT 2.3.2

ESTABLISH AND ADMINISTER A TRUST FUND TO RECEIVE AND DISBURSE INCOME GENERATED FROM THE IMPLEMENTATION OF THE MARKET-BASED INSTRUMENT IN KRABI PROVINCE

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THE INTEGRATION OF NATURAL CAPITAL ACCOUNTING IN PUBLIC AND PRIVATE SECTOR POLICY AND DECISION-MAKING FOR SUSTAINABLE LANDSCAPES

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Executive Summary

Market-Based Instruments (MBIs) are important financial mechanisms for promoting the sustainable management and conservation of natural resources by creating continuous economic incentives for environmental protection. The implementation of MBIs under this project initially focused on waste management in Ao Nang Subdistrict, one of the province's most popular tourist destinations. As effective waste management is essential for sustainable tourism, a financing mechanism based on the Pay-As-You-Throw (PAYT) concept was developed. Although the Ao Nang Subdistrict Administrative Organization had previously explored this approach, the initiative remained at the feasibility study stage and could not proceed due to legal and regulatory constraints. Consequently, the implementation of this MBI was discontinued.

Following this experience, the project explored alternative opportunities for implementing market-based instruments and identified Khlong Prasong Subdistrict as a suitable location. Situated within the wetlands of the Krabi River Estuary, the area forms part of an internationally recognized Ramsar site and lies along the East Asian–Australasian Flyway (EAAF), one of the world's major migratory bird routes. As part of this flyway, the wetlands provide an important seasonal habitat for migratory birds that arrive annually between November and April. Recognizing both the ecological significance of the area and its potential for sustainable ecotourism, the project developed a Payment for Ecosystem Services (PES) model centered on birdwatching tourism. The initiative aims to conserve migratory bird habitats while generating sustainable financial benefits for local communities and strengthening youth participation in biodiversity conservation.

A key component of the PES model is the involvement of local youth as birdwatching guides, enabling them to develop knowledge, leadership, and communication skills while fostering a stronger appreciation of their natural heritage. The program is implemented under the guidance of teachers, particularly from Muang Krabi School, together with local conservationists and experienced birdwatching guides. To support this initiative, the project established the Jib Jib Conservation Youth Club through a series of birdwatching camps for primary and secondary school students in Krabi Province. In addition, a Conservation Trust Fund was created to finance environmental conservation activities, with a portion of the revenue generated from birdwatching tours allocated to the fund. A club office has also been established in Khlong Prasong Subdistrict to serve as the operational center for the club's activities and future community-based conservation initiatives.

Introduction

Market-Based Instruments (MBIs) play an important role in supporting natural resource allocation and conservation by creating economic incentives that promote biodiversity conservation while enhancing local livelihoods. The identification and selection of appropriate MBIs in this study were guided by A Practice-Oriented Framework for Identifying Economic Instruments to Enhance Biodiversity and Human Livelihoods.

In Krabi, the implementation of MBIs has faced several challenges, particularly due to legal and regulatory constraints. Initially, waste management was identified as a potential MBI option; however, its implementation proved difficult under the existing legal framework. As a result, the study shifted its focus toward alternative MBI approaches, leading to the development of birdwatching-tour-based initiatives that aim to generate economic benefits while supporting biodiversity conservation and community participation.

1. Market-Based Instrument for Garbage Management

Krabi province is home to several prominent marine tourist destinations, resulting in a substantial influx of tourists and a high hidden population. Consequently, this has led to an elevated volume of solid waste, constituting a major environmental challenge in the region. Ao Nang Sub-district is among the areas actively confronting this issue. Furthermore, the conventional waste management system poses a significant barrier, rendering the handling of such massive waste volumes even more challenging. Specifically, the placement of large communal bins across various locations for single-stream mixed disposal precipitates subsequent secondary problems. These include the illegal dumping of waste originating from outside the jurisdiction and scavengers tearing open garbage bags to extract recyclable materials for sale.

Recognizing the critical nature of this problem, the Ao Nang Subdistrict Administrative Organization (SAO) piloted a waste management intervention via the "Ao Nang SAO-Branded Garbage bag Distribution Measure." This initiative was implemented among a cohort of 36 restaurant and accommodation operators between January and April 2018. This approach fundamentally aligns with the Polluter Pays Principle (PPP) and the Pay-As-You-Throw (PAYT) paradigm. Under this operational framework, the SAO sells these designated garbage bags to local enterprises and restricts its waste collection services exclusively to bags bearing the official Ao Nang SAO logo. (Figure 1)

Figure 1 Garbage bags stamped with the Ao Nang SAO logo

Source: The research team

The implementation results revealed that, overall, all participating establishments were highly satisfied with the pilot project (100%). The resulting benefits comprise the following:

1) Incentive Creation and Equity: Since establishments can manage their expenses based on the number of garbage bags purchased from the SAO, which contrasts with the conventional flat-rate monthly service fee, it generates a strong incentive to minimize waste disposal. Furthermore, it establishes equity during the low season, a period when waste volumes are inherently lower.

2) Safety: Because the garbage bags are designed to be semi-transparent, waste collection personnel are able to visually identify the contents. This significantly mitigates the risk of accidents caused by handling sharp fragments or hazardous waste.

3) Reduction of Outside Waste Issues: This is achieved because the SAO restricts its collection and disposal services exclusively to garbage bags bearing the official SAO logo.

4) "Saleng Patrol" Innovation: The SAO established formal agreements with groups of scavengers or "Saleng" (tricycle cart operators) who search through the bags for recyclable materials to sell. Stipulations include prohibiting the tearing of the garbage bags and requiring them to securely re-tie the bags to their original state after searching. These individuals are systematically registered and incorporated into the framework. Additionally, they assume an active role in monitoring for potential anomalies and reporting such incidents to the SAO.

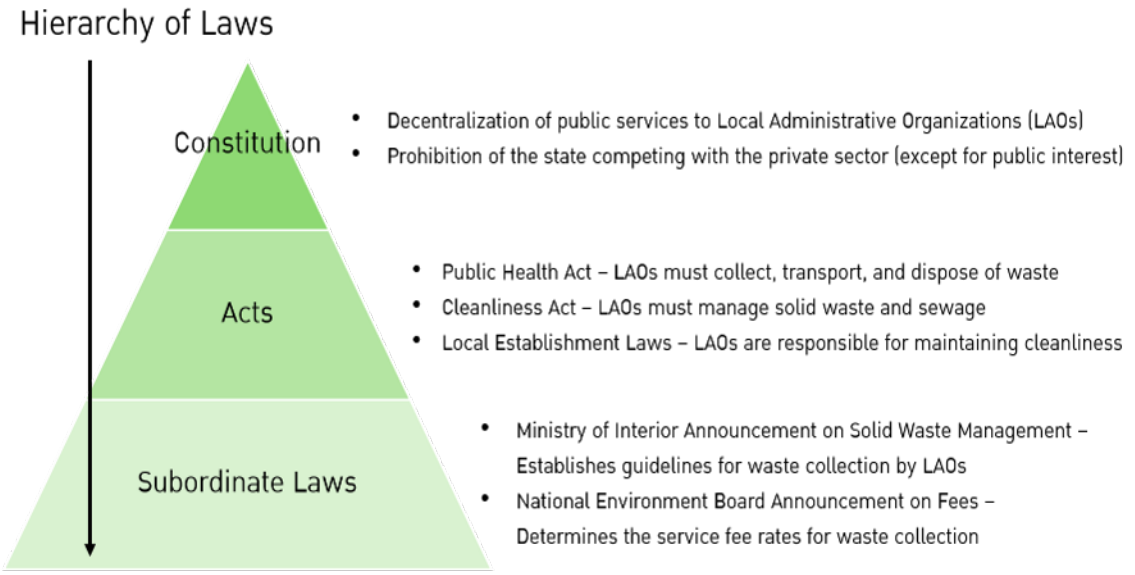
However, despite the implementation yielding satisfactory results, there remain legal constraints that pose significant obstacles to sustaining this measure over the long term. Under Thailand's Hierarchy of Laws (Figure 2), in which the Constitution serves as the supreme law, the execution of this measure falls outside the constitutional scope of authority granted to Local Administrative Organizations (LAOs). These limitations encompass the following:

1) Restriction on Commercial Activity: LAOs, as governmental entities, are prohibited from manufacturing and selling garbage bags, as this is deemed to be competing with the private sector.

2) Mandatory Service Provision: LAOs cannot refuse waste collection services to households and commercial establishments; therefore, they lack the authority to selectively collect only the garbage bags stamped with the official logo.

3) Subordination to National Law: The collection of fees must strictly adhere to national-level legislation, thereby precluding local ordinances from establishing divergent conditions.

Figure 2 The interrelationship within the three-tiered legal framework and the mandate of local administrative organizations in solid waste management



Source: The research team

To unlock the capability to execute this measure, Thailand must revise its existing regulations and legal frameworks. These necessary reforms include:

1) Empowering Local Administrative Organizations (LAOs): Expanding LAO authority in solid waste management operations. Specifically, regarding fee collection, LAOs should be legally permitted to sell garbage bags and reserve the right to refuse waste collection services to non-compliant individuals or establishments (e.g., those failing to sort waste or pay mandatory fees). **2) Lowering the Daily Waste Disposal Ceiling:** Reducing the maximum allowable daily waste disposal volume. This adjustment would enable LAOs to accurately assess waste density and calculate fees based on actual weight (per kilogram). **3) Resolving Regulatory Overlaps:** Amending the redundant and conflicting provisions between the Ministerial Regulations under the Act on the Maintenance of the Cleanliness and Orderliness of the Country and the relevant Ministerial Regulations under the Public Health Act concerning LAO waste management. This is crucial to eliminate operational confusion and apprehension among LAOs.

Additionally, other operational enhancements are required, such as diversifying the available channels for fee payments. The comprehensive details of the study's findings are provided in Appendix 1. The points above demonstrate that implementing the branded garbage bag distribution measure, which is a form of Market-Based Instrument (MBI) utilizing a local price mechanism—currently faces profound practical difficulties in achieving

successful adoption. Consequently, the research team has explored alternative tools with greater feasibility for implementation within Krabi Province, which will be presented in the subsequent section.

2. Market-Based Instrument for Birdwatching Tour in Khlong Prasong Subdistrict

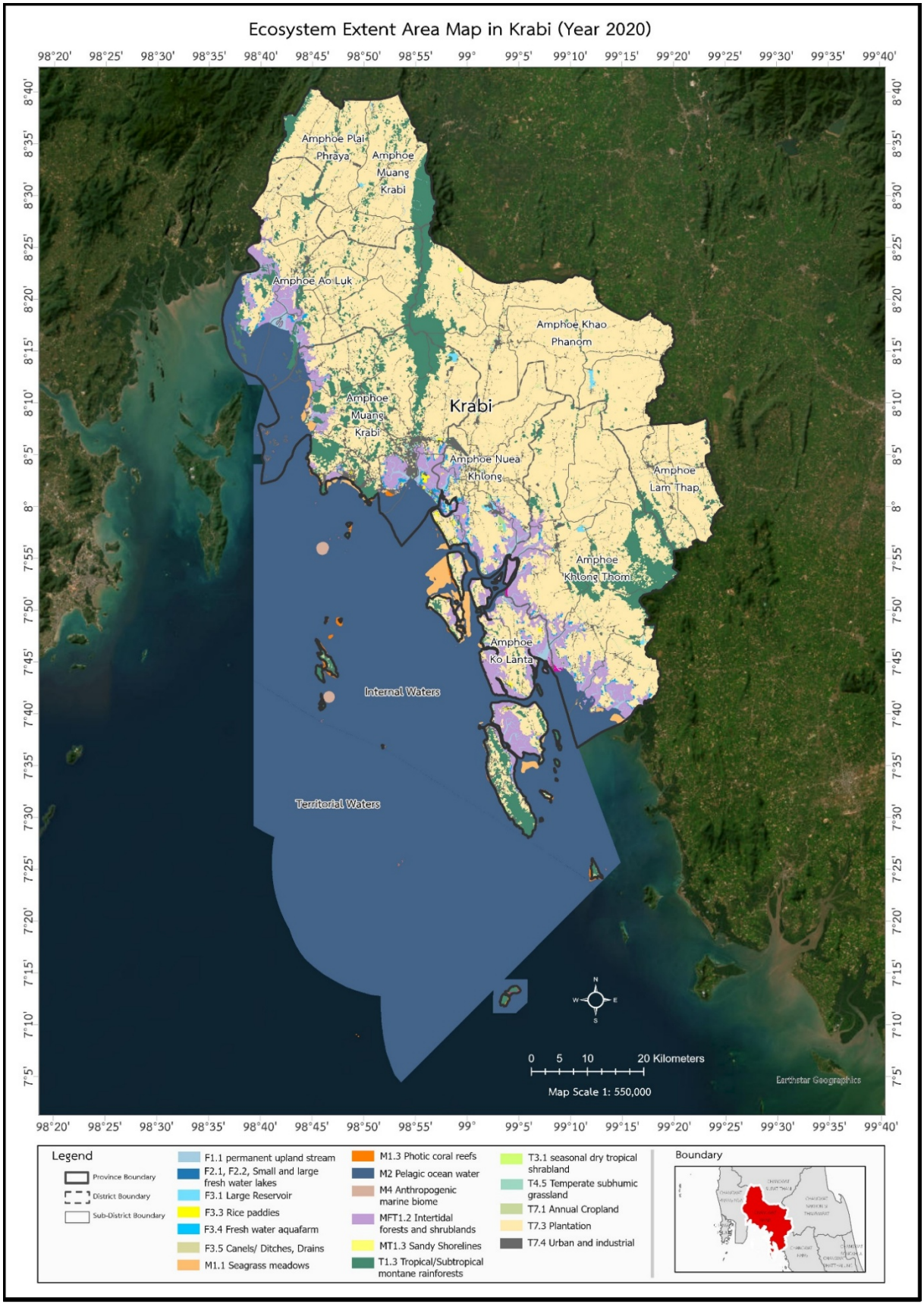
2.1 The Ecological Significance of Krabi Estuary

In recognition of the rich natural resources of Krabi province, particularly the marine resources, the project explored the possibility of designing an market-based instrument that can be deployed to provide incentive system leading to sustainable use of resources. Based on several market-based instrument outline earlier and given the Krabi endowment in marine resources, the Payment for Ecosystem Services (PES) is adopted here as a mechanism to mobilize resources that can be further used for Krabi's marine conservation. (Figure 3)

The Payment for Ecosystem Services (PES) is a mechanism where the beneficiaries of natural resources and environment are charged a fee for resource use. Setting an optimal of the fee is in itself a mechanism that will adjust the visitation rate to be at the optimal level of within the nature's carrying capacity, hence will reduce the unnecessary pressure on nature. The double dividend benefit of the Payment for Ecosystem Service (PES) is the flow of revenue that can be deposited in a revolving fund or a trust fund. This trust fund, when well maintained and managed, can be deployed for marine conservation effort in Krabi province.

The project identified the migratory birdwatching activities at Khlong Prasong Subdistrict that is located within the Krabi River Estuary what is classified as a Ramsar Site (Ramsar Convention on Wetland). Birdwatching in this area has been attracting not only the Thai visitors but visitors worldwide. In the past, birdwatching facilities has not been well organized but conducted by some local villagers. The project, therefore, saw an opportunity where school pupils can be trained and organized into a birdwatching club with adequate knowledge of the ecosystem, bird types and language skills, there is potential that these school pupils can begin providing organized tour guides to the visitors, both local and international.

Figure 3 **Ecosystem extent area map in Krabi (2020)**



Source: The research team

Trainings in ecosystem, bird types and language skills were organized for a group of both primary and secondary schools in Krabi province where the pupils are sufficiently comfortable to become birdwatching tour guides. A Facebook page is also created to enable tourists to book their Krabi birdwatching in advance. It is expected that the Payment for Ecosystem Service will serve as a mechanism where the local Krabi pupils will become a part of Krabi inclusive marine development and conservation. The income earned will not only serve as supplementary for the local pupils, but also resources for conservation activities as well.

The Khlong Prasong Subdistrict is of high ecological significance, as it is situated within the Krabi River Estuary and has been designated as a globally important wetland under the Ramsar Convention on Wetlands (Site No. 1100) (Figure 4).In addition, it is the first site in Thailand to be recognized as part of the East Asian–Australasian Flyway Partnership (EAAFP), a collaborative network dedicated to the conservation of migratory waterbirds and their shared habitats along the East Asia–Australasia Flyway.

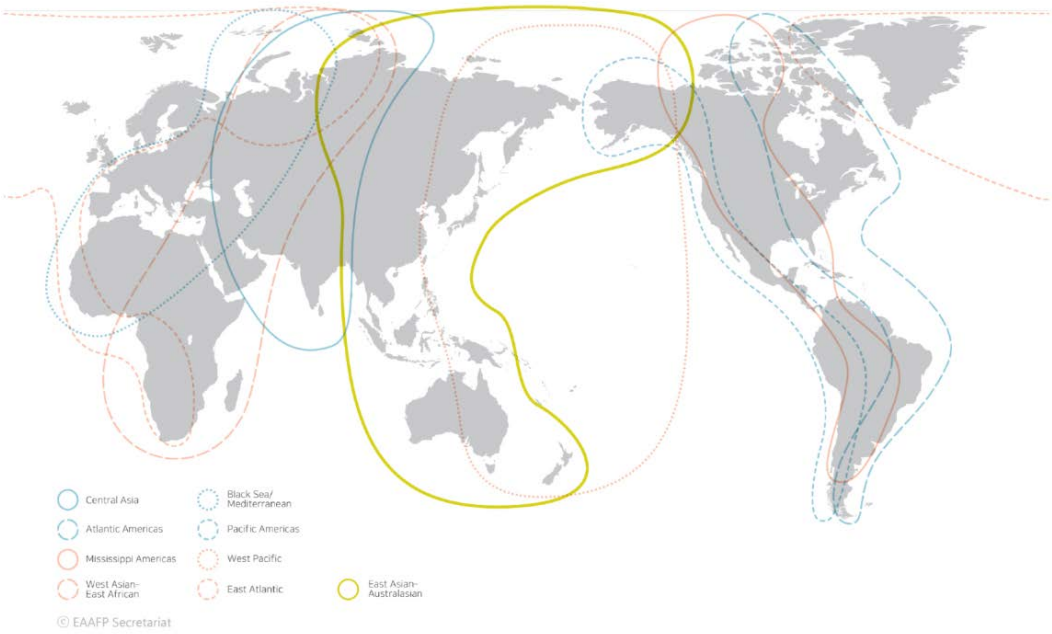
Figure 4 The Krabi Ramsar site map

Source: Krabi River Estuary Krabi Province (2026)

Khlong Prasong is listed as the 84th site under this partnership (Office of Natural Resources and Environmental Policy and Planning, 2023a). The East Asian–Australasian Flyway is one of the world's nine major migratory

waterbird flyways, extending from the Russia and Alaska in the north, through East and Southeast Asia, to Australia and New Zealand in the south, and encompassing 22 countries. (Figure 5)

Figure 5 East Asian–Australasian Flyway Partnership (EAAFP)



Source: EAAFP (2017)

Due to its proximity to the city, relatively intact mangrove ecosystems, and well-preserved traditional way of life, Khlong Prasong has become an attractive destination for tourists. This has led to the development of service-based activities, including boat and local transportation services, which provide important supplementary income for the community. Furthermore, seafood processing and local handicraft production by community groups serve as additional income-generating activities. The sub-district also features several notable tourist attractions, including Khao Khanab Nam, Laem Kham Beach, Laem Son Beach, extensive mangrove forests, OTOP product groups, homestay accommodations, and aquaculture sites. (Khlong Prasong Subdistrict Administrative Organization, 2021)

2.2 Bird Species in Krabi Estuary

The ecological abundance and diverse ecosystems of the Krabi River Estuary establish this area as a vital habitat and foraging ground for a wide array of wildlife, including numerous bird species. At least 57 avian species have been identified within the area, which can be classified into three groups based on their seasonal status: **Resident Species (16 species)**: This group includes birds that remain in the area year-round, such as the Javan Pond-Heron, Indochinese Roller, and Malaysian Plover. **Non-breeding Visitors (40 species)**: These are migratory birds that inhabit the area during the non-breeding or wintering season. Key examples include the Nordmann's Greenshank, Chinese Egret, and Red-necked Stint. **Resident and Non-breeding Visitors (1 species)**: This status applies specifically to the Black-winged Stilt. This classification is due to the fact that while a portion of the Black-

winged Stilt population resides and forages in the Krabi River Estuary permanently, another segment of the population joins them only during the migratory season.

When classified according to their Global Threat Status based on the IUCN Red List, the avian species in the area include 2 species categorized as Endangered (EN): the Nordmann's Greenshank and the Great Knot. Additionally, 4 species are classified as Vulnerable (VU), specifically the Chinese Egret, Curlew Sandpiper, Broad-billed Sandpiper, and Black-bellied Plover.

Furthermore, 9 species hold a Near Threatened (NT) status, including the Red-necked Stint, Red Knot, and Asian Dowitcher. The majority of the population, totaling 42 species, are classified as Least Concern (LC), representing species that are not currently at risk and remain commonly sighted, such as the Javan Pond-Heron, Osprey, and Black-winged Stilt (refer to Table 1 and Figure 6). Detailed information for each individual species is provided in the Appendix.

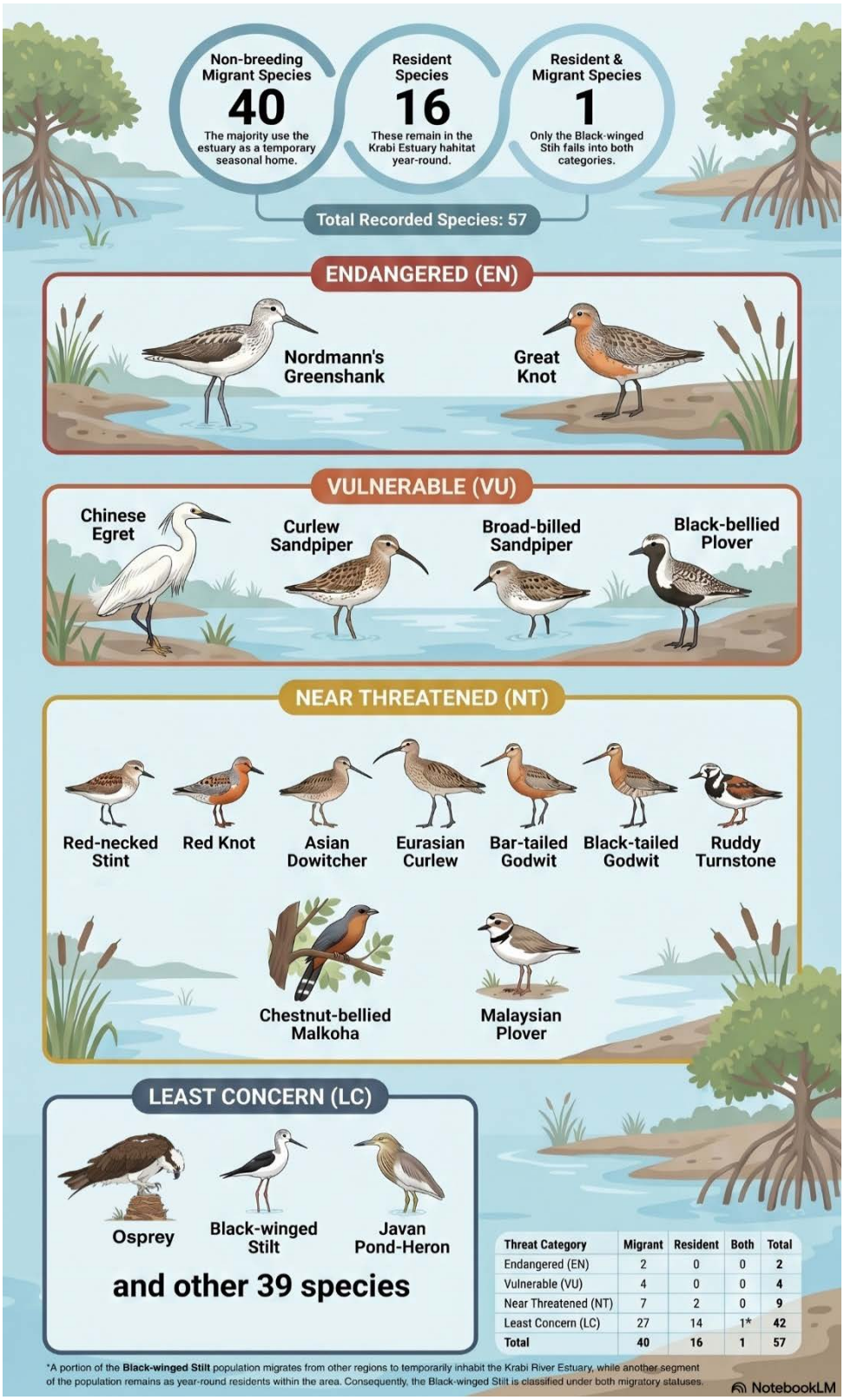
Table 1 Avian population in the Krabi river estuary categorized by seasonal status and global threat status

Global threat status / Seasonal status	Endangered	Vulnerable	Near threatened	Least Concern	Total
Non-breeding visitor	2	4	7	27	**40**
Resident	0	0	2	14	**16**
Non-breeding visitor & Resident	0	0	0	1	**1**
Total	**2**	**4**	**9**	**42**	**57**

Source: The research team

Birds are among the most frequently migratory animals, following a consistent annual cycle. As winter approaches, avian populations in the Northern Hemisphere encounter extreme cold, dormant vegetation, and a significant reduction in food sources as insects retreat underground. These unfavorable environmental conditions compel birds to migrate south to warmer regions to overwinter, before returning to the Northern Hemisphere during the summer months (Department of National Parks, Wildlife and Plant Conservation, 2006; Office of Natural Resources and Environmental Policy and Planning, 2023b). In Thailand, the southward migration typically occurs from September to December each year, with the return migration to the Northern Hemisphere taking place from March to May of the following year (Office of Natural Resources and Environmental Policy and Planning, 2023c). This phenomenon significantly drives the tourism industry in Krabi Province; birdwatching and bird photography are among the primary activities attracting tourists to the region, drawn by both migratory species that visit seasonally and resident birds that can be observed throughout the year.

Figure 6 Avian species of the Krabi river estuary: An infographic guide



Source: The research team

Notable and symbolic birds of Khlong Prasong Subdistrict and the Krabi River Estuary include the **Malaysian Plover** (Figure 7), a rare resident facing habitat loss. Unlike most shorebirds found on mudflats, it nests on white sandy beaches, serving as an indicator of a "pristine beach" and confirming the health of the sandy coastline. Its distinctive appearance makes it a favorite among photographers and birdwatchers. The **Chinese Egret** (Figure 7) is a Vulnerable migratory species and one of the rarest egrets in Thailand, with the Krabi River Estuary being one of the few locations where it can be observed during the winter. **Nordmann's Greenshank** (Figure 7) is an Endangered migratory bird that returns to the Krabi River Estuary annually, verifying that this wetland provides a safe "home" with sufficient food for one of the world's rarest birds. Lastly, the **Osprey** (Figure 7), a large fish-eating raptor, is an annual migratory visitor to the area, often seen foraging at the Krabi Municipality wastewater treatment ponds, attracting numerous bird photographers eager to capture the moment it dives for fish (Jaikiang, 2022).

Figure 7 Key avian species of the Krabi river estuary

Malaysian Plover

Chinese Egret

Nordmann's Greenshank

Osprey

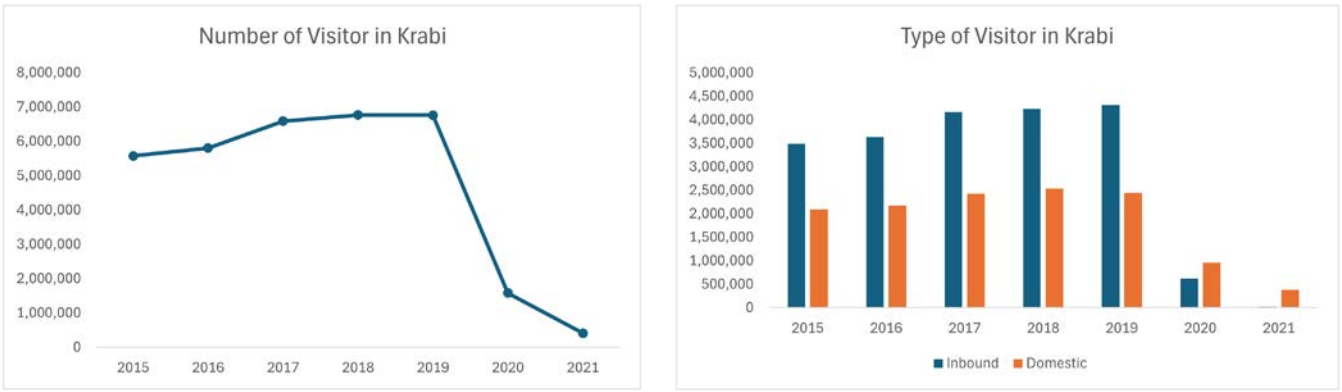
Source: The research team

2.3 Number of Tourists in Krabi and Potential of Birdwatching Tour operation in Krabi

Krabi is a province whose main source of provincial income comes from tourism, attracting an average of over four million tourists annually. On average, 60 percentage of the tourists are foreigners, and 40 percentage are

Thai. Tourism in Krabi focuses on experiencing nature, such as the sea, mountains, and mangrove forests. The Tourism Authority of Thailand (TAT) has introduced the **"Krabi Prototype"** which is the flagship model for sustainable tourism development (Thailand 2025). Many areas in Krabi have begun developing and promoting ecotourism, including community-based tourism initiatives in Ban Nai Nang, Thung Yipeng, and other communities across the province. This reflects an effort to strike a balance between economic development and the conservation of natural resources.

Figure 8 The number and types of visitors in Krabi



Source: The research team

In this context, ecotourism in the form of "birdwatching tours" presents a potential and attractive approach. It aligns with the trend of sustainable tourism and is gaining popularity in many countries worldwide. According to the survey by Booking.com, The digital travel companies that provides platform to book hotel, transportation, and activities, found that 70 percentage of surveyed people interest in choosing sustainable tourism activities (Nature-based tourism: a growing sector of world bioeconomy - The EFI BioGateway 2024). Furthermore, it can generate tangible income for local communities. Ecotourism is a key trend in the current tourism industry, particularly birdwatching, which attracts tourists interested in the environment, nature, and biodiversity. The global trend of birdwatching continues to grow as people prioritize valuable and environmentally friendly travel experiences. Birdwatching tours are relatively expensive compared to other types of tours because they require experienced guides with knowledge of birds to lead visitors to birdwatching locations. Most birdwatchers are environmentally conscious individuals.

An example is Australia. Data from Tourism Research Australia indicates that birdwatching-related tourism can generate up to US$2.6 billion in revenue, including tourist expenditure on transportation, accommodation, and food (Kristy Sexton-McGrath 2025). This highlights the strong potential of birdwatching as a key driver of the ecotourism economy.

2.4 Bird Watching Tour in Khlong Prasong

Birdwatching tourism in Khlong Prasong is currently led primarily by a single local guide, known as Bang Diao, who possesses specialized knowledge and experience in birdwatching. However, the concentration of this

knowledge and operational responsibility in one individual presents a limitation to the long-term sustainability of the activity.

Figure 9 The picture of "Bang Diao"

Source: The research team

Establishing birdwatching tour operations under a more organized institutional or community enterprise structure would help strengthen management, improve continuity, and reduce dependence on a single individual. Such an approach would also promote broader local participation, support more equitable income distribution within the community, and facilitate the transfer of birdwatching knowledge and guiding skills to younger generations, thereby contributing to the long-term sustainability of birdwatching tourism in the area.

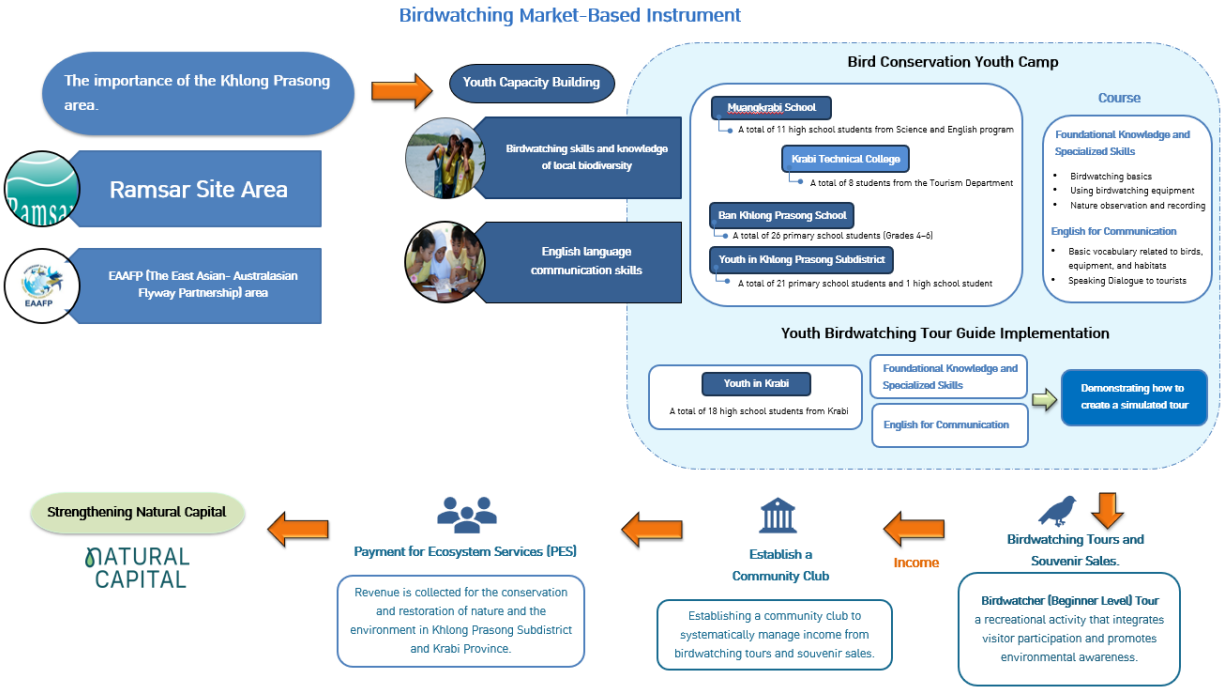
2.5 Payment for Ecosystem Service (PES)

Payment for Ecosystem Services (PES) has been introduced as a mechanism to incentivize the reduction of resource overexploitation while generating revenue for a designated trust fund. Under this approach, birdwatching tours operating in the Khlong Prasong where the area offer the birds, migratory and residency, area will be subject to a PES fee of certain amount of the total tour cost. After deducting operational expenses, the remaining funds will be allocated as earmarked resources to support environmental conservation activities.

PES has been placed in many places in Krabi province, access fees have been applied to manage visitor flows and generate revenue for environmental management, particularly in high-traffic destinations such as Koh Phi Phi and surrounding marine national parks. Access fees function as a mechanism to capture some of the economic benefits tourists derive from public natural resources, while also regulating visitor numbers to prevent ecological degradation. Tourists pay the fees upon arrival, either at ferry piers, entry points to islands, or designated park entrances. Local government authorities are responsible for fee collection and enforcement, ensuring that visitor access aligns with the carrying capacity of fragile ecosystems.

At Hat Noppharat Thara–Mu Ko Phi Phi National Park in Krabi Province, entrance fee rates reflect a clear tiering by nationality and age: Thai adults are charged 40 THB and Thai children 20 THB, whereas foreign adults pay 200 THB and foreign children 100 THB. For designated special islands within the park—such as Ko Phi Phi Don, Ko Phi Phi Le and Ko Mai Phai—an additional service/entry fee applies to foreign visitors, typically around 400 THB for adults and 200 THB for children (Bangkok Post, 2023). Over a recent four month window (October 2023 to February 2024), the park collected approximately 267.5 million THB in entrance fees from around 126,398 tourists, underscoring the strong revenue potential of such dual rate structures (Bangkok Post, 2024)

Figure 10 Market-based instrument concept for birdwatching tour



Source: The research team

2.6 Youth Development Program for Conservation-based Birdwatching Guides

Under the PES birdwatching tour concept, a critical component for successful implementation is the capacity building of local youth, aimed at fostering awareness of the ecological and social importance of their hometown. In addition, these activities help enhance participants' skills and potential in ecotourism, which is being actively promoted as a key tourism development in Krabi. Therefore, The Research Team organized the **"Jib Jib*Conservation Youth Camp"** during 4–6 March, 11–13 March 2026, and 30 April – 2 May 2026. The implementation the these skills in the camp in 6-8 May 2026 for high school students in Youth Development Program for Conservation-based Birdwatching Guides camp.

The name "Jib Jib" was inspired by the sound of birds, reflecting the camp's focus on nature learning and bird conservation. The youth guide training was delivered through both theoretical and practical birdwatching camp activities. Participants included high school students from **Muangkrabi School**, **Nuaklongprachabumrung School, Ammartpanichnukul School, Yasirah Pithyanusorn School** and vocational students from **Krabi Technical**

College, and elementary school students from **Ban Khlong Prasong School** and **Ban Koh Klang School**. The camp was designed to strengthen participants' foundational knowledge of wetlands, biodiversity, and birdwatching through a combination of classroom-based learning and hands-on field experiences.

The program emphasized learning from nature, responsible birdwatching, and the cultivation of essential skills for future careers. Participants also received basic English language training for tour guiding, along with introductory knowledge and practical skills related to birdwatching. This initiative aimed to enhance the capacity and quality of community-based tourism in a manner that is consistent with the principles of ecotourism.

Overall, the training sought to build the confidence, skills, and potential of local youth to become future birdwatch guides and to pursue opportunities in ecotourism, including serving as guides for birdwatching tours in the area.

Figure 11 Jib Jib Conservation Youth Camp at Ban Khlong Prasong School

Source: The research team

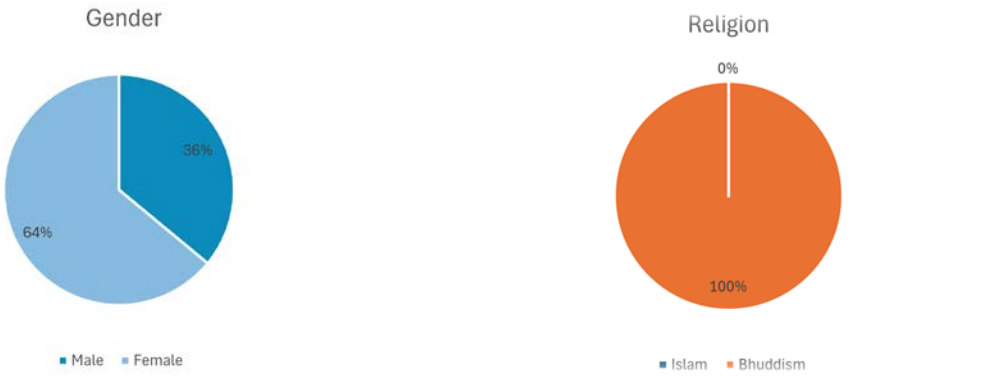
Following the completion of the **"Jib Jib Conservation Youth Camp"** in March, students from both schools, Muangkrabi School and Ban Khlong Prasong School will further their birdwatching learning through hands-on experience by participating in a on birdwatching site at Khlong Prasong area practical birdwatching camp organized by the 'Enlive Foundation' in May. Upon successful completion of both camps, the youth will receive certificates and commemorative pins to certify their training. Details of the theoretical birdwatching training camp for young people in March are as follows:

1) Jib Jib Conservation Youth Camp at Muangkrabi School for 3 days (4-6 March 2026)

Muangkrabi School, located in Mueang District, provides secondary education from Mathayom 1 to Mathayom 6 and is situated in close proximity to Khlong Prasong Subdistrict. The school offers a science-focused curriculum that emphasizes outdoor learning activities to strengthen students' hands-on experiences. In this context, birdwatching presents an important opportunity to promote scientific learning related to ecosystems and biodiversity, while also helping students develop observation skills, analytical thinking, and scientific communication abilities. In addition, these activities are intended to help prepare students for future opportunities in the tourism sector by linking educational experiences with the development of sustainable tourism, in line with the provincial **"Krabi Go Green"** policy for sustainable tourism development.

The **Jib Jib Conservation Youth Camp** was designed to strengthen participants' foundational knowledge of birdwatching and biodiversity through a combination of theoretical, practical, and field-based activities. It also aimed to build the confidence, skills, and potential of young people for future careers as birdwatching guides and in the field of ecotourism. A total student of 11 person from Mathayom to 4-6 participated in this camp.

Figure 12 Characteristic of the students in Muangkrabi School



Source: The research team

The camp curriculum was structured into two main components: (1) foundational knowledge and specialized skills, and (2) English for communication, as shown in Table 2

Table 2 Scope of learning for the Muangkrabi School camp

Component	Detail
Foundational knowledge and specialized skills	
Foundational Knowledge on Birdwatching and Ecology	Basic knowledge of birdwatching and types of resident and migratory birds
	Ecosystems and wetlands in Krabi Province
Birdwatching Skills and Field Techniques	Training in observing bird behavior, sounds, and habitats
	Birdwatching equipment and its proper use
	Bird recording
Conservation Awareness and Responsible Practice	Ethics and responsible birdwatching
Reflective Learning and Participatory Activities	Group activities and experience sharing
	Creating a nature journal
English for communication	
	Basic vocabulary related to birds, birdwatching equipment, and habitats

Component	Detail
Activities to Develop Foundational Knowledge of English and Birdwatching	Self-introduction phrases and expressions for introducing birdwatching activities
	Simple descriptions of bird characteristics (e.g. color, size, and behavior)
	Safety and etiquette expressions for birdwatching
	Basic responses to tourists' questions
Activities to Strengthen Communication Skills and Practical Learning	English vocabulary games related to birds
	Role-play conversation practice
	Practice describing birds based on photographs and birdwatching scenarios
Practical Birdwatching Tour Guiding Activities	Practice leading a birdwatching activity in English

Source: The research team

Moreover, Teachers and students from the Tourism Department of **Krabi Technical College** shared their experiences in tour guiding, real-world work experience, and suggestions for appropriate tour guiding practices for birdwatching tours.

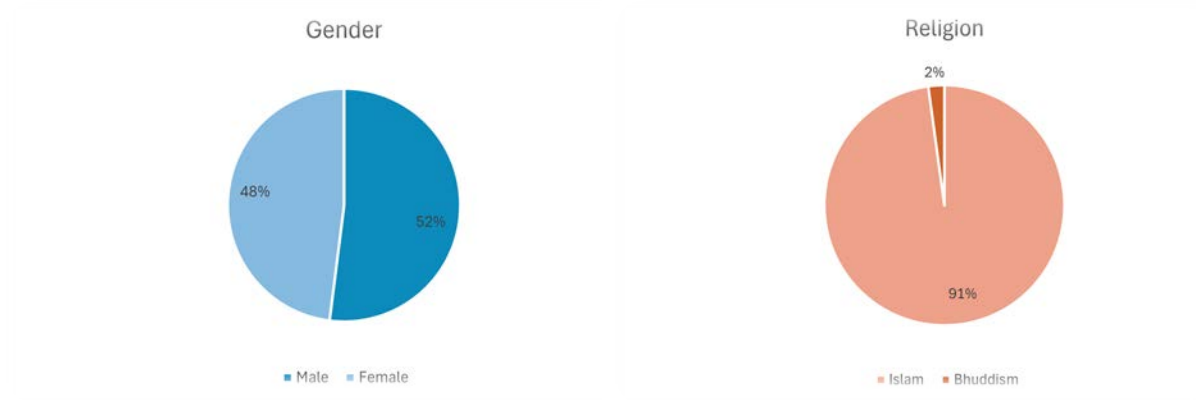
Figure 13 Jib Jib Conservation Youth Camp at Muangkrabi School.

Source: The research team

2) Jib Jib Conservation Youth Camp at Ban Khlong Prasong School for *3* days *(*11-13 March 2026*)*

Ban Khlong Prasong School, located in Khlong Prasong Subdistrict, provides training for primary school 23 students (Grades 4–6) where the majority of the students are Muslim and the total of students 25 person aimed at fostering a sense of pride in and connection to their hometown. Through a tour guiding course offered at the school, students are introduced to the importance of wetlands, biodiversity, and local resources of the area, enabling them to develop a deeper understanding of Khlong Prasong Subdistrict.

Figure 14 Characteristic of the students in Khlong Prasong school



Source: The research team

This learning process not only helps students become more familiar with their community but also supports the development of local tourism awareness and encourages them to become welcoming and responsible hosts for visitors.

Figure 15 The Students from Ban Khlong Prasong School

Source: The research team

The camp's learning content is divided into three main areas: learning activities, field activities, and English language activities, as follows

Table 3 **Scope of Learning for the Ban Khlong Prasong School camp**

Area	Detail
Learning Activities	Learn basic knowledge about birds for kids
	Get to know birds in the area around Ban Khlong Prasong School
	Learn ethics and etiquette for responsible birdwatching
	Learn how to use birdwatching equipment
English Language Activities	Learn basic English vocabulary about birds and nature
	Practice simple English sentences for birdwatching and communicating with tourists
	Role-playing activity: Introducing birdwatching activities
	Practice giving simple birdwatching introductions in English
Field Activities	Practice bird observation around the school and nearby communities.
	Practice using binoculars and field birdwatching
	Practice identifying bird species based on shape, color, sound, and simple behavior
	Record birdwatching observations in a nature journal

Source: The research team

The activities also included designing souvenirs for the birdwatching tour as a way to encourage students' creativity and participation in tourism-related activities. The program initially introduced simple souvenir ideas, such as T-shirt designs and keychains, to make the activity more accessible and less challenging for children. However, students were also encouraged to contribute their own ideas and develop additional souvenir concepts based on their interests and creativity.

Figure 16 **The students designed the souvenirs**

Source: The research team

In addition, on the final day of the camp, **'Bang Diao,'** a local birdwatching guide in Khlong Prasong area, shared his experiences in guiding tours and birdwatching, as well as providing knowledge about bird species and the conservation of natural resources in the area.

Figure 17 Bang Diao shared his birdwatching tour experience to students at Ban Khlong Prasong School

Source: The research team

In addition, the activities included the design, production, and installation of a birdwatching learning corner at Ban Khlong Prasong School. The school was selected due to its location, which offers opportunities to observe both migratory and resident birds, and because birdwatching is already closely connected to the daily lives of many children in the community.

Learning Materials

The development of learning materials and guiding tools for birdwatching activities aims to support youth learning, strengthen local knowledge, and build capacity for future community-based ecotourism. Key materials include a small birdwatching booklet featuring easy-to-understand information on local and migratory bird species, a guiding catalogue for young tour guides with content on the history and significance of Krabi Province and Khlong Prasong Subdistrict, and a bird catalogue with bird photographs to support interpretation during tours.

Supporting equipment and educational tools include binoculars, a telescope, bird field guides, books and educational materials, vests and hats for field activities, route maps, and photographic learning materials for bird identification and observation. In addition, learning tools for young birdwatchers will be developed, including a field activity guide, a bird identification and field recording notebook, and a nature journal for practicing environmental observation and recording.

These materials will help enhance knowledge, observation skills, and local pride among young people, while also creating opportunities to support sustainable birdwatching tourism in the future.

Figure 18 **Bird field guide for Jib Jib Conservation youth club**

Source: The research team

Figure 19 **The last day of Jib Jib Conservation Youth Camp at Ban Khlong Prasong School**

Source: The research team

3) Jib Jib Conservation Youth camp in Koh Klang School (30 April to 2 May 2026)

This camp is extend from the previous camp as happening at Ban Khlong Prasong School to get the engagement from the young across the subdistrict. This camp was held at the Ban Koh Klang School on 30 April to 2 May 2026 which is the Summer time and school closed but the participants across the subdistrict and also mix of level of students from Pratom 3 to Mathayom 4. Since this camp is to raise the awareness of the environment in their hometown and the knowledge of being a guide where all the student can participate.

The camp's learning content is divided into three main areas: learning activities, field activities, and English language activities, as follows

Learning Activities

The learning activities were designed to provide students with foundational knowledge and practical skills in birdwatching. Participants learned basic information about birds suitable for young learners and became familiar with bird species commonly found in the area surrounding Ban Khlong Prasong School. The activities also introduced the ethics and etiquette of responsible birdwatching to promote respect for wildlife and the

environment. In addition, students received hands-on training on how to properly use birdwatching equipment, including binoculars and field observation tools.

Figure 20 The students from Ban Koh Klang School learned the activities

Source: The research team

English Language Activities

The English language activities were designed to strengthen participants' basic communication skills in the context of birdwatching and ecotourism. Students learned essential English vocabulary related to birds and nature and practiced using simple English sentences for birdwatching activities and communicating with tourists. The program also included role-playing activities in which participants practiced introducing birdwatching activities and interacting with visitors. In addition, students were encouraged to develop confidence in speaking by practicing short and simple birdwatching introductions in English.

Figure 21 The students from Ban Koh Klang School

Source: The research team

Field Activities

The field activities provided participants with hands-on experience in birdwatching and nature observation around the school and nearby communities. Students practiced observing birds in natural settings and learned how to properly use binoculars and other birdwatching equipment during field sessions. They also developed basic skills in identifying bird species by observing their shape, color, sound, and simple behaviors. In addition, participants recorded their observations and experiences in a nature journal to encourage careful observation and environmental awareness.

Figure 22 Birdwatching field Activities at Ban Koh Klang School

Source: The research team

Bang Diao, a local birdwatching expert, also shared his experiences in conducting birdwatching tours and provided insights into working as a local guide. In the final activity, students were encouraged to participate in designing their own birdwatching tour operations, allowing them to apply the knowledge and skills gained throughout the camp.

Figure 23 The students shared their tour guide trip

Source: The research team

4) Youth Birdwatching Tour Guide Implementation Camp for 3 days (6-8 May 2026)

This camp represented an advanced youth development initiative in Krabi, involving 20 high school students from four schools across the province, including **Muang Krabi School, Nuaklong Prachabumrung School, Ammartpanichnukul School, and Yaseerah Wittayanusorn School**. The program aimed to equip youth with the knowledge and practical skills necessary to perform as local guides based on the skills and experiences gained throughout the camp. The activities were designed to raise awareness of science and environmental conservation while enhancing participants' leadership and communication skills for future careers in ecotourism and nature-based tourism activities. The camp focused on providing foundational knowledge in bird identification and the proper use of birdwatching equipment.

In addition, experienced professionals, including ecotourism specialists, environmental communicators, and environmental writers, participated as guest speakers to share their experiences in environmental work, conservation practices, and sustainable tourism management.

Figure 24 The experienced professionals at outh Birdwatching Tour Guide Implementation Camp

Source: The research team

This Youth Camp is intended for participants who have previously completed the first “Jib Jib Conservation Youth Camp”. The camp aims to encourage the youth to apply and further develop the knowledge and skills they have gained, including ecosystem awareness, bird conservation, and English communication. Through this camp, participants are expected to strengthen their practical skills and enhance their confidence through hands-on activities. On the first day, the participants reviewed their knowledge of birdwatching, biodiversity, English communication, the use of birdwatching equipment, and bird identification skills.

Figure 25 The youth identify the birds at Youth Birdwatching Tour Guide Implementation Camp

Source: The research team

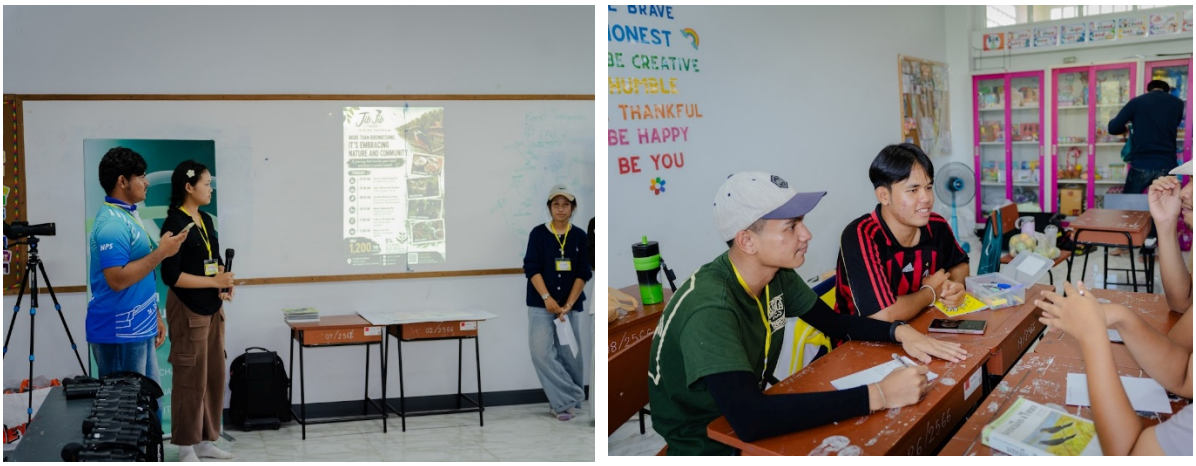
On the second day, the participants conducted a morning field birdwatching activity to familiarize themselves with the area and apply their bird identification skills in practice within the Khlong Prasong area. The activity also aimed to enhance their observation skills and understanding of the surrounding environment.

Figure 26 Birdwatching activity at Youth Birdwatching Tour Guide Implementation Camp

Source: The research team

In the afternoon, the students were assigned to design their own birdwatching tour program in preparation for the tour simulation practice scheduled for the following day.

Figure 27 The youth design their birdwatching tour program



Source: The research team

On the third day, the students conducted a simulated birdwatching tour with volunteer tourists, including both Thai and international participants, to demonstrate the knowledge and skills they had acquired. This activity was designed to prepare them for real-world tour guiding and practical field experience.

Figure 28 The youth conducted a simulated birdwatching tour

Source: The research team

At the end of the activity, the students discussed their plans for implementing the birdwatching tour in real-life situations and divided responsibilities among themselves based on each person's strengths and areas of expertise.

Figure 29 The youth and tourists at Youth Birdwatching Tour Guide Implementation Camp

Source: The research team

2.7 Business Model of Bird Watching Tour

The birdwatching tourism model in Khlong Prasong is designed to cater to different target groups while generating income to support local conservation and community development. The business model consists of two main tour segments:

1. Non-Amateur Birdwatchers (Professional Level)

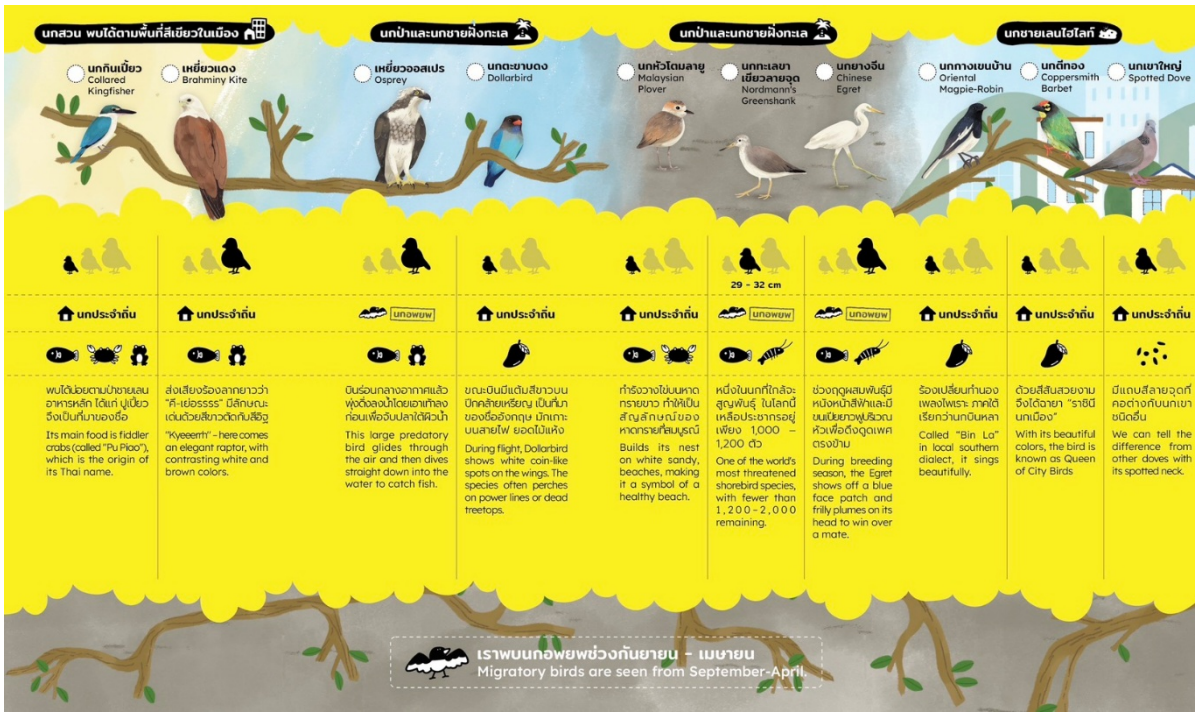
This tour package is designed for experienced birdwatchers who visit Khlong Prasong specifically for bird identification and observation. These visitors are generally already familiar with birdwatching equipment, field techniques, and species identification. Therefore, the tour will focus on providing access to key birdwatching locations and expert local guidance. Tours in this segment will be led by a well-known local bird guide, Bang Diao, whose knowledge of the area and bird species adds value to the overall experience.

2. Amateur Birdwatchers (Beginner / Non-Professional Level)

This tour package targets beginner birdwatchers and nature enthusiasts who are interested in learning about birds and the natural environment of Khlong Prasong, a globally recognized Ramsar Site. This segment is also suitable for families with children and visitors seeking alternative nature-based activities in addition to conventional sea tourism in Krabi.

The beginner-level tour will include introductory birdwatching activities, such as guidance on the use of binoculars and other equipment, basic bird identification, and interpretation of the local ecosystem. The aim is to provide an accessible and enjoyable learning experience for participants with little or no prior birdwatching experience.

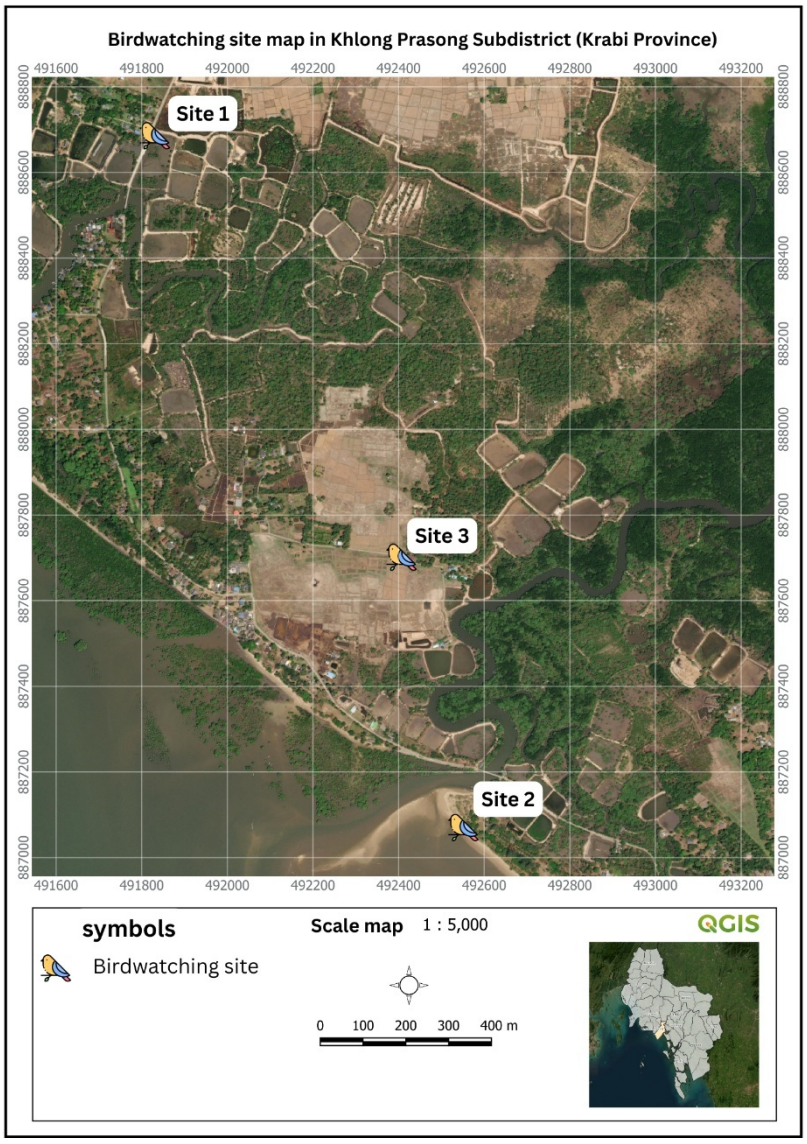
Figure 30 A brochure introducing the birds and the local area



Source: The research team

This amateur birdwatching tour involves observing birds from designated birdwatching points, as indicated on the map below. While moving between these points, participants can also experience the landscape and community of Khlong Prasong, as birdwatching sites are distributed throughout the area. The tour is designed to enhance nature observation and provide a deeper appreciation of the Khlong Prasong environment.

Figure 31 **Birdwatching site map in Khlong Prasong**



Source: The research team

The business model also consists of the other activities and the way to manage the tour according to Canvas business model, Figure 34, and the activities as describe below

Souvenir Sales

In addition to the birdwatching tours, birdwatching-themed souvenirs will be developed and marketed as complementary products. Inspired by the bird species and natural heritage of Khlong Prasong, these locally inspired-designed souvenirs, as shown in Figure32, will generate additional income for the community while communicating the importance of the tour in supporting local environmental conservation.

Figure 32 The birds inspired-designed of souvenir

Source: The research team

Booking and Promotion Platform

A Facebook page, as shown in Figure 33, will be established as the main platform for tour booking and promotion. Compared to a dedicated website, Facebook is easier to manage, more cost-effective, and more accessible to both local operators and potential visitors. It will serve as a practical communication channel for inquiries, reservations, tour information, and promotional content.

Youth Engagement and Community Participation

Local youth will play an active role in the operation and promotion of the birdwatching tours, including supporting online communication, tour promotion, and participating as local guides in appropriate activities. Their involvement not only helps strengthen local capacity and employment opportunities but also encourages intergenerational learning and stewardship of local natural resources.

Figure 33 **The Facebook page for tour booking and promotion.**

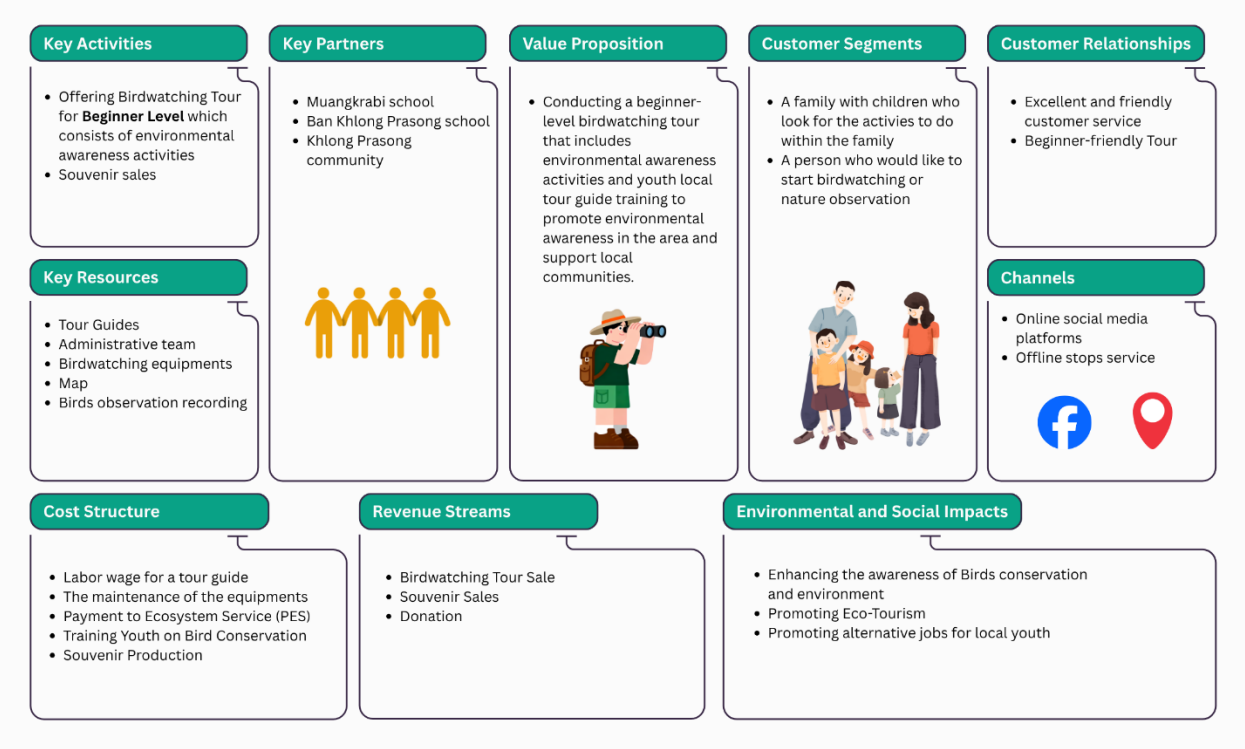
Source: The research team

Revenue Use and Conservation Fund

Revenue generated from birdwatching tours and souvenir sales, after deducting operational expenses, will be allocated to a community-based conservation fund for the protection and restoration of local natural resources.

The management guidelines for this fund will be developed collaboratively by community members to ensure transparency, shared decision-making, and equitable benefit distribution. This participatory approach helps shift away from a top-down model of resource management and instead promotes stronger community ownership, engagement, and long-term sustainability of the initiative.

Figure 34 **Business model**



Source: The research team

The Calculation of the Trip Cost

As the tour concept also incorporates the generation of benefits for both the community and the environment under the PES framework, students participated in activities related to tour planning and cost estimation during the camp. The participants worked together to calculate appropriate tour costs by considering various expenses, including local guide fees, hotel pickup services, transportation costs, and contributions to the local community. In addition, the students presented their ideas for operating a community-based ecotourism tour and explained how the tour would consist of different activities designed to provide both recreational and educational experiences for visitors. Their proposed activities included birdwatching activities, and educational components that integrated scientific and environmental knowledge throughout the trip.

Figure 35 The presentation of the birdwatching tour from in Youth Birdwatching Tour Guide Implementation Camp

Source: The research team

The main costs of the birdwatching tour consist of three components: tour operation costs, fixed costs, and variable costs, including birdwatching equipment and the production of souvenirs, leaflets and educational materials.

According to table 4, the tour operation costs include all activities required for the tour implementation. These include booking and administrative operations. The social media admin will receive THB 100 per tour booking. Tour operation costs also include expenses related to the Youth Guide and Junior Tour Guides, who will be trained to support the implementation of the tour and will receive THB 200 baht each tour. In addition to recreational activities, Transportation costs cover boat services, which cost THB 10 per tour and hotel pick-up by taxi, with prices varying depending on the route and number of participants. The tour is designed to provide educational and environmental learning experiences for participants. The final component is the snack box and drink, which cost THB 150, which aims to promote and support local cuisine.

Table 4 The tour operation cost

Tour Operation Cost	Quantity	Price	Total (Baht)
Transportation			
Boat	1	10	10
Taxi pick up (Optional)	-	-	-
Administration			
Social Media Admin	1	150	150
Tour Operation			
Youth Guide	2	200	400
Junior Guide*	1	200	200
Food and Drink			
Snack Box	1	100	100
Drink	1	50	50
Total			**910**

*The Junior Guide will be implemented once the **Jib Jib Conservation Youth Club** has been further strengthened and is capable of providing training and mentorship to children within the community.

Source: The research team

According to table 5 below, the fixed costs consist of essential birdwatching equipment required for the tour, which will be provided to participants during the trip and made available for rental. The equipment includes binoculars, telescopes, and birdwatching books used to support bird identification and environmental education.

Table 5 The fixed cost of the birdwatching tour

Fixed cost	Quantity	Price	Total (Baht)
Equipment			
Binoculars	6	6,500	39,000
Telescope	1	12,000	12,000
Birdwatching Book	10	1,000	10,000
Total			**61,000**

Source: The research team

According to Table 6, the variable costs include the production of bird field guides used during each tour, as well as the printing of brochures and the production of souvenirs, such as hats and stickers.

Table 6 The variable cost of the birdwatching tour

Variable Cost	Quantity	Price	Total (Baht)
Production Cost			
Bird Field Guide	100	50	5,000
Brochure	1000	5	5,000
Souvenir			
-Shirt	100	100	10,000
-Stickers	200	25	5,000
Total			**25,000**

Source: The research team

Table 7 The distribution of the cost

Cost	Amount (Baht)
Fixed Cost	61,000
Variable Cost	25,000
Total	**86,000**

Source: The research team

The equipment cost per trip was calculated by dividing the total equipment cost by its expected useful life and then allocating the annual cost across the total number of birdwatching trips conducted each year. Assuming a birdwatching season of six months per year and an average of 20 trips per month, the operation is expected to conduct 120 trips annually. Based on these assumptions, the equipment cost is estimated at 72 THB per trip, as according to the assumption of the maximum capacity of conducting birdwatching tour.

The Assumption

1. Each Trip consists of 4 Tourists
2. Each month consists of 20 trips
3. The Equipment can last 10 years for the utilization

Table 8 The cost of the equipment and souvenirs production of each trip

Year	The total amount of equipment each year (Baht)	The total amount of equipment each trip (Baht)
1	8,600	72
2	8,600	72
3	8,600	72
4	8,600	72
5	8,600	72
6	8,600	72
7	8,600	72
8	8,600	72
9	8,600	72
10	8,600	72

Source: The research team

The cost of the birdwatching tour is set at THB 1,800 per person. From this amount, 5 percentage of the tour price (THB 90 per participant) is allocated as an environmental contribution under the Payment for Ecosystem Services (PES) scheme. In addition, THB 910 is allocated to tour operation costs and THB 72 to equipment costs. After deducting these expenses, the net revenue generated from each tour is THB 728, as shown in Table 9.

Table 9 The total amount of the birdwatching tour

Activity	Amount (Baht)
Birdwatching (half-day trip)	1,800
Payment for Ecosystem Services	-90
Tour Operation cost	-910
Total cost of equipment	-72
Total Revenue	**728**

Source: The research team

Establishment of a Trust Fund in the form of Tourism Conservation Youth Club

On Saturday, May 23, a meeting was held to discuss and plan the direction of the club. Participants included youth representatives, teachers from Muangkrabi School, local conservationists, and local birdwatching guides.

During the meeting, roles and responsibilities were established, with youth members taking the lead in club operations while adults serving as advisors to support the club's activities.

Figure 36 **The Discussion for the Establishment of the Youth Club**

Source: The research team

The establishment of the Jib Jib Conservation Youth Club Fund will support the implementation of conservation activities through the birdwatching tour program by applying the Payment for Ecosystem Services (PES) mechanism within an economic framework. This will serve as a systematic mechanism for managing migratory and residency birdwatching tourism in Khlong Prasong Subdistrict, encompassing natural resource conservation, community income generation, and the balanced and sustainable use of the ecosystem. Furthermore, there is a concept to develop supplementary income from the sale of souvenirs related to birdwatching activities and rental services for birdwatching equipment like binoculars. This will provide another avenue for generating tourism revenue while simultaneously raising awareness and enhancing the image of Khlong Prasong Subdistrict as a conservation-oriented birdwatching destination.

The income generated from these birdwatching tourism activities will be managed through a fund to be used for the conservation of natural resources, ecosystem maintenance, and the ongoing development of community potential in Khlong Prasong Subdistrict and Krabi Province. The establishment of this fund emphasizes community and youth participation. Since the birdwatching tours are in their initial stages, the initial composition.

Table 10 **The member of the Jib Jib Conservation Youth Club**

Name	Position
Pairin Boonphla	President
Amanyarin Kaewphorathak	Vice President
Asanee Yiangyang	Equipment Coordinator

Name	Position
Anawin Malaengthap	Birdwatching Activities Coordinator
Natchaya Thapprap	Birdwatching Activities Coordinator
Amanyarin Kaewphorathak	Junior Guide Coordinator
Rapheepan Samanrat	Junior Guide Coordinator
Ketsara Sophee	Junior Guide Coordinator
Pailin Boonphla	Conservation and Academic Coordinator
Chonnikan Pankiti	Public Relations Coordinator
Apatsara Chusang	Public Relations Coordinator
Chawarit Madsai	Finance Coordinator
Rapheepan Samanrat	Finance Coordinator
Natchaya Thapprap	Finance Coordinator
Surasit Krueawan	Advisor
Amornthat Iadsrichai	Advisor
Piyanat Namnaphon	Advisor
Sansanee Charitngam	Advisor
Kornkaew Nokkaew	Advisor

Source: The research team

2.8 Club Station

The Jib Jib Conservation Youth Club will be located on Bang Diao's property, which was identified by club members as a suitable site for birdwatching activities and training. As Bang Diao serves as a key resource person and mentor for birdwatching, members recognized that regular visits to learn from him would be an important part of the club's activities. Locating the club on his property therefore provides both convenience and continuity for training and learning. In addition, this arrangement is consistent with common practice in Khlong Prasong Subdistrict, where many community-based enterprises are established on the property of their operators, ensuring accessibility, effective management, and ongoing oversight.

Figure 37 The inspiration of the club station

Source: The research team

Conclusion and Way Forward

The project adopts the Payment for Ecosystem Service (PES) as the market-based instrument that is aimed to serve as a mechanism for mobilizing resources for the conservation of natural capital in Krabi province. The Payment for Ecosystem Service (PES) is a suitable vehicle for nature's conservation for two reasons: the existence of the East Asian Australasian Flyway (EAAF) migratory birdwatching activities that are well known among the international and local birdwatchers, and the readiness of the local capacity in terms of human resource availability. The project explored this opportunity by initiating the Youth Development Program for Conservation-Base Birdwatching Guides, known as "Jib Jib". This project aimed at training young pupils of Krabi Province to become birdwatching tour guides, enabling them to learn and preserve and pass on the knowledge of the migratory birds as well as establishing a trust fund where the inflow of fund is obtained from part of the revenue derived from operating migratory birdwatching tours at Khlong Prasong are located within the Krabi Estuary of the Krabi Ramsar Site.

After the youth tour guide training camps, it was learned that the selected pupils from two schools have potential to operate birdwatching tours. During the youth tour guide training camps, the pupils learned the ecological significance of the Krabi Estuary, how to distinct different types of birds and language skills. A sample of tourists were chosen to experiment birdwatching tours operated by the trained pupils and the responses were positive.

In the case of Krabi Province, it was learned that the enabling conditions for the conservation of natural capital rests on three key elements: first, the richness of the natural capital, in this case the Krabi Estuary at the Krabi Ramsar Site that is home to the EAAFP migratory birds, second, the readiness of the human capital, in this case the local pupils who are willing to preserve the birdwatching activities from their ancestors, and third, the revenue from operating the birdwatching tours that serve as supplementary income for the pupils and the income source for the conservation trust fund. Combining these three capitals, they are, natural capital, human capital and financial capital enable Krabi Province to effectively move forward meaningful sustainability.

The way forward for the future prospect of the Youth Development Program for Conservation-Base Birdwatching Guides involves work development in the areas of marketing through social media, work plan of the conservation trust fund and strengthening the birdwatching network among the youth. Activities in these areas will help strengthen the natural capital conservation in Krabi Province and can be used as lesson learned for natural capital conservations in other areas.

Annex 1:

A Study on the transition from plastic waste bins or black plastic garbage bags to bags bearing the Ao Nang SAO logo

A Study on the Transition from Plastic Waste Bins or Black Plastic Garbage Bags to Bags Bearing the Ao Nang SAO Logo

1. Conceptual Background

Ao Nang Subdistrict, located in Mueang Krabi District of Krabi Province, lies approximately 16 kilometers west of Krabi town and covers a total area of 126 square kilometers, comprising both land and coastal waters. Bordered by the Andaman Sea to the west and neighboring subdistricts on its remaining sides, the area combines residential communities with an extensive coastal and marine environment. Ao Nang consists of eight villages and features a diverse physical landscape shaped by geological subsidence, resulting in a rugged coastline with steep inlets, limestone mountains close to the shore, mangrove forests, and numerous nearby islands. With a coastline stretching around five kilometers, excluding Railay Bay, the subdistrict is renowned for its natural beauty and has developed into one of Krabi's most prominent tourist destinations. Well-known attractions such as Ao Nang Beach, Noppharat Thara Beach, Railay Beach, Phi Phi Island, and Maya Bay draw large numbers of both domestic and international visitors throughout the year. The area experiences a tropical monsoon climate, with rainfall occurring during most months, further influencing patterns of settlement, tourism activity, and environmental management within the subdistrict.

Ao Nang Subdistrict has a registered population of 12,650 people, comprising 6,274 males and 6,376 females, with a total of 10,823 households. In addition to the registered population, the area accommodates an estimated floating population of approximately 30,000 people, largely associated with tourism and related economic activities. The majority of residents practice Islam, reflecting the area's distinctive social composition. Economically, Ao Nang retains a foundation in agriculture, with key crops including rubber, oil palm, coconut, and pineapple. However, commercial activities, particularly those linked to tourism, play an increasingly prominent role in the local economy. The Ao Nang beachfront has developed into the primary commercial hub, concentrating on tourism-related businesses, hotels, and associated services. In addition, dense clusters of hotels and resorts have emerged in specific areas, notably in Village No. 7 (Ban Ko Phi Phi), Village No. 8 (Ban Laem Tong), and the Railay Bay area, underscoring the growing importance of tourism as a central economic driver within the subdistrict.

Table 1: Showing Waste Generation Volumes Disaggregated by Village and Establishment

Category	Number (Households /Establishments)	Waste Generated (tons/month)
Village		
Village No. 1	1,213	90
Village No. 2	2,760	720
Village No. 3	1,206	150
Village No. 4	1,198	60
Village No. 5	1,309	60
Village No. 6	413	30
Village No. 7	1,223	600
Village No. 8	319	90
Establishments		
Hotels / Accommodation / Resorts	301	27.09

Category	Number (Households /Establishments)	Waste Generated (tons/month)
Restaurants	438	8.7
Laundry Shops	125	1.2

Ao Nang Subdistrict generates an average of approximately 50–60 tons of municipal solid waste per day across its eight villages, reflecting both household activities and the intense pressures associated with tourism. While a large proportion of the local population continues to rely on agriculture, such as rubber plantations and oil palm cultivation, or wage labor, the scale of waste generation far exceeds that of a typical rural community. All collected waste is transported for disposal at the Krabi Municipal Solid Waste-to-Energy Plant (MSW Krabi), operated by a private company, Absolute Clean Energy (ACE), which applies a closed-system incineration technology to generate electricity supplied to the Provincial Electricity Authority. The facility, located in Sai Thai Subdistrict, receives waste from multiple areas across Krabi Province, with disposal costs charged at 400 baht per ton based on actual weight. As a result, Ao Nang Subdistrict Administrative Organization (SAO) incurs substantial annual expenditures for waste management, totaling approximately 21.5 million baht per year. This includes costs for collection and transport within island communities such as Koh Phi Phi and Laem Tong, marine transport of waste from island piers to the mainland, and disposal fees at the waste-to-energy plant, with disposal costs alone averaging nearly 800,000 baht per month.

As one of Krabi Province's most prominent and long-established tourist destinations, Ao Nang serves as a central hub for marine tourism, providing access to coral reefs and surrounding islands that attract large numbers of domestic and international visitors year-round. Rapid growth in tourism-related businesses, accommodations, and services has significantly increased waste generation, placing mounting pressure on local collection and disposal systems. In practice, waste collection remains uneven and insufficient to fully cover all areas, leading to residual waste accumulation. Moreover, limited environmental awareness among businesses, residents, youth, and tourists, particularly regarding waste reduction, source separation, and proper handling of hazardous and infectious waste, has exacerbated environmental risks and long-term public health concerns.

Waste collection operations differ between mainland and island areas. On the mainland (Villages 1–6), waste is collected nightly to minimize disruption to tourism activities, while island communities rely on small vehicles and marine transport to consolidate waste at piers before shipment to the mainland. This system is both costly and operationally fragile, especially during the monsoon season when rough seas and unpredictable weather can delay transport, forcing temporary storage of waste on vessels. Given the absence of local disposal facilities on the islands and the necessity of daily waste removal, Ao Nang's current waste management system faces significant structural and financial constraints, underscoring the urgent need for more effective upstream waste control, separation, and reduction measures.

The pilot implementation of semi-transparent waste bags bearing the Ao Nang Subdistrict Administrative Organization (SAO) logo was conducted in Village No. 2 (Ban Ao Nang), Ao Nang Subdistrict, Mueang Krabi District, Krabi Province. The pilot area comprised a total of 36 establishments, including 25 food service outlets and 11 accommodation facilities such as hotels and resorts. The trial period lasted four months, from January to

April 2018, and aimed to assess the feasibility of applying semi-transparent waste bags in high-activity commercial and tourism-related areas.

The pilot implementation of semi-transparent waste bags bearing the Ao Nang SAO logo was conducted in Village No. 2 (Ban Ao Nang), Ao Nang Subdistrict, Mueang Krabi District, Krabi Province. The pilot area comprised a total of 36 establishments, including 25 food service outlets and 11 accommodation facilities such as hotels and resorts. The trial period lasted four months, from January to April 2018, and aimed to assess the feasibility of applying semi-transparent waste bags in high-activity commercial and tourism-related areas.

2. Concept of Selling Semi-Transparent Waste Bags with the Ao Nang SAO Logo

The initiative is grounded in the principle that polluters pay. Prior to 2017, the Ao Nang SAO provided large waste bins to households along collection routes to facilitate waste disposal. In practice, however, widespread misuse occurred, with residents disposing of mixed and inappropriate waste, such as broken glass, light bulbs, metal scraps, animal waste, liquid food waste, and bulky organic materials, without proper separation or secure packaging. This not only posed serious occupational safety risks to waste collection workers, who frequently suffered injuries from sharp objects, but also revealed a lack of shared responsibility for waste handling. Many households failed to maintain the bins provided, leaving them dirty, overturned, or damaged, while expecting local officials to clean and manage them.

In addition, the extensive placement of large waste bins along major tourist routes negatively affected the visual landscape, created traffic and safety hazards, and undermined the image of Ao Nang as a tourism destination. Waste collection services were able to cover only about 25 percent of households and business establishments, while uncontrolled disposal by residents and businesses from neighboring jurisdictions further distorted actual waste volumes. The system was also strained by the disposal of non-collectable materials—such as construction debris and bulky waste—that damaged collection vehicles, as well as excessive waste loads that increased the risk of physical injury to workers. Compounding these challenges, informal recyclers frequently tore open waste bags in the evening to retrieve valuable materials, leaving waste scattered along roadsides after being further disturbed by stray animals.

These accumulated problems highlighted structural weaknesses in the existing waste management system and demonstrated the need for a new approach that emphasizes source separation, accountability, and behavioral change, particularly within accommodation facilities and food service establishments. The introduction of standardized, semi-transparent waste bags is therefore intended not only as a logistical adjustment, but as a policy instrument to raise awareness, encourage proper waste separation, and reinforce the principle of shared responsibility in a rapidly expanding tourism area.

3. Advantages of Switching to Semi-Transparent Waste Bags with the SAO Logo

The use of semi-transparent waste bags bearing the Ao Nang SAO logo offers multiple advantages for improving waste management effectiveness and accountability. First, it helps reduce cross-boundary waste disposal from neighboring subdistricts, as standardized and identifiable bags discourage dumping from outside

areas. The bags are designed in manageable sizes, making them easier and safer to lift and transport without excessive physical strain on collection workers. Their semi-transparent nature also enhances safety in tourism areas by allowing potentially hazardous or unusual objects to be visually identified before handling, an issue that is difficult to address with opaque black bags. In addition, the visibility of contents significantly reduces the practice of tearing open garbage bags by informal recyclers at night, as recyclable materials can be separated at the source rather than mixed with general waste.

The system further encourages basic waste separation at the household and establishment level, as residents and businesses are more likely to separate recyclable items such as plastic bottles, cans, paper, and glass when contents are visible. By limiting bag size, the policy also reduces prolonged waste accumulation within households and commercial premises. More broadly, the initiative functions as a social regulatory mechanism, reinforcing shared responsibility for cleanliness within the community by making waste generation more visible and traceable to specific areas. Importantly, waste management costs are incorporated into the price of the bags themselves, eliminating the need for a fixed monthly waste fee while ensuring that those who generate more waste contribute proportionally more. Finally, sales data from the standardized bags provide the local authority with more accurate estimates of waste volumes, potentially allowing for area-based monitoring, such as by village or community, through differentiated bag designs or colors.

Figure 1 Image of Waste Bag with Ao Nang SAO Logo (24 × 30 inches)

Table 2 Comparison of Waste Bag Prices and Waste Collection Fees

Bag Size (24 × 30 inches)	Number of Bags per 1 kg	Production Cost (THB/kg)	Disposal & Collection Cost (THB)	Selling Price (THB/kg)	Average Cost per Bag	Monthly Waste Collection Fee
Semi-transparent waste bag with Ao Nang SAO logo	22	70	110	180	5 THB per bag (180 ÷ 22 = 8.18)	None (included in bag price)

Bag Size (24 × 30 inches)	Number of Bags per 1 kg	Production Cost (THB/kg)	Disposal & Collection Cost (THB)	Selling Price (THB/kg)	Average Cost per Bag	Monthly Waste Collection Fee
Conventional black waste bag	20	55–60	300–1,000 per month (charged under the existing local ordinance)	–	–	Charged based on waste volume / establishment size

The community group may agree on the selling price per kilogram of waste bags; however, the initial price set by the Ao Nang SAO is 180 baht per kilogram. The production and transportation cost is estimated at 70 baht per kilogram. The bags are sold to business establishments at 180 baht per kilogram (or potentially 200 baht, subject to agreement), resulting in a margin of 110 baht per kilogram for the SAO. Of this amount, 10 baht per kilogram is allocated to the community group for administrative and operational purposes, while the remaining 100 baht per kilogram is contributed back to the SAO to cover waste management expenses, including island waste collection, boat transport of waste from Koh Phi Phi to Krabi, truck transport from the pier to the disposal site, and disposal fees charged by Krabi Municipality.

Figure 2 Image of Waste Bag with Ao Nang SAO Logo 24 × 30 inches compared with 30 x 40

The Ao Nang SAO conducted a pilot implementation of semi-transparent waste bags bearing the Ao Nang SAO logo in selected tourism-related establishments, including food service outlets and accommodation facilities, totaling 36 establishments. The pilot was carried out over a four-month period from January to April 2018, with the objective of assessing actual bag usage in relation to the volume of municipal solid waste generated by each establishment. The results were then compared with the existing flat-rate waste collection and disposal fees prescribed under the Ao Nang SAO local ordinance, which are calculated based on the size of food establishments and the number of guest rooms rather than actual waste generation. The pilot further evaluated both the cost implications and user satisfaction associated with replacing the flat-rate system with the use of semi-transparent waste bags bearing the Ao Nang SAO logo. The implementation outcomes are summarized as follows.

(1) Results from Food Service Establishments (25 outlets)

All participating food service establishments reported full satisfaction (100 percent) with the use of semi-transparent waste bags bearing the Ao Nang SAO logo. In terms of waste handling, respondents indicated that the bag size was appropriate for placement and collection, while the semi-transparent design allowed clear visibility of contents. This facilitated basic waste separation, particularly of recyclable items such as plastic bottles and glass bottles, thereby contributing to a reduction in overall bag usage to some extent. About costs, satisfaction was also reported at 100 percent, as establishments were able to clearly recognize expenses based on actual waste generation. This eliminated disputes over waste collection and disposal fees during high and low tourism seasons, unlike the previous flat-rate fee system, which required the same monthly payment regardless of fluctuations in waste volume. Overall, food service operators expressed strong support for the adoption of semi-transparent waste bags, viewing the system as both effective and fair under the principle that "waste generators should bear responsibility proportional to the amount of waste they generate." During the pilot, semi-transparent bags sized 24 x 30 inches were sold at 180 baht per kilogram, with each kilogram containing 22 bags.

(2) Results from Accommodation Facilities and Hotels (11 establishments).

All accommodation facilities participating in the pilot likewise reported full satisfaction (100 percent) with the new waste bag system. In addition to improved convenience in storage and collection, the visibility of waste content enhanced occupational safety for cleaning staff by allowing potential hazards, such as broken glass or sharp objects, to be identified prior to handling, thereby reducing the risk of injury during lifting, transport, and disposal. Cost-related satisfaction was also reported at 100 percent, as expenses could be adjusted according to actual waste volumes generated in different seasons. This addressed long-standing concerns associated with the former flat-rate fee structure, particularly during low tourism periods when waste generation declined.

In summary, accommodation operators supported the continued use of semi-transparent waste bags with the Ao Nang SAO logo, emphasizing that the system promotes fairness and accountability by ensuring that higher waste generation is matched with proportionately higher responsibility for disposal costs.

Waste Generation Before and After the Pilot Use of Semi-Transparent Waste Bags

Table 3 Accommodation Facilities / Hotels (11 establishments)

Month	Waste Volume (kg/month)	Month	Waste Volume (kg/month)	Difference (kg)	Remarks
October 2016	3,312	October 2017	3,489	+177	–
November 2016	3,526	November 2017	3,809	+283	–
December 2016	3,969	December 2017	4,122	+153	–
January 2017	3,878	January 2018	3,867	−11	Waste volume after using semi-transparent bags
February 2017	3,702	February 2018	3,122	−580	Waste volume after using semi-transparent bags

Month	Waste Volume (kg/month)	Month	Waste Volume (kg/month)	Difference (kg)	Remarks
March 2017	3,598	March 2018	3,018	−580	Waste volume after using semi-transparent bags
April 2017	3,671	April 2018	3,101	−570	Waste volume after using semi-transparent bags
Total	**25,656**		**24,528**		

Table 4 Food Service Establishments / Restaurants (25 establishments)

Month	Waste Volume (kg/month)	Month	Waste Volume (kg/month)	Difference (kg)	Remarks
October 2016	7,600	October 2017	7,784	+184	–
November 2016	7,700	November 2017	7,822	+122	–
December 2016	7,900	December 2017	7,915	+15	–
January 2017	7,800	January 2018	7,745	−55	Waste volume after using semi-transparent bags
February 2017	7,899	February 2018	7,199	−700	Waste volume after using semi-transparent bags
March 2017	8,154	March 2018	7,324	−830	Waste volume after using semi-transparent bags
April 2017	8,003	April 2018	7,402	−601	Waste volume after using semi-transparent bags
Total	**55,056**		**53,191**		

Based on data collected on actual waste volumes generated by participating establishments and food service outlets under the pilot project using semi-transparent waste bags bearing the Ao Nang SAO logo and compared with data from the same months in the previous year, it was found that waste volumes prior to the use of semi-transparent bags were higher. This was primarily due to the lack of waste separation practices among staff in establishments and restaurants, as recyclable materials—such as plastic bottles, glass bottles, cans, and paper—could not be visually identified when opaque bags were used. Consequently, recyclable materials were disposed of together with general waste, resulting in larger overall waste volumes. Following the pilot implementation of semi-transparent waste bags, certain types of waste became visible and could be effectively separated. These recyclable materials were subsequently sold, generating funds that were used for various improvements within accommodation facilities, resorts, and hotels. In some establishments, the proceeds were allocated to staff welfare initiatives, such as employee birthday gifts.

Waste Separation by Type Before and After the Pilot Implementation

Table 5: Accommodation Facilities / Hotels (11 establishments)

Month	Plastic Bottles (kg/month)	Paper (kg/month)	Glass Bottles (kg/month)	Cans (kg/month)	Total Weight (kg)	Remarks
October 2017	21	10	35	40	106	Before implementation
November 2017	23	11	39	42	115	Before implementation
December 2017	25	15	25	50	115	Before implementation
January 2018	29	20	35	43	127	During implementation
February 2018	35	21	37	46	139	During implementation
March 2018	30	22	31	37	120	During implementation
April 2018	38	25	39	41	143	During implementation

Table 6: Food Service Establishments / Restaurants (25 establishments)

Month	Plastic Bottles (kg/month)	Paper (kg/month)	Glass Bottles (kg/month)	Cans (kg/month)	Total Weight (kg)	Remarks
October 2017	10	5	25	20	60	Before implementation
November 2017	15	9	30	21	75	Before implementation
December 2017	19	4	31	22	76	Before implementation
January 2018	25	6	35	25	91	During implementation
February 2018	28	8	34	26	96	During implementation
March 2018	30	10	35	27	102	During implementation
April 2018	39	15	33	29	116	During implementation

Based on data collected on actual waste volumes disaggregated by recyclable waste types from establishments and food service outlets participating in the pilot project using semi-transparent waste bags bearing the Ao Nang SAO logo, it was found that prior to the introduction of these bags, the amount of waste separated for sale was relatively low. This was largely due to the absence of concrete measures or clear directives from business owners or management requiring systematic separation of recyclable waste—such as plastic bottles, glass bottles, cans, and paper. Under the previous flat-rate monthly payment system for waste collection and disposal, which did not take actual waste volumes into account, establishments lacked financial incentives to reduce waste or separate recyclable materials, resulting in higher overall waste generation.

Following the pilot implementation of semi-transparent waste bags, certain waste types became more easily identifiable and could be separated for sale. This increased awareness of the economic value of recyclable

materials and encouraged more consistent waste separation practices. As a result, the overall weight of waste requiring disposal declined, reflecting improved efficiency in waste management at the source.

4. Principles for Pricing Waste Bags with the Ao Nang SAO Logo

The initial pricing of semi-transparent waste bags bearing the Ao Nang SAO logo is based on the following cost components:

(1) Waste disposal cost: Waste disposal is charged by the private waste-to-energy facility at a rate of 0.40 baht per kilogram. Each semi-transparent waste bag can contain up to 10 kilograms of waste. Accordingly, the disposal cost per bag is calculated as 10 kg × 0.40 baht, amounting to 4 baht per bag. One kilogram contains 22 bags, which can collectively hold up to 220 kilograms of waste. The total disposal cost for this volume is therefore 88 baht (220 kg × 0.40 baht).

(2) Fuel, labor, and vehicle maintenance costs: Fuel expenses, staff wages, and vehicle maintenance costs are not included in the pricing calculation. These costs are treated as part of the local authority's public service obligations, as households, businesses, hotels, resorts, and shops already contribute to local government revenues through taxes and fees such as signage tax, land and building tax, and other local charges paid annually.

(3) Cost of waste bag production: One kilogram of semi-transparent waste bags (size 24 × 30 inches) contains 22 bags. The factory price for producing and printing the Ao Nang SAO logo on these bags is 70 baht per kilogram, resulting in an average production cost of 3.18 baht per bag.

Summary of unit cost calculation the average cost per bag total cost per bag 7.18 baht is calculated as follows:

- Disposal cost per bag: 4.00 baht
- Fuel/labor/vehicle costs: 0.00 baht
- Production cost per bag: 3.18 baht

Accordingly, the total cost for one kilogram of waste bags (22 bags) is 157.96 baht (22 × 7.18 baht). Selling price and cost comparison. One kilogram of semi-transparent waste bags (22 bags) is sold at 180 baht, with each bag capable of containing up to 10 kilograms of waste. This means that one kilogram of bags can accommodate approximately 220 kilograms of waste in total.

For households, accommodation facilities, and food service establishments, the effective cost of waste disposal is therefore approximately 1.22 baht per kilogram of waste (180 baht ÷ 220 kg). If calculated strictly based on actual cost, the expense would amount to approximately 264 baht (220 kg × 1.22 baht). However, the local authority sets the selling price at 180 baht, thereby subsidizing part of the cost to reduce the financial burden on waste generators while maintaining the principle of proportional responsibility.

5. Examples of Local Authorities Implementing Their Own Waste Bag Systems

Drawing on the Pay-As-You-Throw (PAYT) principle—which charges waste management fees based on the actual amount of waste generated—and international experiences demonstrating that PAYT creates incentives for waste reduction and source separation, this article presents selected case studies of local authorities in Thailand that have attempted to apply PAYT-based approaches to municipal solid waste management. The cases highlight both enabling factors and practical challenges, leading to broader policy and legal recommendations aimed at supporting wider adoption of PAYT by local governments.

(1) Pak Phun Municipality, Nakhon Si Thammarat Province

Pak Phun Municipality replaced communal waste bins with municipality-branded waste bags in August 2023. The bags (28 × 36 inches) are sold at 10 baht per bag, eliminating the need for monthly waste collection fees. Only bags bearing the municipal logo are collected; unbranded bags are not accepted. Residents can purchase the bags directly from collecting trucks and receive official receipts. Municipal leaders emphasize that the policy is not intended to generate profit from bag sales but to reflect waste disposal costs, including transport, equipment maintenance, and labor, through a simple and affordable per-bag charge. The policy also supports the objective of maintaining clean streetscapes without visible waste bins.

(2) Umong Subdistrict Municipality, Lamphun Province

Umong Municipality operates a village-level recycling promotion scheme. Participating households receive two free waste bags per month; additional bags or waste disposal by non-participants is charged at 10 baht per bag. The program has reduced waste sent to private disposal contractors to approximately 264 kilograms per household per year—equivalent to about 0.24 kilograms per person per day. Village committees play a key role in monitoring and preventing illegal dumping or open burning.

(3) Du Tai Subdistrict Municipality, Nan Province

Du Tai Municipality transitioned from a flat monthly waste fee of 25 baht to a community-based PAYT approach linked to a “bin-free street” initiative. In nine pilot villages, municipality-branded waste bags are sold at 7 baht per bag, with revenue allocated to village waste management funds supporting activities such as waste banks. Bags without the municipal logo are not collected. Initial resistance emerged due to large bag sizes causing odor problems during weekly collection cycles, but the municipality addressed these concerns through community engagement, composting education, and the establishment of local learning centers on organic waste management.

(4) Nang Lae Subdistrict Municipality, Chiang Rai Province

Following its transition from a subdistrict administrative organization to a municipality, Nang Lae experimented with multiple waste management models. Early pilots included incineration with partial municipal subsidies. Over time, villages adopted different charging mechanisms, including flat fees and weight-based charges. Notably, Village No. 2 implemented a PAYT system based on actual waste weight, achieving the lowest waste generation rate—approximately 0.06 kilograms per person per day—and the slowest growth in waste volume. This success later encouraged other villages to adopt unit-based charging, with households labeling waste bags and paying per kilogram, while fixed monthly fees were imposed on households attempting to avoid the system entirely.

(5) Mae Fah Luang SAO, Chiang Rai Province

Facing landfill capacity constraints, Mae Fah Luang SAO collaborated with community partners to implement source separation by waste type and collection day. Residents purchase designated waste bags from participating shops, while recyclable and organic waste is managed at household or village level. Specific bag sizes are required for contaminated waste and refuse, priced at 2.50 baht per bag, alongside a monthly collection fee of 15 baht. By 2022, the SAO reduced waste volumes by approximately 75 percent compared to 2019. Key success factors included strong community leadership, shared commitment, and strict enforcement of collection rules requiring the use of approved bags.

(6) Li Subdistrict Municipality, Lamphun Province

Li Municipality introduced black waste bags printed with the message “Throw More, Pay More.” Households paying a monthly fee of 20 baht receive four municipality-issued bags per month, with collection occurring once per week. Only these bags are collected; others are rejected. The policy is supported through public communication via online platforms and community meetings.

Figure 3 Examples of garbage bags bearing local government logos: Pak Phun Municipality (left) and Mae Fa Luang Subdistrict Administrative Organization (right)

6. Challenges and Success Factors

Under current Thai law, namely the Public Health Act B.E. 2535 (1992) and its Amendment (No. 2) B.E. 2550 (2007), as well as the Act on the Maintenance of Cleanliness and Orderliness of the Country B.E. 2535 (1992) and its Amendment (No. 2) B.E. 2560 (2017), local authorities are legally permitted to charge municipal solid waste management fees based on the volume of waste generated. The regulatory framework allows fees to be calculated in increments of every additional 20 liters of waste per day, with statutory ceilings set at 65 baht for collection and 155 baht for disposal. In practice, however, several structural and operational challenges remain.

First, although the law permits local authorities to charge fees exceeding 220 baht per month when waste generation surpasses 20 liters per day, almost no local authority imposes fees higher than 40 baht per month, the rate originally prescribed by a 2002 ministerial regulation. Many local governments charge only 10 or 20 baht per month, or do not charge at all. This is often due to political considerations, as local executives seek to avoid imposing perceived financial burdens on residents. Moreover, the current legal framework does not establish a minimum fee, and practical difficulties in measuring waste volume further discourage enforcement. While selling

standardized waste bags could provide a simpler mechanism for volume-based charging, such an approach lacks explicit legal authorization under existing regulations. Even though the 2016 ministerial regulation under the Public Health Act increased permissible fee levels for waste management services, raising flat fees without linking payment to actual waste generation risks undermining behavioral incentives. If residents are required to pay substantially higher fixed fees, potentially more than five times the previous rate, they may feel entitled to dispose of more waste, having already paid a high charge.

Second, the threshold of 20 liters per day (or 600 liters per month under the draft regulation) is relatively high compared to actual household waste generation. Using an average household size of 3.16 persons and a waste density of 0.2 kilograms per liter, this threshold permits disposal of up to 4 kilograms of waste per day, or approximately 1.26 kilograms per person per day. This exceeds Thailand's national average of 1.03 kilograms per person per day and the ASEAN average of 1.14 kilograms per person per day, meaning that most households can increase waste disposal without incurring additional fees.

Third, local authorities are legally unable to refuse waste collection services for residents who fail to pay fees or do not separate waste, as waste collection and sanitation are statutory duties imposed on local governments.

Fourth, collecting fee practices remain inefficient. In many areas, fees are still collected through door-to-door visits, which are ineffective when residents are absent and are not supported by penalties for late payment. Annual lump-sum collections such as 360 baht per year, can also be perceived as unaffordable by some households, further reducing compliance.

Fifth, cross-boundary waste disposal presents a significant challenge in tourism areas such as Ao Nang, which borders Sai Thai and Nong Thale Subdistricts. Workers residing in nearby rental housing often dispose of waste in Ao Nang during evening hours before collection, particularly when waste collection in neighboring areas occurs at different times. This practice contributes to visual pollution in tourist zones and undermines local waste management efforts.

7. Factors Contributing to Success

(1) Strong leadership at both local authority and community levels: Success is closely linked to the strength of leadership, both within local administrative organizations and at the village or community level. Political commitment and sustained dedication by local executives and officials are essential to driving meaningful solutions to municipal solid waste problems.

(2) Constraints in downstream waste disposal capacity: Local authorities that lack their own disposal facilities, face capacity limitations, or encounter difficulties in transporting waste to external disposal sites tend to demonstrate stronger efforts to reduce waste at the source and improve overall waste management practices.

(3) Supporting systems and infrastructure: The presence of complementary systems—such as waste banks, informal recyclers, recycling buyers, and organic waste management mechanisms (whether community-based or municipally operated)—plays a crucial role in enabling effective waste separation and reduction.

(4) Appropriate frequency of waste collection: Collection schedules that allow sufficient time between pickups encourage communities to separate food waste in order to prevent odor and pest problems. In contrast, very frequent collection (daily or every two to three days) reduces incentives for waste reduction and source separation.

(5) Adoption of a "bin-free street" policy: Local authorities that successfully implement PAYT-oriented systems often require communities to take responsibility for their own waste by removing municipal waste bins from streets and public areas. Exceptions may be made to tourist locations, where clearly designated points for separate waste disposal are appropriate.

(6) Effective communication and public engagement: Continuous meetings, public outreach, and information dissemination through multiple channels are essential to build shared understanding among residents and business operators regarding the actual costs of waste management, including collection, transport, and disposal.

(7) Use of social measures and community monitoring: Social enforcement mechanisms are particularly important in areas with high numbers of rental residents who may not receive information through official communication channels. Residents registered in the area can play a key role in reminding tenants to comply with designated waste disposal time and practices, ensuring alignment with local waste collection schedules.

8. Appropriate Models

(1) Scenario Where Legal Amendments Are Possible: Given Thailand's current constraints in waste management funding, particularly the aging fleet of waste collection vehicles, and the large number of existing waste bag manufacturers, a bag-based charging system may be more practical than weight-based measurement or bin-based systems. Allowing waste generators to use commercially available waste bags already on the market, while charging fees through the sale of stickers or labels affixed to the bags and priced according to bag volume, would reduce administrative complexity. This approach would be simpler to implement than establishing an entirely new weighing or container-based system and would lower barriers for local authorities with limited technical and financial capacity.

(2) Scenario Under the Existing Legal Framework: As current law does not authorize local authorities to sell waste bags or bag-label stickers, and does not permit them to refuse waste collection services, a more feasible approach under existing legislation is a community-based model. Like practices adopted in Wiang Thoeng Subdistrict Municipality or Mae Fah Luang Subdistrict Administrative Organization, communities may manage waste collectively, with community leaders or representatives collecting fees based on the amount of waste generated and consolidating waste at a designated point for collection by the local authority. In this model, the local authority charges the community representative a fee in accordance with statutory limits—potentially

up to 220 baht per month where waste volumes exceed 20 liters per day—while individual households that separate waste effectively would ultimately pay less. Alternatively, communities may agree on rules requiring waste to be placed only in designated bags that implicitly include waste management fees, purchased from participating local shops. In this arrangement, the local authority does not sell the bags directly but coordinates supply and remains responsible for collecting and transporting waste for disposal.

9. Appropriate Fee Structure

PAYT fees should adopt a hybrid model, combining a fixed fee with a variable fee. The fixed components such as a basic collection fee—covers labor costs, investment in vehicles, and disposal facilities, which are incurred regardless of whether some households generate waste. The variable components such as transportation and disposal costs—should fluctuate according to the actual amount of waste generated. Empirical studies consistently show that this hybrid approach is the most effective, as it more accurately reflects the true costs borne by local authorities and reduces illegal dumping. Because households must pay a minimum fee in any case, incentives to evade fees by dumping waste elsewhere are reduced.

In practice, a status quo–based transition is advisable to minimize resistance. Under this approach, households that do not separate waste or do not reduce waste generation would continue to pay the current fee or a slightly higher rate, while those that successfully reduce waste would pay a lower fee. This should be paired with charging based on actual waste volume. For example, households disposing of more than 20 liters per day should pay more than the current 40 baht per month, with finer volume brackets (e.g., every additional 10 liters) introduced. Such differentiation is feasible because it remains within the limits set by existing law.

10. Required Preparations and Supporting Infrastructure

(1) Improvement of data systems: Databases should be updated to accurately identify waste generators, including detached houses, gated communities, dormitories, condominiums, and shophouses. Clear rules are needed for cases where multiple households share a single disposal point. For large generators—such as hotels, shopping centers, and office waste volumes may vary seasonally, requiring long-term average assessments or simplified estimation methods that are fair to both residents and local authorities.

(2) Upgrading fee collection systems: Billing should be modernized through invoice-based systems (like land tax billing) and expanded payment channels, including bank transfers, QR codes, barcodes, ATM payments, and convenience stores.

(3) Provision of separated collection systems: Local authorities must prepare systems to handle source-separated waste, particularly food waste and recyclables. Options include compartmentalized collection vehicles, scheduled collection by waste type, designated drop-off points, or accessible recycling outlets (e.g., waste banks or recycling shops), ensuring residents that separated waste will be meaningfully reused or recycled.

(4) Prevention of illegal dumping: Preventive measures may include installing CCTV in high-risk areas (e.g., canals), supporting community monitoring, and sharing fines with informants. Baseline household waste

data should be collected prior to implementation and compared with post-implementation data; abnormal reductions should trigger targeted inspections for potential illegal dumping or open burning. Publicizing enforcement actions is essential to deter violations, and enforcement must be consistent to achieve lasting behavioral change.

(5) Communication and public engagement: Early and inclusive consultation with all stakeholders is critical. Communities should be encouraged to co-design fee structures so that PAYT is not perceived as coercive. Comprehensive communication should begin at least six months prior to implementation and cover:

(6) Where waste goes, how it is managed, and its impacts:

- Resources used before waste is generated
- Impacts and penalties of illegal dumping
- Actual waste management expenditures and potential savings for education or sports
- Current fees compared with actual costs
- Comparisons of waste fees with everyday expenses (e.g., utilities, phone bills)
- The analogy with electricity and water pricing (use more, pay more)
- Details of the new fee structure
- Simple waste separation practices to reduce fees
- Channels for inquiries and feedback

11. Pilot Expansion to Other Areas

The successful experiences of Wiang Thoeng Subdistrict Municipality and Mae Fah Luang Subdistrict Administrative Organization, as well as other local authorities that have adopted waste-bag systems in place of distributing communal bins, should be scaled up and replicated in other provinces and regions. Such expansion would help confirm that the PAYT principle can effectively reduce the volume of municipal solid waste requiring disposal. Pilot projects could initially focus on small island areas, where external variables are easier to control and where waste management challenges are often particularly acute. To facilitate implementation without regulatory concerns, provincial sanitation and waste management committees may need to issue formal resolutions authorizing local authorities in targeted island areas to participate. In addition, PAYT-based models should be extended to municipalities or subdistrict administrative organizations with populations not exceeding 15,000 that face downstream disposal constraints, allowing them to adapt the approaches of Wiang Thoeng, Mae Fah Luang, or similar waste-bag–based systems to their local contexts.

12. Legal Policy Recommendations

Considering the challenges identified, amendments to the existing legal framework are recommended as follows:

(1) Regulatory harmonization: If ministerial regulations issued under the Act on the Maintenance of Cleanliness and Orderliness of the Country are enforced, the ministerial regulations issued under the Public Health Act should be repealed. Otherwise, local authorities may continue to rely on the latter to avoid collecting waste management fees due to the absence of a minimum fee requirement.

(2) Adjustment of disposal thresholds: The permitted disposal threshold should be reduced from 20 liters per day to a lower level, such as no more than 15 liters per day, to facilitate the application of tiered fees. Waste quantities should also be defined in kilograms, or local authorities should be empowered to determine waste density themselves based on standardized sampling and analysis, enabling weight-based charging.

(3) Expanded authority for fee collection mechanisms: Local authorities should be granted discretion to select appropriate fee collection methods, including the sale of waste bags or bag-label stickers, weight-based measurements with monthly billing, and diversified payment channels such as bank transfers, QR codes, barcodes, ATMs, and convenience stores.

(4) Duties of waste generators and enforcement powers: Legal duties should be imposed on residents to separate waste and pay waste management fees. Local authorities should be empowered to refuse collection from waste generators who fail to comply with payment or separation requirements, alongside increased penalties for illegal dumping and reward mechanisms for informants.

(5) Strengthening reporting and deterrence mechanisms: Additional reporting channels should be established to allow residents to submit evidence of illegal dumping—such as photographs—via official messaging platforms or online media operated by local authorities. These measures would enhance deterrence and improve compliance with local waste management regulations.

13. Conclusion

Weight-based PAYT systems have been empirically shown to increase recycling rates, reduce disposal volumes, and lower overall waste generation in a tangible manner. However, successful implementation requires sustained communication and public outreach through multiple channels to ensure that residents understand and comply with the new rules. A transitional period is often necessary to allow communities to adapt. Importantly, PAYT should be implemented concurrently across neighboring local authority areas to prevent inconsistencies that could undermine compliance, such as perceptions of unfairness or regulatory arbitrage between adjacent jurisdictions.

Annex 1:
Implementation Steps for the Pilot Use of Waste Bags with the Ao Nang SAO Logo

(1) Data collection and assessment

Collect data on waste collection operations and the applicable collection, transport, and disposal fees under the Ao Nang Subdistrict Administrative Organization (SAO) local ordinance. The data are analyzed to identify causes of existing problems and areas requiring improvement to ensure smooth implementation.

(2) Project proposal and internal coordination

Present the draft project to the Ao Nang SAO executives and all relevant units, including the Revenue Collection Unit (Finance Division), waste collection staff, and officials from the Public Health and Environment Division. The briefing covers project objectives, implementation methods, data collection processes, and analytical approaches.

(3) Selection of participating establishments

Identify suitable accommodation facilities and food service establishments to participate in the pilot. Selection is based on establishments applying for license renewals or new licenses—such as food premises registration, accommodation licenses, hotels, and resorts—that regularly contact the Public Health and Environment Division.

(4) Briefing and voluntary enrollment of participants

Conduct briefings with hotel, accommodation, and restaurant operators to explain the pilot approach and trial period. Participation is voluntary, and a list of participating establishments is recorded to facilitate data collection and statistical analysis during the pilot.

(5) Coordination with waste bag manufacturers

Liaise with waste bag manufacturers to explain specifications for producing semi-transparent waste bags bearing the Ao Nang SAO logo.

(6) Post-implementation data collection and evaluation

After completion of the pilot, collect and analyze data for future application and improvement, including:

- convenience and efficiency of waste collection and transport
- occupational safety during handling and collecting
- cost comparison between using semi-transparent waste bags and paying fees under the existing local ordinance
- durability of waste bags
- visibility of waste contents and the extent to which recyclable materials can be identified and separated, compared with opaque containers or black bags

- overall evaluation of outcomes, including key findings, challenges, and recommendations for further development and scaling of waste collection models.

Annex 2:
Complementary Activities to the Pilot Transition from Black Garbage Bags to Waste Bags with the Ao Nang SAO Logo, Waste-to-Fund Innovation: "Ao Nang SAO Saleng Patrol"

The Ao Nang SAO has addressed waste management challenges not only by fostering cooperation with local residents and private businesses, but also by introducing an innovative initiative known as the "Saleng Patrol Project," launched in April 2019. The project formalizes and integrates informal waste pickers—locally known as saleng—into the waste management system, enabling proper waste separation at the source.

In the past, waste was often disposed of improperly: garbage was left outside bins, bins overflowed, or waste was discarded indiscriminately. When informal waste pickers searched through these piles, waste became further scattered, creating unpleasant sights and odors. Moreover, the presence of saleng operators moving through neighborhoods late at night often generated fear and distrust among residents. To address these issues, the Ao Nang SAO created a registration system that allows saleng operators to operate legally and free of charge, under a set of mutually agreed conditions:

- All registered saleng operators must wear a green reflective vest with an identification number whenever collecting, opening, or sorting waste bags within Ao Nang Subdistrict, at any time of day.
- Operators are prohibited from competing aggressively, tearing open waste bags indiscriminately, or leaving bags untied. After sorting, all waste bags must be securely re-tied.
- Theft of items outside waste bags or containers belonging to households or establishments is strictly prohibited.
- If suspicious or potentially hazardous objects are found in waste bags, operators must immediately notify the SAO Public Health and Environment Division via phone or the official LINE group established by the SAO. The same applies if they encounter disturbances such as youth-related incidents; photographic evidence should be submitted through the group for official follow-up.
- Any violation of the agreement results in a formal warning. Repeated violations or substantiated complaints lead to immediate revocation of registration and confiscation of the vest.
- Any individual collecting, tearing, or sorting waste within Ao Nang Subdistrict without registration or without wearing the official vest is subject to legal enforcement, including fines or arrest, as appropriate.

To date, more than 50 saleng operators have registered and received reflective vests with clearly identifiable numbers. Beyond helping to reduce waste at the source through proper sorting, these individuals also act as the "eyes and ears" of local authorities, reporting incidents and contributing to public safety for both residents and tourists.

In this sense, the Saleng Patrol functions not only as a waste management mechanism but also as a form of civic engagement. The saleng operators serve as community volunteers and informal extensions of SAO personnel, helping maintain cleanliness and promote waste separation at the local level.

Public perception of saleng operators has gradually shifted in a positive direction. They are now more widely accepted and familiar figures within the community, recognized for their contribution to environmental protection and their participation in local activities such as tourism festivals, music events, and monthly Big Cleaning Day campaigns.

Economically, the initiative has also improved livelihoods. Saleng operators can earn between 800 and 2,000 baht per day, and during high tourism seasons, monthly incomes may reach 60,000-70,000 baht. Operating from approximately 9:00 a.m. until 2:00 a.m., they typically collect no less than 100 kilograms of recyclable waste per day, and in some cases up to 1,000 kilograms daily. Such income levels reflect not only economic opportunity, but also the vast volume of waste generated within the area. As one operator observed, “When people do not separate waste, it inevitably piles up like this. If households separated waste from the beginning, the overall volume would not be nearly as large.”

Figure 4 Registered Saleng Waste Pickers Conducting Waste Separation in Ao Nang Subdistrict

Figure 5 Compilation of Activities Conducted During the Pilot Implementation of Semi-Transparent Waste Bags with the Ao Nang SAO Logo

Figure 6 Centralized Waste Collection Point at Ao Nang Beach (Replacing SAO Waste Bins)

Annex 2:

Avian species list of the Krabi river estuary

Table 1 Avian Species List of the Krabi River Estuary

No.	English name	Scientific name	Global threat status		
Non-breeding visitor species					
1	Nordmann's Greenshank	*Tringa guttifer*	Endangered	EN	
2	Chinese Egret	*Egretta eulophotes*	Vulnerable	VU	
3	Red-necked Stint	*Calidris ruficollis*	Near Threatened	NT	
4	Red Knot	*Calidris canutus*	Near Threatened	NT	
5	Curlew Sandpiper	*Calidris ferruginea*	Vulnerable	VU	
6	Broad-billed Sandpiper	*Calidris falcinellus*	Vulnerable	VU	
7	Little Ringed Plover	*Thinornis dubius*	Least Concern	LC	
8	White-faced Plover	*Anarhynchus dealbatus*	Least Concern	LC	
9	Asian Dowitcher	*Limnodromus semipalmatus*	Near Threatened	NT	
10	Gray-headed Lapwing	*Vanellus cinereus*	Least Concern	LC	
11	Gray-tailed Tattler	*Tringa brevipes*	Least Concern	LC	
12	Marsh Sandpiper	*Tringa stagnatilis*	Least Concern	LC	
13	Wood Sandpiper	*Tringa glareola*	Least Concern	LC	
14	Common Redshank	*Tringa totanus*	Least Concern	LC	
15	Long-toed Stint	*Calidris subminuta*	Least Concern	LC	
16	Sanderling	*Calidris alba*	Least Concern	LC	
17	Pacific Golden-Plover	*Pluvialis fulva*	Least Concern	LC	
18	Eastern Cattle-Egret	*Ardea coromanda*	Least Concern	LC	
19	Medium Egret	*Ardea intermedia*	Least Concern	LC	
20	Purple Heron	*Ardea purpurea*	Least Concern	LC	
21	Black-bellied Plover	*Pluvialis squatarola*	Vulnerable	VU	
22	Tibetan Sand-Plover	*Anarhynchus atrifrons*	Least Concern	LC	
23	Greater Sand-Plover	*Anarhynchus leschenaultii*	Least Concern	LC	
24	Kentish Plover	*Anarhynchus alexandrinus*	Least Concern	LC	
25	Eurasian Whimbrel	*Numenius phaeopus*	Least Concern	LC	

No.	English name	Scientific name	Global threat status		
26	Eurasian Curlew	*Numenius arquata*	Near Threatened	NT	
27	Bar-tailed Godwit	*Limosa lapponica*	Near Threatened	NT	
28	Black-tailed Godwit	*Limosa limosa*	Near Threatened	NT	
29	Terek Sandpiper	*Xenus cinereus*	Least Concern	LC	
30	Ruddy Turnstone	*Arenaria interpres*	Near Threatened	NT	
31	Little Egret	*Egretta garzetta*	Least Concern	LC	
32	Great Egret	*Ardea alba*	Least Concern	LC	
33	Common Sandpiper	*Actitis hypoleucos*	Least Concern	LC	
34	Barn Swallow	*Hirundo rustica*	Least Concern	LC	
35	Common Greenshank	*Tringa nebularia*	Least Concern	LC	
36	Great Knot	*Calidris tenuirostris*	Endangered	EN	
37	Osprey	*Pandion haliaetus*	Least Concern	LC	
38	Lesser Crested Tern	*Thalasseus bengalensis*	Least Concern	LC	
39	Great Crested Tern	*Thalasseus bergii*	Least Concern	LC	
40	Oriental Darter	*Anhinga melanogaster*	Least Concern	LC	
Resident species					
1	Javan Pond-Heron	Ardeola speciosa	Least Concern	LC	
2	Brahminy Kite	Haliastur indus	Least Concern	LC	
3	Indochinese Roller	Coracias affinis	Least Concern	LC	
4	Large-billed Crow	Corvus macrorhynchos	Least Concern	LC	
5	White-bellied Sea-Eagle	Icthyophaga leucogaster	Least Concern	LC	
6	Greater Coucal	Centropus sinensis	Least Concern	LC	
7	Chestnut-bellied Malkoha	Phaenicophaeus sumatranus	Near Threatened	NT	
8	Green-billed Malkoha	Phaenicophaeus tristis	Least Concern	LC	
9	Asian Koel	Eudynamys scolopaceus	Least Concern	LC	
10	Plaintive Cuckoo	Cacomantis merulinus	Least Concern	LC	
11	White-nest Swiftlet	Aerodramus fuciphagus	Least Concern	LC	

No.	English name	Scientific name	Global threat status		
12	Red-wattled Lapwing	Vanellus indicus	Least Concern	LC	
13	Greater Painted-Snipe	Rostratula benghalensis	Least Concern	LC	
14	Bronze-winged Jacana	Metopidius indicus	Least Concern	LC	
15	Malaysian Plover	Anarhynchus peronii	Near Threatened	NT	
16	Little Cormorant	Microcarbo niger	Least Concern	LC	
Non-breeding visitor and resident species					
1	*Black-winged Stilt	Himantopus himantopus	Least Concern	LC	

***A portion of the Black-winged Stilt population migrates from other regions to temporarily inhabit the Krabi River Estuary, while another segment of the population remains as year-round residents within the area. Consequently, the Black-winged Stilt is classified under both migratory statuses.**

The ornithological data were compiled and synthesized from the following primary sources:

- The eBird Database
- Birds of Thailand (2018), Authored by Uthai Treesucon and Wich'yanan Limparungpatthanakij
- Checklist of Thai Birds, officially maintained and updated by the Thai Bird Records Committee (TBRC)

Non-breeding visitor bird species in Krabi estuary

Nordmann's Greenshank *(Tringa guttifer)*

It is very similar to the **Common Greenshank**, but its body proportions are different. The body is **stockier and burlier**, their head appears larger and more bull-headed, and **the legs are shorter** than those of the Common Greenshank.

Global threat status: Endangered (EN)

Chinese Egret *(Egretta eulophotes)*

A medium-sized egret with completely **pure white plumage**. It is often confused with the **Little Egret**, but has a **thicker bill**, **slightly shorter and stubbier legs**, and the gape line extending past the eye forms a shallow crook.

Global threat status: Vulnerable (VU)

Red-necked Stint *(Calidris ruficollis)*

It is a small wader, about the size of a sparrow. It has **short black legs and a short, pointed black bill**. It feeds on tiny invertebrates on the ground by keeping its head down and **pecking rapidly**, much like **a sewing machine**.

Global threat status: Near Threatened (NT)

Red Knot (*Calidris canutus)*

A medium-sized wader with a **strong and stocky build**. Its legs and bill are relatively short compared to its body size. It is **smaller and appears stockier than the Great Knot**, and has a short, straight, and slightly thicker bill.

Global threat status: Near Threatened (NT)

Curlew Sandpiper *(Calidris ferruginea)*

A medium-sized wader with a **slender body and long legs**. Its bill is the most distinct feature, being **long and slightly curved downwards**. In flight, a large and clearly visible white rump patch can be seen.

Global threat status:	Vulnerable (VU)

Broad-billed Sandpiper *(Calidris falcinellus)*

A small wader with **short black or dark grey legs**. It has a rather **slow and shy (furtive) foraging behavior** compared to other wader species that often run around busily. When startled, it flies low and over a short distance.

Global threat status:	Vulnerable (VU)

Little Ringed Plover (*Thinornis dubius)*

A small plover with prominent facial features: **bright yellow eyerings** and a **black band** across the eyes and forehead. In flight, **a very thin and faint white wing bar** is visible. It has a behavior of rapidly running and stopping along the water's edge, and it emits a short, unique 'peu' call.

Global threat status:	Least Concern (LC)

White-faced Plover *(Anarhynchus dealbatus)*

A small plover characterized by a **clean white face**, especially the area between the bill and the eyes (lores) which is **almost entirely white**. It is often found on **extensive sandy beaches** during the winter in Thailand, and usually forages together with flocks of other plover species.

Global threat status:	Least Concern (LC)

Asian Dowitcher *(Limnodromus semipalmatus)*

The **bill is distinctive**, being **long, thick, and completely solid black**. It has a unique foraging behavior known as the 'sewing machine action', which involves **rapidly and repeatedly probing its bill vertically into the mud**, similar to the rhythm of a sewing machine needle.

Global threat status:	Near Threatened (NT)

Gray-headed Lapwing *(Vanellus cinereus)*

A large lapwing featuring a bright gray head and neck. It is characterized by a **thick black breast band** that distinctly separates the gray neck from the clean white underparts. These birds are typically found in loose flocks within **cultivated wetlands**, recently harvested rice paddies, and freshwater marshes.

Global threat status:	Least Concern (LC)

Gray-tailed Tattler *(Tringa brevipes)*

A medium-sized shorebird characterized by clean, grey plumage and sturdy, **relatively short yellow legs**. It is a quiet and solitary species, typically foraging with deliberate, cautious movements among **coastal rocks** or **mangrove roots**. Its commonly heard call is a melodic **"too-lee."**

Global threat status:	Least Concern (LC)

Marsh Sandpiper (*Tringa stagnatilis)*

It is one of the most slender birds in the wader family. In flight, a white stripe extending up to the middle of the back (white wedge/stripe on back) is visible. It can be found in both freshwater and brackish wetlands, but is **rarely seen on open beaches** with strong waves.

Global threat status:	Least Concern (LC)

Wood Sandpiper (*Tringa glareola)*

A medium-sized wader with **brownish-grey plumage**. It is often confused with the **Marsh Sandpiper** but can be distinguished by the more prominent spotting on its back and its overall coloration, which is more brownish than greyish-white.

Global threat status: Least Concern (LC)

Common Redshank *(Tringa totanus)*

This medium-sized shorebird is characterized by its **bright red legs**. It is a **highly wary bird** that frequently emits a loud call to alert others in the flock whenever humans or predators approach. Due to this vigilant behavior, it has earned the nickname **"The Sentinel of the Wetlands"**.

Global threat status: Least Concern (LC)

Long-toed Stint *(Calidris subminuta)*

A very small wader featuring **remarkably long toes, particularly the middle toe**. Its plumage is characterized by dark, distinct scaly patterns on the back. It has a slender profile and **often appears slightly hunch-backed while foraging**. This species is typically found in flooded paddies, overgrown marsh edges, or salt pans with grassy fringes.

Global threat status: Least Concern (LC)

Sanderling (*Calidris alba)*

A small wader with bright, white plumage. It **lacks a hind toe**, allowing it to run rapidly across sandy shores. Its signature behavior is **"wave-chasing"** (running back and forth), where it follows receding water to forage and quickly retreats from incoming waves, moving with a speed and rhythm that resembles a **wind-up toy**.

Global threat status: Least Concern (LC)

Pacific Golden-Plover *(Pluvialis fulva)*

A medium-sized, slender plover characterized by upperparts that are **spangled with fine golden spots**. These spots become exceptionally bright and distinct when caught in the sunlight. It possesses a unique foraging rhythm of **walking then pausing to peck at its food**.

Global threat status:	Least Concern (LC)

Eastern Cattle Egret *(Ardea coromanda)*

A small, stocky heron primarily distinguished by its terrestrial foraging habits. Unlike other egrets, it rarely wades into deep water. These birds are uniquely known for **"following buffaloes or tractors"** to catch insects that are flushed out from the grass or the soil during plowing.

Global threat status:	Least Concern (LC)

Medium Egret *(Ardea intermedia)*

During the breeding season, they develop long, elegant aigrettes (ornamental plumes) covering their back and chest, and their bills may temporarily change to black or dark red. They can be found in any water-related environment.

Global threat status:	Least Concern (LC)

Purple Heron *(Ardea purpurea)*

A large, slender heron with a **neck that is longer and thinner** than that of other heron species. It is a relatively **solitary and retiring** bird, often standing perfectly still to camouflage itself among the grass while waiting to ambush its prey.

Global threat status:	Least Concern (LC)

Black-bellied Plover *(Pluvialis squatarola)*

A medium-sized shorebird with a **stout and robust** build, featuring a short, thick bill. While in flight, it reveals **"black axillaries"**, which is the most distinct characteristic used to differentiate it from other golden plovers. It exhibits a signature **"run-stop-peck"** foraging behavior.

Global threat status:	Vulnerable (VU)

Tibetan Sand-Plover *(Anarhynchus atrifrons)*

A medium-sized plover with brown upperparts, a white throat, and a white belly. Compared to the **Greater Sand-Plover**, it has a smaller head proportion, darker legs, and a shorter bill that is slightly **bulbous at the tip**. It is frequently running across mudflats to forage for food.

Global threat status:	Least Concern (LC)

Greater Sand-Plover *(Anarhynchus leschenaultii)*

A medium-sized plover characterized by an **exceptionally long and thick bill**. It is larger than the **Tibetan Sand-Plover** and typically has lighter-colored legs (ranging from yellowish-grey to olive-green).

Global threat status:	Least Concern (LC)

Kentish Plover *(Anarhynchus alexandrinus)*

A small, slender plover. The black or brown breast band is distinctively characteristic, appearing like a **"broken collar."** Its upperparts are a pale sandy-brown, and it features a white nape that is more prominent than that of the **Tibetan Sand-Plover**.

Global threat status:	Least Concern (LC)

Eurasian Whimbrel *(Numenius phaeopus)*

A large, brown-bodied shorebird whose most distinctive feature is its **long, decurved bill**. It possesses **bold head stripes**, consisting of alternating dark and light bands. It uses its long, curved bill to probe and extract prey from burrows.

Global threat status:	Least Concern (LC)

Eurasian Curlew *(Numenius arquata)*

A very large shorebird with streaked brown plumage. It is larger than the **Eurasian Whimbrel** and lacks the distinct dark head stripes found on the latter. Its unique **"coor-lee"** call is a signature characteristic used for identification.

Global threat status:	Near Threatened (NT)

Bar-tailed Godwit *(Limosa lapponica)*

A medium-large shorebird with a long, **bicolored bill** that is slightly upturned at the tip. This bird is renowned for its **extraordinary endurance**, capable of performing long-distance migratory flights without stopping to rest.

Global threat status:	Near Threatened (NT)

Black-tailed Godwit *(Limosa limosa)*

A medium-sized shorebird with a very long, **slightly upturned** (uptilted) bill that features a pink base. In flight, it reveals a **bold white wing stripe**. It is typically found foraging by wading in **deeper water** compared to many other shorebird species.

Global threat status:	Near Threatened (NT)

Terek Sandpiper *(Xenus cinereus)*

A small-to-medium shorebird that is easily identified by **short, bright orange legs** and its long, **distinctly upturned bill**. The vibrant orange legs stand out prominently against the mudflats.

Global threat status: Least Concern (LC)

Ruddy Turnstone *(Arenaria interpres)*

A small but **stockily built** shorebird with **short, bright orange legs**. It possesses a unique foraging behavior, using its bill to **flip over stones, shells, and various debris** along the shoreline to find hidden insects or small invertebrates underneath.

Global threat status: Near Threatened (NT)

Little Egret *(Egretta garzetta)*

A small heron has **black legs and bright yellow feet**. The name **"Little Egret"** (or locally referred to as the "Braided Egret" in Thai) comes from its breeding plumage, which features **two long, slender plumes** extending from the nape, resembling hair braids.

Global threat status: Least Concern (LC)

Great Egret *(Ardea alba)*

A large heron with pure white plumage, an elegant long neck, and a notably **lanky** build. Both its legs and feet are **entirely black**. It is significantly larger than other egret species. This bird typically hunts by **stalking** slowly and cautiously through shallow water.

Global threat status: Least Concern (LC)

<table>
<tr>
<td>  </td>
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<tr>
<td>Common Sandpiper (Actitis hypoleucos)</td>
<td>Barn Swallow (Hirundo rustica)</td>
</tr>
<tr>
<td>A small shorebird with plain brown upperparts that contrast sharply with its clean white underparts. It exhibits a signature behavior of continuously bobbing its tail up and down. Its flight pattern is characterized by flying low over the water with short, rapid wingbeats followed by rhythmic glides.</td>
<td>A brightly colored, streamlined swallow with a deeply forked tail and prominent, long, pointed tail streamers (outer tail feathers). It feeds on airborne insects, by capturing them in mid-air with high-speed flight. It builds its cup-shaped nest using mud pellets mixed with grass.</td>
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<tr>
<td>Global threat status: Least Concern (LC)</td>
<td>Global threat status: Least Concern (LC)</td>
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<tr>
<td>Common Greenshank (Tringa nebularia)</td>
<td>Great Knot (Calidris tenuirostris)</td>
</tr>
<tr>
<td>A relatively large, slender shorebird. When in flight, it reveals a distinct long, wedge-shaped white patch extending from the rump up to the middle of its back, which contrasts sharply with its darker wings. They emit a melodic and resonant call described as “tew-tew-tew”.</td>
<td>A medium-sized, stout-bodied shorebird. In flight, it reveals a strikingly clean white rump. It is noticeably larger and possesses a longer bill than the Red Knot. During migration, it is found almost exclusively on coastal mudflats and is rarely seen in inland areas.</td>
</tr>
<tr>
<td>Global threat status: Least Concern (LC)</td>
<td>Global threat status: Endangered (EN)</td>
</tr>
</table>

Osprey *(Pandion haliaetus)*

A large bird of prey, In flight, it kinks its wings at the **wrists**, creating a distinct **"M" shape** when viewed from below. It possesses a specialized foot structure featuring **spiny scales (spicules)** and long, curved talons, providing an exceptional grip for catching slippery fish.

Global threat status:	Least Concern (LC)

Lesser Crested Tern *(Thalasseus bengalensis)*

A medium-sized tern characterized by its **grey upperwings, rump, and tail**. Its underparts are a clean white. Compared to the **Great Crested Tern**, it has a **more orange bill** and a smaller body size. This species is found exclusively along sea coasts.

Global threat status:	Least Concern (LC)

Great Crested Tern (*Thalasseus bergii)*

A large tern characterized by a long, thick, and distinct **lemon-yellow bill**, which is its easiest identifying feature. Its body size is nearly as large as a **gull**. It is primarily found along sea coasts and river estuaries.

Global threat status:	Least Concern (LC)

Oriental Darter *(Anhinga melanogaster)*

A waterbird with a **long, slender neck**. It uses sharp bill to spear fish underwater. Unlike ducks, its feathers are not coated with waterproof oil. Therefore, after diving, it must perch on branches or rocks and **spread its wings wide** to dry its feathers in the sun.

Global threat status:	Least Concern (LC)

Resident bird species in Krabi estuary

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Javan Pond-Heron (Ardeola speciosa)</td><td>Brahminy Kite (Haliastur indus)</td></tr>
<tr><td>A small, stoutly built and robust heron. When standing still to ambush prey such as small fish, frogs, or amphibians along water edges or grassy patches, its body appears a dull brown, camouflaging perfectly with its surroundings.</td><td>A medium-sized bird of prey characterized by a rounded tail, which distinguishes it from many other raptors. It features a pure white head and chest that contrast sharply with its deep reddish-brown body, wings, and tail.</td></tr>
<tr><td>Global threat status: Least Concern (LC)</td><td>Global threat status: Least Concern (LC)</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Indochinese Roller (Coracias affinis)</td><td>Large-billed Crow (Corvus macrorhynchos)</td></tr>
<tr><td>A bird with a striking blue and azure-toned body. It is renowned for its acrobatic and beautiful flight displays during courtship, which involve rolling and diving, the behavior from which the name "Roller" is derived.</td><td>A large crow with entirely jet-black plumage that exhibits a distinct glossy sheen in certain areas. This bird is highly social and exceptionally intelligent. They are capable of learning and adapting to human behaviors effectively.</td></tr>
<tr><td>Global threat status: Least Concern (LC)</td><td>Global threat status: Least Concern (LC)</td></tr>
</table>

White-bellied Sea-Eagle *(Icthyophaga leucogaster)*

A massive bird of prey with broad, powerful wings. While soaring, it holds its wings in a distinct **V-shape (dihedral)**, making it easily identifiable from a great distance. It possesses a loud, resonant call that sounds like laughter—**"ok-ok-ok"**—which is the origin of its Thai name, **"Nok-Ok."**

Global threat status: Least Concern (LC)

Greater Coucal *(Centropus sinensis)*

A large bird with the most striking feature, **deep red eyes**. It is primarily a **carnivore**, feeding on a wide range of prey. It is not a strong flyer and prefers **hopping along tree branches**. Its call is a rhythmic, which is commonly heard during the early morning or after rainfall.

Global threat status: Least Concern (LC)

Chestnut-bellied Malkoha *(Phaenicophaeus sumatranus)*

A large cuckoo with striking **neon-orange skin** around the eyes that contrasts sharply with its **greenish-yellow bill**. It rarely flies long distances, instead preferring to **"clamber"** and hop through dense branches while searching for prey.

Global threat status: Near Threatened (NT)

Green-billed Malkoha *(Phaenicophaeus tristis)*

A large cuckoo with an **exceptionally long tail**. It features a **paler head** compared to the Chestnut-bellied Malkoha, and the skin around its eyes is **bright red**. It is rarely flies in the open. Their call is similar to the sounds made by frogs or toads.

Global threat status: Least Concern (LC)

Asian Koel *(Eudynamys scolopaceus)*

A large cuckoo with the most notable for its striking **ruby-red eyes**. This bird is a well-known **brood parasite**. The female secretly lays her eggs in the nests of other larger bird species, leaving them to hatch and raise her chicks as their own.

Global threat status:	Least Concern (LC)

Plaintive Cuckoo *(Cacomantis merulinus)*

A small cuckoo known for its **plaintive** call. Its primary diet consists of insect larvae, specifically **caterpillars**, and grasshoppers. This bird is a **brood parasite**. However, it typically chooses to lay its eggs in the nests of smaller bird species.

Global threat status:	Least Concern (LC)

White-nest Swiftlet *(Aerodramus fuciphagus)*

A small bird with highly agile flight skills. Its nest is a translucent white, cup-shaped structure built **entirely from saliva**. It feeds on small insects captured mid-air. Remarkably, it possesses the ability of **echolocation**, allowing it to navigate and build nests in the depths of pitch-black caves.

Global threat status:	Least Concern (LC)

Red-wattled Lapwing *(Vanellus indicus)*

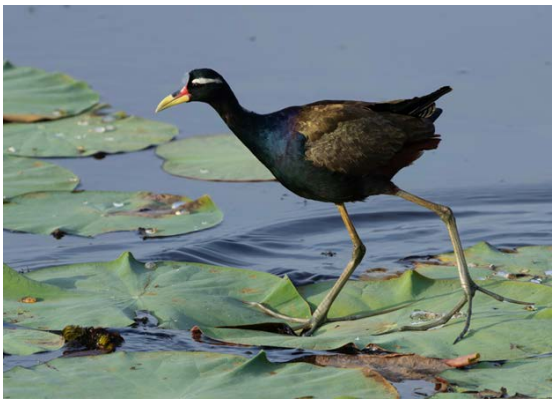
A relatively large plover easily identified by the **striking red fleshy wattles** in front of its eyes. In flight, it reveals broad wings with a high-contrast **black and white pattern**. When it perceives a threat, it circles overhead and emits a piercing, loud alarm to alert others and drive away intruders.

Global threat status:	Least Concern (LC)

Greater Painted-Snipe *(Rostratula benghalensis)*

A medium-sized shorebird. Its **white patch** around the eye that extends backward, resembling a **"white comma."** In a role reversal from most birds, the **female is the one who courts the male.** Once the female has finished laying the eggs, she leaves the **male to incubate them and raise the chicks alone**, while she moves on to find a new mate.

Global threat status:	Least Concern (LC)



Bronze-winged Jacana *(Metopidius indicus)*

A waterbird with striking **bronzy-brown wings**. Its most distinctive feature is a **long, prominent white supercilium**. Its body proportions are perfectly "engineered" for living on **floating vegetation**. It possesses **exceptionally long toes** designed to distribute its weight, allowing it to walk across aquatic weeds effortlessly without sinking.

Global threat status:	Least Concern (LC)

Malaysian Plover *(Anarhynchus peronii)*

A small, relatively pale plover that camouflages perfectly with the color of sand. The feathers on its upperparts have **pale fringes**, giving it a distinct **"worn or tattered" appearance**. This species is found almost exclusively on **sandy beaches**.

Global threat status:	Near Threatened (NT)

Little Cormorant *(Microcarbo niger)*

A small cormorant with **dark brown, almost blackish upperparts**. Because its **feathers are not coated with waterproof oil**, after diving to catch fish, it must perch on branches or rocks and spread its wings to **dry its plumage** in the air.

Global threat status:	Least Concern (LC)

Resident and Non-breeding visitor Birds in Krabi Estuary

Black-winged Stilt *(Himantopus himantopus)*

A large shorebird characterized by its striking, high-contrast **black and white plumage**. Its most distinctive feature is its **exceptionally long, slender legs**, which are vibrant pink or red. These legs are so long that when the bird is in flight, they extend significantly beyond the end of its tail. It feeds on aquatic insects, larvae, shrimp, crabs, and small mollusks by wading through shallow water and picking prey from the surface or just beneath it. This bird can be found in nearly all types of wetlands, with a particular preference for **brackish water** environments.

Global threat status:		Least Concern (LC)

The ornithological data were compiled and synthesized from the following primary sources:

- The eBird Database
- Birds of Thailand (2018), Authored by Uthai Treesucon and Wich'yanan Limparungpatthanakij
- Checklist of Thai Birds, officially maintained and updated by the Thai Bird Records Committee (TBRC)

Annex 3:

Field Guide for Jib Jib Conservation Field Guides


Field Guide
JiBJiB
Conservation
Youth Club

ข้อปฏิบัติในโครงการ

1. ให้เกียรติเพื่อนผู้เข้าร่วมกิจกรรมและพี่ ๆ Staff ตลอดระยะเวลาการทำกิจกรรม
2. หากมีความจำเป็นต้องออกจากพื้นที่กิจกรรม กรุณาแจ้งพี่ ๆ Staff ทุกครั้ง
3. ขอความร่วมมือปิดเสียงโทรศัพท์มือถือ และงดการใช้งานระหว่างทำกิจกรรม (ยกเว้นกรณีใช้เพื่อค้นหาข้อมูลประกอบกิจกรรม หรือมีเหตุจำเป็นเร่งด่วน)
4. หากมีอาการเจ็บป่วย ได้รับอุบัติเหตุ หรือรู้สึกไม่สบายใจ สามารถแจ้งและขอความช่วยเหลือจากพี่ ๆ Staff ได้ตลอดระยะเวลาการเข้าร่วมกิจกรรม

ชื่อเล่น ..... ชั้นปี .....

ชื่อ ..... นามสกุล .....

เบอร์ติดต่อ .....

เบอร์ผู้ปกครอง (กรณีติดต่อได้) .....

Course Program

Day 1 วันพุธที่ 6 พฤษภาคม 2569

8:30	นัดพบที่โครงการป่าในเมือง จ.กระบี่ (สำหรับผู้ที่มาจากเกาะกลาง นัดพบที่ท่าเรือธารา)
9:00 - 16:00	ทักษะพื้นฐานการเป็นมัคคุเทศก์นำเที่ยวดูนก (ภาคทฤษฎี)
16:00 - 17:00	ลงพื้นที่ดูนกจริงในโครงการป่าในเมือง จ.กระบี่ (ภาคปฏิบัติ)

สถานที่: โครงการป่าในเมือง จ.กระบี่
การแต่งกาย: ชุดไปรเวท กางเกงขายาว / รองเท้าผ้าใบ

Day 2 วันพฤหัสบดีที่ 7 พฤษภาคม 2569

6:30	นัดพบที่ท่าเรือธารา ข้ามฝั่งมาที่โรงเรียนบ้านคลองประสงค์
7:00 - 9:00	ลงพื้นที่ดูนกจริงช่วงเช้า พื้นที่หาดบริเวณโรงเรียนบ้านคลองประสงค์ (ภาคปฏิบัติ)
9:00 - 16:00	กิจกรรมออกแบบเส้นทางดูนกเชิงอนุรักษ์และนำเสนอ

สถานที่: หาดบริเวณโรงเรียนบ้านคลองประสงค์
การแต่งกาย: ชุดไปรเวท กางเกงขายาว / รองเท้าผ้าใบ

Day 3 วันศุกร์ที่ 8 พฤษภาคม 2569

9:00 - 10:00	นัดพบที่ท่าเรือธารา ข้ามฝั่งมาที่ท่าเรือท่าเล
10:00 - 11:30	เริ่มโปรแกรมจำลองสถานการณ์นำเที่ยว (ภาคปฏิบัติ)
11:30 - 12:00	สรุปกิจกรรม ที่โรงเรียนบ้านคลองประสงค์

สถานที่: เกาะกลาง ต.คลองประสงค์ / โรงเรียนบ้านคลองประสงค์
การแต่งกาย: ชุดไปรเวท กางเกงขายาว / รองเท้าผ้าใบ

*หมายเหตุ กิจกรรมอาจเปลี่ยนแปลงตามความเหมาะสม

กระบี่...
จุดแวะพักนกอพยพระดับโลก

"บินให้สูง มองให้ไกล ไปให้ถึง" สะท้อนผ่านประติมากรรมนกอินทรีทะเลท้องขาวหรือ "นกออก" ณ ลานปูดำและสี่แยกนกอินทรี ถ.มหาราช เพราะกระบี่คือเมืองแห่งนก

จังหวัดกระบี่พบนกกว่า 111 ชนิด พบมากบริเวณปากแม่น้ำกระบี่ (Krabi estuary) ซึ่งเป็นพื้นที่ชุ่มน้ำ (wetland) สำคัญระดับโลกตามอนุสัญญาแรมซาร์ไซต์ กินพื้นที่ป่าชายเลน หาดเลน หาดทราย ลำคลอง แหล่งหญ้าทะเล รวมถึงตัวเมืองกระบี่

กระบี่ยังเป็นหนึ่งในเส้นทางอพยพหลายหมื่นกิโลเมตรประจำปีของนกอพยพจากต่างแดน เมื่อฤดูหนาวมาถึงประเทศซีกโลกเหนือ แหล่งอาหารและทำรังของนกน้ำอพยพถูกปกคลุมไปด้วยหิมะ จึงพากันบินอพยพหนีหนาวลงมาบริเวณเอเชียและประเทศไทย พักผ่อนอยู่ราว 8 เดือน ก่อนบินกลับ

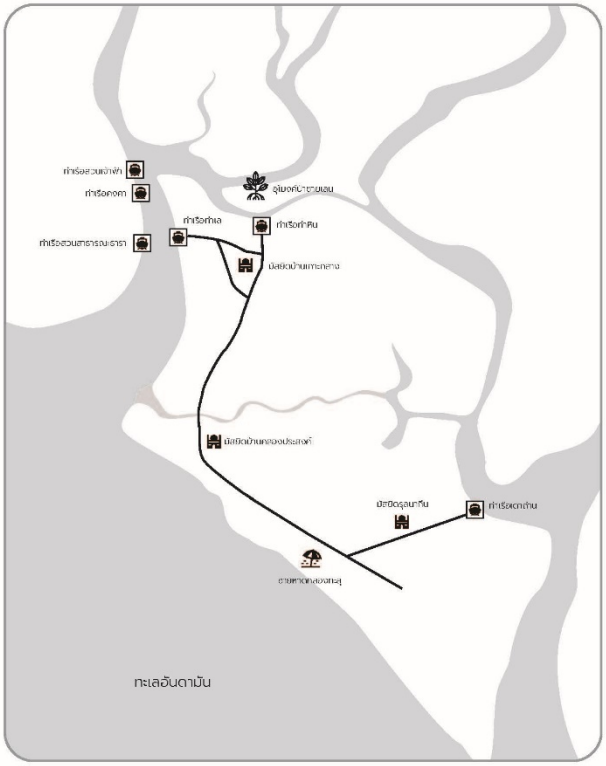
การเดินทางนี้เรียกว่า "เส้นทางการบินเอเชียตะวันออก-ออสเตรเลีย" (East Asian - Australasian Flyway) อันเป็น 1 ใน 9 เส้นทางนกน้ำอพยพหลักที่สำคัญของโลก ทอดยาวจากรัสเซียและอลาสก้า ผ่านเอเชียตะวันออกและเอเชียตะวันออกเฉียงใต้ ไปถึงออสเตรเลียและนิวซีแลนด์ ครอบคลุม 22 ประเทศ มีนกน้ำสัญจรด้วยเส้นทางนี้มากกว่า 50 ล้านตัว รวมถึงนกใกล้สูญพันธุ์หลายชนิด

PARTNERSHIP for the EAST ASIAN - AUSTRALASIAN FLYWAY
EAAFP

เราเห็นนกอพยพที่กระบี่ได้ช่วงกันยายน - เมษายน

แผนที่นก
คลองประสงค์ของฉัน

มาวาดแผนที่จุดดูนกฉบับของเรากัน
ใกล้ๆ บ้านเราและสถานที่สำคัญของชุมชน เราเจอนกอะไรบ้าง



มาดูนกกันเถอะ

โลกของเรามีนกอาศัยอยู่กว่า 7,000 ชนิดกระจายกันอยู่ในทวีปต่างๆ ส่วนในประเทศไทยมีการรายงานพบนกแล้วกว่า 1,000 ชนิด ทั้งที่เป็นนกประจำถิ่นพบเห็นได้ตลอดทั้งปี นกอพยพเข้ามาหากินในช่วงฤดูหนาว

เพราะนกมีอยู่มากมาย นักวิทยาศาสตร์จึงได้พยายามค้นคว้าหาวิธีเรียกชื่อและจัดรวบรวมชนิดสัตว์ ให้เข้าเป็นหมวดเป็นหมู่ เพื่อให้สะดวกต่อการศึกษา นักดูนกมักเรียกการจำแนกประเภทนกว่า "ไอเดน" (Identify = ระบุแยกแยะ) เพื่อระบุว่านกที่เห็นเป็นนกชนิดใด มีพฤติกรรมอย่างไร และเป็นตัวบ่งชี้ว่าสภาพแวดล้อมนี้เป็นอย่างไร เป็นทะเลหรือเมือง เสื่อมโทรมหรืออุดมสมบูรณ์

ไกด์ดูนกต้องทำอะไรบ้าง

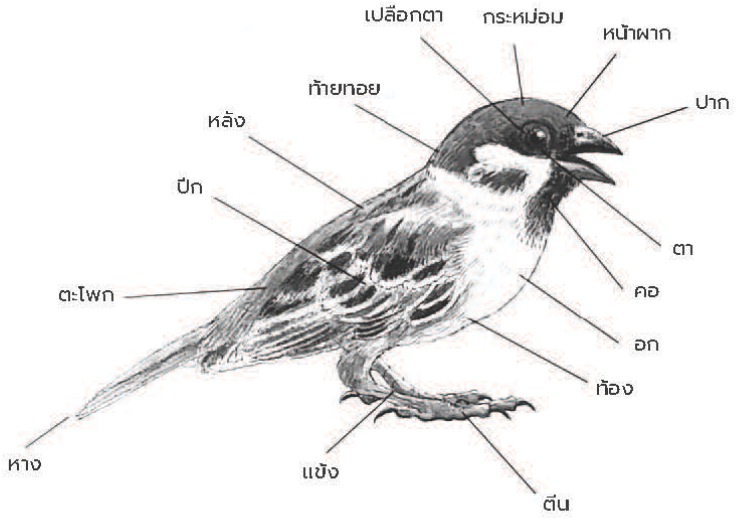
1. **ต้อนรับและดูแลนักท่องเที่ยว** ทำให้ทุกคนรู้สึกสบายใจและปลอดภัยตลอดทริป
2. **เล่าเรื่องธรรมชาติ** แนะนำนก ป่า และ ธรรมชาติให้นักท่องเที่ยวเข้าใจ
3. **ดูแลสิ่งแวดล้อมและความปลอดภัย** ช่วยให้นักท่องเที่ยวรักและไม่ทำลายธรรมชาติ

ไกด์ที่ดี = การท่องเที่ยวที่ยั่งยืน

(Good Guides = Sustainable Tourism)

JiJi Conservation Youth Club

Parts of Bird



small เล็ก (สมอล)	black ดำ (แบล็ค)	dark สีเข้ม (ดาร์ค)
medium กลาง (มีเดียม)	white ขาว (ไวท์)	light สีอ่อน (ไลท์)
big ใหญ่ (บิก)	gray เทา (เกรย์)	spotted มีจุด (สป็อททิด)
short สั้น (ชอร์ท)	brown น้ำตาล (บราวน์)	striped มีลาย (สไตรป์)
tall สูง (ทอล)	yellow เหลือง (เยลโลว์)	plain สีเรียบ (เพลน)
long ยาว (ลอง)	green เขียว (กรีน)	
thick หนา (ทิค)	red แดง (เรด)	
thin บาง (ทิน)	orange ส้ม (ออเรนจ์)	
	blue น้ำเงิน (บลู)	

ข้อมูลภาพอ้างอิงจากหนังสือ ชวนน้องดูนก โดย นันทวัน วาตะ สนพ. รีดดิ้ง ปาร์ตี้

วิธีจำแนกนกเบื้องต้น

อ่านรูปร่างและโครงสร้างร่างกาย

รูปร่างเปลี่ยนแปลงน้อยกว่าสี จึงมักเป็นเบาะแสที่เชื่อถือ ลองนึกภาพนกแต่ละตัวเป็นเงาสีดำ (บุคคลปริศนาในโคนันคุง) แล้วค่อยเติมรายละเอียดทีหลัง

- ขนาด น้องตัวใหญ่หรือเล็ก โดยเทียบกับนกที่คุ้นเคย เช่น ขนาดอีกา
- รูปร่างจะงอยปาก เพราะปากเรียวเล็กมักบ่งบอกถึงนกกินแมลงหรือน้ำหวานเพื่อใช้ดูดน้ำหวาน เหยี่ยวมีปากงุ้มแหลมไว้ฉีกเหยื่อก่อนกลืน
- รูปทรงปีกขณะบิน เช่น ปีกแคบและยาว แบบนกทะเลที่ชอบร่อนเหนือน้ำทั้งวัน ปีกแคบและสั้น เหมาะสำหรับบินเร็วๆ แบบนกตามป่า

อ่านสีให้เป็นประโยชน์

สีอาจคลาดเคลื่อนได้ง่ายเมื่อแสงไม่ดี โฟกัสที่ "ลวดลายสี" ไม่ใช่แค่สีเดี่ยวๆ

- ความต่างของสีระหว่างส่วนต่างๆ ของร่าง เช่น หัวสีเข้ม ลำตัวสีอ่อน
- ปื้นสีเฉพาะตำแหน่ง เช่น วงรอบตาหรือแถบปีก
- บางทีนกตัวผู้กับตัวเมียชุดขนสีก็ไม่เหมือนกัน และเวลาฤดูผสมพันธุ์ก็เปลี่ยนสี (เหมือนเราที่แต่งสวยหล่อเป็นพิเศษเวลาไปกินข้าวกับคนพิเศษ)

อ่านวิธีการเคลื่อนไหว

นกแต่ละกลุ่มและสภาพพื้นที่อยู่ มีวิธีเคลื่อนไหวเป็นเอกลักษณ์

- วิธีหาอาหาร เช่น กระโดดหากินบนพื้น หรือดำน้ำระดับผิวน้ำ
- รูปแบบการบิน เช่น บินสะบัดปีกสม่ำเสมอ สะบัดปีกแล้วร่อน

ฟังเสียงนก

การฟังเสียงนกอาศัยความคุ้นเคย นกบางชนิดมีเสียงร้องเป็นเอกลักษณ์ แยกได้ทันทีโดยไม่ต้องเห็นตัว เช่น นกกาเหว่า กระแตแต้แวด

รู้จักนกน้ำ นักร่อนเร่

นกน้ำ (waterbird) มีทั้งอาศัยในแหล่งน้ำจืดและน้ำเค็ม ที่กระบี่ พบมากเป็นกลุ่มนกชายเลน (shorebird) อันเป็นตัวชี้วัดความอุดมสมบูรณ์ของระบบนิเวศหาดเลนชายฝั่งทะเล (mudflat)

นกชายเลนมีลักษณะเด่นคือปากแหลม เพื่อแทงเจาะลงไปในดินเลน หาจับสัตว์น้ำหรือไส้เดือนแดง แถมยังขายาว เพื่อลงน้ำลึกและเคลื่อนที่หากินบนหาดเลนอันอ่อนนุ่มอย่างคล่องแคล่ว

นกน้ำมีทั้งนกท้องถิ่นและนกอพยพ ช่วยควบคุมสมดุลธรรมชาติประชากรสัตว์น้ำขนาดเล็กในพื้นที่และยังดึงดูดนักดูนกทั่วโลก

ปากน้ำกระบี่พบนกอพยพมากถึง 27 ชนิด มีถึง 10 ชนิดที่อยู่ในสถานภาพคุกคามและใกล้ถูกคุกคาม ดังนั้น พื้นที่ปากน้ำกระบี่จึงได้รับการขึ้นทะเบียนเป็น "พื้นที่เครือข่ายนกน้ำอพยพ" (Flyway Network Site) ที่แรกของไทยเพื่อรวมพลังอนุรักษ์ระดับอินเตอร์

สะสมเหรียญนกซุปเปอร์สตาร์ 3 ชนิดแห่งปากน้ำกระบี่

มีอะไรที่นักท่องเที่ยวควรรู้บ้าง?

การทักทาย + บอกรายละเอียดการทัวร์

สวัสดีทุกคน ยินดีต้อนรับสู่ทัวร์ล่องเรือของเรา
Hello everyone, welcome to our boat tour.
(เฮลโล่ เอวรีวัน, เวลคัม ทู อาวร์ โบ๊ท ทัวร์)

welcome = ยินดีต้อนรับ
boat tour = ทัวร์ล่องเรือ

ฉันชื่อ _____ เป็นไกด์ของวันนี้ค่ะ
My name is _____. I'm your guide today.
(มาย เนม อิส _____. ไอม ยัวร์ ไกด์ ทูเดย์)

guide = ไกด์/ผู้นำทัวร์

วันนี้เราจะดูนก และชมป่าชายเลน
Today we will watch birds and see the mangrove forest.
(ทูเดย์ วี วิล วอทช์ เบิร์ดส์ แอนด์ ซี เดอะ แมงโกรฟ ฟอเรสต์)

watch (birds) = สังเกต/ดู (นก)
mangrove forest = ป่าชายเลน

ระหว่างทางถ้ามีคำถาม ถามได้ตลอด
If you have any questions, please ask me anytime.
(อิฟ ยู แฮฟ เอนี เควสเชินส์, พลีส อาสก์ มี เอนีไทม์)

questions = คำถาม
anytime = ตอนไหนก็ได้

ข้อควรระวัง + การดูนกอย่างมีความรับผิดชอบ

ขอให้ช่วยดูนกแบบเงียบ ๆ
Please watch quietly.
(พลีส วอทช์ ไควเอ็ทลี่)

watch = ดู
quietly = เงียบ ๆ

ขอไม่เข้าใกล้นก
Please don't get close to the birds.
(พลีส โดนท์ เก็ท โคลส ทู เดอะ เบิร์ดส์)

get close = เข้าใกล้

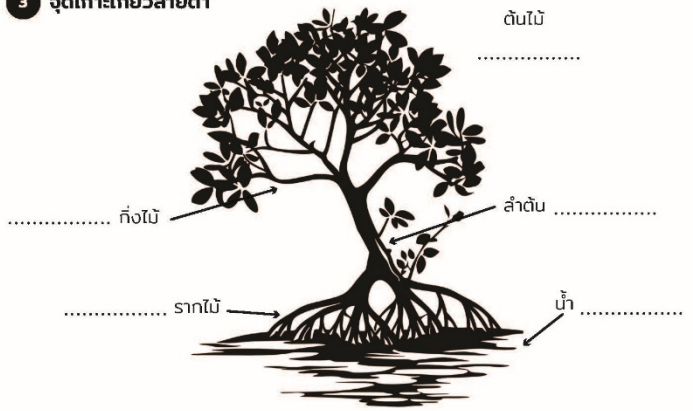
ความสุขของนกมาก่อน
The birds' well-being comes first.
(เดอะ เบิร์ดส์ เวล-บีอิ้ง คัมส์ เฟิร์สท์)

well-being = ความสบาย
comes first = มาก่อน

คำศัพท์ภาษาอังกฤษในการบอกทิศทาง

	1 ทิศทาง	2 คำเชื่อม
←	ทางซ้ายของคุณ On your **left.** (ออน ยัวร์ เลฟท์)	ใกล้ ๆ **near** (เนียร์)
→	ทางขวาของคุณ On your **right.** (ออน ยัวร์ ไรท์)	ข้าง ๆ / ถัดจาก **next to** (เน็กซ์ทู)
↑	ด้านหน้าพวกเรา **In front of** us. (อิน ฟรอนท์ ออฟ อัส)	บน **on** (ออน)
↓	ด้านหลังพวกเรา **Behind** us. (บีไฮนด์ อัส)	ใน **in** (อิน)

3 จุดเกาะเที่ยวสายตา



การเตรียมตัวก่อนดูนก

การดูนกเป็นกิจกรรมที่ทำได้ง่ายมากสำหรับเด็ก
เพียงแค่ออกมานอกตัวอาคาร แล้วมองหาในบริเวณ
ที่มีต้นไม้ ฟังเสียง มองหาดูดีๆ เด็กๆ ก็จะเห็นนก
บางแห่งมีนกหลากหลายชนิดอาศัยอยู่บริเวณเดียวกัน

ถ้าอยากดูนกให้สนุกมากขึ้นควรมีอุปกรณ์ ดังนี้

คู่มือดูนก
คู่มือดูนกช่วยให้เราทราบชื่อ
และรายละเอียดของนกที่เราพบ

สมุดบันทึก
สำหรับวาดรูปนกที่เราเจอ
จดบันทึกรายละเอียด
วัน เวลา สถานที่ที่เราเจอ

การแต่งกาย
เลือกส่วมใส่เสื้อผ้าที่มีสีกลมกลืน
กับธรรมชาติแวดล้อม เตรียมหมวก
น้ำดื่มและอาหารใส่เป้สัมภาระ
ติดตัวไปด้วยนะจ๊ะ

กล้องดูนก
เมื่อเราเห็นนกแล้ว จึงค่อยใช้กล้อง
ส่องดูรายละเอียดให้เห็นชัดๆ
ทำให้เราไม่ต้องเข้าใกล้มากเกินไป
แต่ถ้านกตัวใหญ่ ก็ไม่ต้องใช้กล้อง

ข้อควรปฏิบัติในการดูนก

เฝ้าดูอยู่เงียบๆ

เดินให้เบาที่สุด

ไม่เข้าใกล้นก
โดยเฉพาะนกที่กำลังกกลูก
ห้ามเข้าใกล้เด็ดขาด

ไม่ส่งเสียงดัง
เราต้องจำไว้เสมอว่า
"ความสุขของนก
ต้องมาก่อนความสุขของเรา"

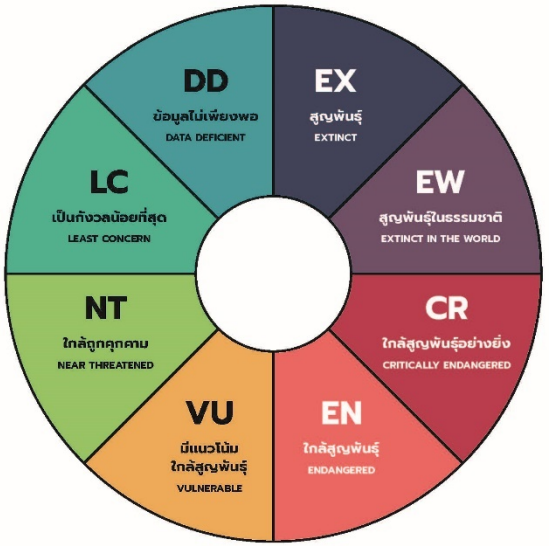
ข้อมูลภาพอ้างอิงจากหนังสือ ชวนน้องดูนก โดย นันทวัน วาตะ สนพ. รีดดิ้ง ปาร์ตี้

"บัญชีแดง" เตือนภัยใกล้สูญพันธุ์

ชีวิตนกนั้นไม่ง่าย เจอภัยคุกคามหลายอย่าง ทั้งแหล่งอาหารและที่อยู่อาศัยทางธรรมชาติที่ค่อยๆ กลายเป็นเมืองหรือพื้นที่เกษตร มลพิษทางแสงทำให้นกสับสนทิศทาง

"บัญชีแดง" จัดทำโดยสหภาพระหว่างประเทศเพื่อการอนุรักษ์ธรรมชาติ (IUCN Red List) เป็นเหมือนกับระดับสี ช่วยบอกระดับความเดือดร้อน เป็นเครื่องมือช่วยให้เราแบ่งสถานภาพของสิ่งมีชีวิตเป็น 8 ระดับ ว่ากำลังเจอภัยคุกคามและจำนวนลงลดในระดับไหน

เกณฑ์การจำแนกสถานภาพของชนิดพันธุ์



สำหรับประเทศไทยได้มีการประเมินสถานภาพชนิดพันธุ์ที่ถูกคุกคามโดยใช้หลักเกณฑ์ IUCN Red List Categories and Criteris เพื่อให้สอดคล้องกับสถานการณ์ปัจจุบัน

ข้อมูลภาพอ้างอิง: สผ.

Equipment

Binocular

Telescope

Tripod

ชื่อ: นกทะเลขาเขียวลายจุด
ชื่ออังกฤษ: Nordmann's Greenshank (นอร์ดมันส์ กรีนแชงก์)

*สถานะ: "ใกล้สูญพันธุ์อย่างยิ่ง"(Endangered)

ขาสั้น
It has **short** legs.

จะงอยปากหนา ปลายสีเข้ม
It has a **thick** bill with a **dark** tip.

ขนสีขาว และเทา
Its feathers are **white and gray**

เป็นนกใกล้สูญพันธุ์
It is **endangered.**

ชื่อ: นกยางจีน
ชื่ออังกฤษ: Chinese Egret (ไชนีส อีเกร็ต)

*สถานะ: "เสียงต่อการสูญพันธุ์" (Vulnerable)

ขนสีขาวทั้งตัว
It has all **white feathers.**

มีขนยาวที่หัว คอ และหลัง
It has **long feathers** on the **head, throat, and back.**

เป็นนกสถานะเสียงต่อการสูญพันธุ์
It is **vulnerable.**

ชื่อ: นกหัวโตมลายู
ชื่ออังกฤษ: Malaysian Plover (มะเลย์เซียน พลัฟเวอร์)

ตัวเล็ก สีออกน้ำตาลอ่อน
เหมือนกับทราย
It is **small and light brown,**
like the **sand.**

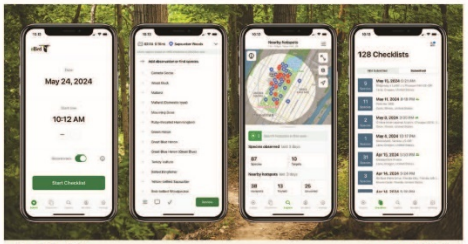
มีแถบสีเข้มที่หน้าผากและคอ
It has a **dark stripe**
on the **crown and throat.**

Reference

แอปพลิเคชันดูนก

eBird
ebird.org

Inaturalist
inaturalist.org



Reference

กลุ่มเฟซบุ๊กช่วยตอบ

นกอะไร

เฟซบุ๊ก

สมาคมอนุรักษ์นก
และธรรมชาติแห่งประเทศไทย
(Bird Conservation Society of Thailand)

BCST

ภาพยนตร์สร้างแรงบันดาลใจ

ปมรักในบึงลึก
Where The Crawdad Sing

Youth Development Program for Conservation-Based Birdwatching Guides

โครงการพัฒนาเยาวชนสู่การเป็นมัคคุเทศก์ดูนกเชิงอนุรักษ์

ภายใต้กิจกรรมการใช้เครื่องมือทางเศรษฐศาสตร์ตามกลไกตลาด ผ่านการจัดทำทัวร์ดูนกเชิงอนุรักษ์ จังหวัดกระบี่ โครงการจัดทำบัญชีทุนทางธรรมชาติเพื่อการตัดสินใจเชิงนโยบายสู่การพัฒนาที่ยั่งยืน

โครงการฝึกอบรมเยาวชนในท้องถิ่นจังหวัดกระบี่เพื่อเสริมสร้างทักษะด้านการจำแนกชนิดนก การเป็นมัคคุเทศก์ การอนุรักษ์ทรัพยากรธรรมชาติ และการท่องเที่ยวเชิงนิเวศอย่างยั่งยืน โดยมุ่งพัฒนาเยาวชนให้มีความรู้ ความสามารถ และทักษะเชิงวิชาชีพ พร้อมก้าวสู่การเป็นมัคคุเทศก์ดูนกมืออาชีพควบคู่กับการส่งเสริมการอนุรักษ์ความหลากหลายของนกและระบบนิเวศในพื้นที่จังหวัดกระบี่

ค่ายนี้เป็นส่วนหนึ่งของโครงการอนุรักษ์ต่อเนื่องที่จ.กระบี่ เพื่อค้นหา "ทุนทางธรรมชาติ" แนวคิดทางเศรษฐศาสตร์ที่ชวนชุมชนทำความรู้จักของดีในธรรมชาติบริเวณบ้านตนอย่างลึกซึ้ง

โครงการทุนทางธรรมชาติ ดำเนินการโดย 3 หน่วยงานหลัก ได้แก่ สำนักงานนโยบายและแผนทรัพยากรธรรมชาติและสิ่งแวดล้อม (สผ.) โครงการสิ่งแวดล้อมแห่งสหประชาชาติ (UNEP) และสถาบันวิจัยเพื่อการพัฒนาประเทศไทย (TDRI) พร้อมทีมงานในพื้นที่ มูลนิธิเอ็นไลฟ์และพี่ค่าย What If

โครงการมุ่งเน้นการพัฒนาศักยภาพเยาวชนในระยะยาว โดยเยาวชนที่ผ่านการอบรมสามารถนำความรู้และทักษะไปประกอบอาชีพมัคคุเทศก์ดูนกได้อย่างต่อเนื่องในชุมชน และรวมกลุ่มเป็นเครือข่าย Jib Jib Conservation Youth Club เพื่อสนับสนุนการท่องเที่ยวเชิงนิเวศ การอนุรักษ์ทรัพยากรธรรมชาติ และการพัฒนาชุมชนอย่างยั่งยืนในระยะยาว

กิจกรรมโครงการ

1. การพัฒนาทักษะการสื่อสารเพื่อเป็นมัคคุเทศก์
2. การอบรมด้านจริยธรรมการอนุรักษ์ ความปลอดภัย และการดูนกอย่างรับผิดชอบ
3. การอบรมภาคทฤษฎีด้านการดูนก การจำแนกชนิดนก และความหลากหลายทางชีวภาพ
4. ประเมินผลภาคปฏิบัติและการมอบประกาศนียบัตร

ผลที่คาดว่าจะได้รับ

1. เตรียมความพร้อมและพัฒนาเยาวชนสู่มัคคุเทศก์ดูนกชุมชน
2. เยาวชนสามารถนำกิจกรรมดูนกได้อย่างมืออาชีพ
3. เกิดโอกาส สร้างรายได้ และอาชีพให้เยาวชนในท้องถิ่น
4. ยกระดับกิจกรรมการท่องเที่ยวดูนกเชิงอนุรักษ์ในจังหวัดกระบี่และรับผิดชอบต่อธรรมชาติ
5. ชุมชนมีบทบาทในการอนุรักษ์และการท่องเที่ยวเชิงนิเวศมากขึ้น

"ทุนทางธรรมชาติ" คืออะไร

อย่าให้ความเคยชินทำให้เรา "มองข้ามคุณค่า" ของคนที่อยู่ใกล้ตัว...

...เราไม่ได้พยายามพูดให้ดูเกินจริง แต่เรื่องแบบนี้เกิดขึ้นกันได้...

...และถ้า "ตา" ของเราที่มองสิ่งใกล้ตัวเปลี่ยนไป เราอาจจะรู้สึกไม่เหมือนเดิม...

"ทุนทางธรรมชาติ" คือดวงตาคู่นั้น

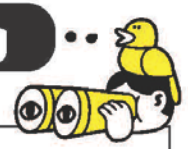
ทุนทางธรรมชาติ (Natural Capital) คือ แนวคิดที่นักเศรษฐศาสตร์สิ่งแวดล้อมนำเสนอ เพื่อใช้เป็นเครื่องมือสร้างการตระหนักรู้ถึงคุณค่าของทรัพยากรธรรมชาติและระบบนิเวศอย่างรอบด้าน ทั้งในแง่ "มูลค่า" ทางเศรษฐกิจและ "คุณค่า" ที่มากกว่านั้น

คุณค่าของป่าไม่ได้มีแค่เนื้อไม้ใช้งาน แต่ป่ายังช่วยผลิตออกซิเจนและเป็นต้นน้ำของสายน้ำน้อยใหญ่ ปะการังในท้องทะเลสวยงาม สร้างรายได้ท่องเที่ยว แถมยังเป็นบ้านของสิ่งมีชีวิตทางทะเลและรักษาความสมดุลของมหาสมุทร

ทรัพยากรธรรมชาตินั้นมีค่าและอาจเสื่อมโทรม สูญหายได้ หากไม่ได้รับการดูแล เมื่อเริ่มเห็นคุณค่าของสิ่งใกล้ตัว เมื่อนั้นเราก็เริ่มกำหนดทิศทางการพัฒนาที่ยั่งยืนได้อย่างแท้จริง

JiBJiB Conservation Youth Club

Bird - Watching Log



บันทึกข้อมูลนก

Name ชื่อ		**Resident / Migratory** ประจำถิ่น / อพยพ	
English name ชื่อภาษาอังกฤษ		**How many did you see?** จำนวน	
Date วัน/เดือน/ปี	**Time** เวลา	**Weather** สภาพอากาศ	**Location** สถานที่พบ
Draw the bird(s) รูปวาด			
Status สถานะ	**Nest and eggs** การทำรังและวางไข่	**Food and eating habits** พฤติกรรมการหาอาหาร	
Notes (local name, ecological role etc.) หมายเหตุ (ชื่อท้องถิ่น, บทบาทในระบบนิเวศ ฯลฯ)			

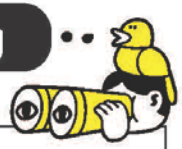
Bird - Watching Log

บันทึกข้อมูลนก

Name ชื่อ		Resident / Migratory ประจำถิ่น / อพยพ	
English name ชื่อภาษาอังกฤษ		How many did you see? จำนวน	
Date วัน/เดือน/ปี	Time เวลา	Weather สภาพอากาศ	Location สถานที่พบ
Draw the bird(s) รูปวาด			
Status สถานะ	Nest and eggs การทำรังและวางไข่	Food and eating habits พฤติกรรมการหาอาหาร	
Notes (local name, ecological role etc.) หมายเหตุ (ชื่อท้องถิ่น, บทบาทในระบบนิเวศ ฯลฯ)			

Bird - Watching Log

บันทึกข้อมูลนก



Name ชื่อ		Resident / Migratory ประจำถิ่น / อพยพ	
English name ชื่อภาษาอังกฤษ		How many did you see? จำนวน	
Date วัน/เดือน/ปี	Time เวลา	Weather สภาพอากาศ	Location สถานที่พบ
Draw the bird(s) รูปวาด			
Status สถานะ	Nest and eggs การทำรังและวางไข่	Food and eating habits พฤติกรรมการหาอาหาร	
Notes (local name, ecological role etc.) หมายเหตุ (ชื่อท้องถิ่น, บทบาทในระบบนิเวศ ฯลฯ)			

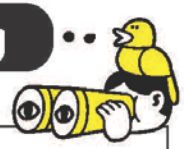
Bird - Watching Log

บันทึกข้อมูลนก

Name ชื่อ		Resident / Migratory ประจำถิ่น / อพยพ	
English name ชื่อภาษาอังกฤษ		How many did you see? จำนวน	
Date วัน/เดือน/ปี	Time เวลา	Weather สภาพอากาศ	Location สถานที่พบ
Draw the bird(s) รูปวาด			
Status สถานะ	Nest and eggs การทำรังและวางไข่	Food and eating habits พฤติกรรมการหาอาหาร	
Notes (local name, ecological role etc.) หมายเหตุ (ชื่อท้องถิ่น, บทบาทในระบบนิเวศ ฯลฯ)			

Bird - Watching Log

บันทึกข้อมูลนก



Name ชื่อ		Resident / Migratory ประจำถิ่น / อพยพ	
English name ชื่อภาษาอังกฤษ		How many did you see? จำนวน	
Date วัน/เดือน/ปี	Time เวลา	Weather สภาพอากาศ	Location สถานที่พบ
Draw the bird(s) รูปวาด			
Status สถานะ	Nest and eggs การทำรังและวางไข่	Food and eating habits พฤติกรรมการหาอาหาร	
Notes (local name, ecological role etc.) หมายเหตุ (ชื่อท้องถิ่น, บทบาทในระบบนิเวศ ฯลฯ)			

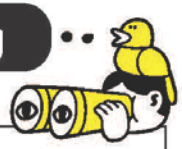
Bird - Watching Log

บันทึกข้อมูลนก

Name ชื่อ		Resident / Migratory ประจำถิ่น / อพยพ	
English name ชื่อภาษาอังกฤษ		How many did you see? จำนวน	
Date วัน/เดือน/ปี	Time เวลา	Weather สภาพอากาศ	Location สถานที่พบ
Draw the bird(s) รูปวาด			
Status สถานะ	Nest and eggs การทำรังและวางไข่	Food and eating habits พฤติกรรมการหาอาหาร	
Notes (local name, ecological role etc.) หมายเหตุ (ชื่อท้องถิ่น, บทบาทในระบบนิเวศ ฯลฯ)			

Bird - Watching Log

บันทึกข้อมูลนก



Name ชื่อ		Resident / Migratory ประจำถิ่น / อพยพ	
English name ชื่อภาษาอังกฤษ		How many did you see? จำนวน	
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Status สถานะ	Nest and eggs การทำรังและวางไข่	Food and eating habits พฤติกรรมการหาอาหาร	
Notes (local name, ecological role etc.) หมายเหตุ (ชื่อท้องถิ่น, บทบาทในระบบนิเวศ ฯลฯ)			

Bird - Watching Log

บันทึกข้อมูลนก

Name ชื่อ		Resident / Migratory ประจำถิ่น / อพยพ	
English name ชื่อภาษาอังกฤษ		How many did you see? จำนวน	
Date วัน/เดือน/ปี	Time เวลา	Weather สภาพอากาศ	Location สถานที่พบ

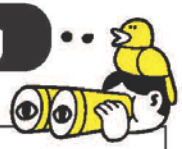
Draw the bird(s)
รูปวาด

Status สถานะ	Nest and eggs การทำรังและวางไข่	Food and eating habits พฤติกรรมการหาอาหาร

Notes (local name, ecological role etc.)
หมายเหตุ (ชื่อท้องถิ่น, บทบาทในระบบนิเวศ ฯลฯ)

Bird - Watching Log

บันทึกข้อมูลนก



Name ชื่อ		Resident / Migratory ประจำถิ่น / อพยพ	
English name ชื่อภาษาอังกฤษ		How many did you see? จำนวน	
Date วัน/เดือน/ปี	Time เวลา	Weather สภาพอากาศ	Location สถานที่พบ

Draw the bird(s)
รูปวาด

Status สถานะ	Nest and eggs การทำรังและวางไข่	Food and eating habits พฤติกรรมการหาอาหาร

Notes (local name, ecological role etc.)
หมายเหตุ (ชื่อท้องถิ่น, บทบาทในระบบนิเวศ ฯลฯ)

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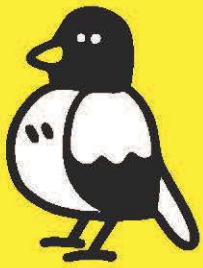

Annex 4:

Participant List

No.	Name	School/ Institution
1	Amornthat Iadsrichai	Muangkrabi School
2	Piyanat Namnaphon	Muangkrabi School
3	Jetsadakorn Sakhanlai	Muangkrabi School
4	Niyom Thongmuean	Bird Conservation Society of Thailand (BCST)
5	Pailin Boonphla	Muangkrabi School
6	Amanyarin Kaewphorathak	Muangkrabi School
7	Asanee Yiangyang	Muangkrabi School
8	Anawin Malaengthap	Muangkrabi School
9	Natchaya Thapprap	Muangkrabi School
10	Amanyarin Kaewphorathak	Muangkrabi School
11	Rapheepan Samanrat	Muangkrabi School
12	Ketsara Sophee	Muangkrabi School
13	Chonnikan Pankiti	Muangkrabi School
14	Apatsara Chusang	Muangkrabi School
15	Thanawat Muakthong	Muangkrabi School
16	Chawarit Madsai	Nuaklongprachabumrung Schoo
17	Wannapha Chitmung	Krabi Technical College
18	Chanphimsi Anyong	Krabi Technical College
19	Warisa Wangya	Krabi Technical College
20	Phanida Changruea	Krabi Technical College

No.	Name	School/ Institution
21	Kunthida Changruea	Krabi Technical College
22	Amitta Khonru	Krabi Technical College
23	Charinthip Kaewkamlam	EnLive Foundation
24	Jirapong Jeewarongkul	EnLive Foundation
25	Chonticha Homklinkaew	What if Co.Ltd.
26	Amom Kerdkaewfa	What if Co.Ltd.
27	Charathee Muangyoo	What if Co.Ltd.
28	Thanyalak Sinrerk	What if Co.Ltd.
29	Nicha Wachpanich	What if Co.Ltd.
30	Panchanok Malakun	What if Co.Ltd.
31	Wuttikan Sriraksa	What if Co.Ltd.
32	Dollada Khasan	Thailand Development Research Institute (TDRI)
33	Ramida Hansawat	Thailand Development Research Institute (TDRI)
34	Panida Phranphanat	Thailand Development Research Institute (TDRI)
35	Kanjana Yasen	Thailand Development Research Institute (TDRI)
36	Ronnaphee Khlongrua	Ban Khlong Prasong School
37	Athinan Fakthong	Ban Khlong Prasong School
38	Rainan Naibanchuay	Ban Khlong Prasong School
39	Pandita Butngha	Ban Khlong Prasong School
40	Dawama Changruea	Ban Khlong Prasong School

No.	Name	School/ Institution
41	Nattakrit Rotkoet	Ban Khlong Prasong School
42	Patinya Butngha	Ban Khlong Prasong School
43	Nuntita Rotkoet	Ban Khlong Prasong School
44	Aris Leedee	Ban Khlong Prasong School
45	Chakkhaphop Matosot	Ban Khlong Prasong School
46	Anyawee Matosop	Ban Khlong Prasong School
47	Matcharee Kosiman	Ban Khlong Prasong School
48	Kesinee Khonrian	Ban Khlong Prasong School
49	Kittithon Thawanchuea	Ban Khlong Prasong School
50	Pitchayapha Waharak	Ban Khlong Prasong School
51	Phatthira Rotlek	Ban Khlong Prasong School
52	Thidarat Choojinda	Ban Khlong Prasong School
53	Falada Doiprasong	Ban Khlong Prasong School
54	Avita Khlongrua	Ban Khlong Prasong School
55	Chaat Chuaykan	Ban Khlong Prasong School
56	Phatthathip Prachongkaew	Ban Khlong Prasong School
57	Kanthee Khlongrua	Ban Khlong Prasong School
58	Thanaphat Phattrakitcharoen	Ban Khlong Prasong School
59	Danaithorn Noosong	Ban Khlong Prasong School
60	Theerapat Noosong	Ban Khlong Prasong School

No.	Name	School/ Institution
61	Karlis Meelam	Ban Ko Klang School
62	Sawawee Adae	Ban Ko Klang School
63	Kittithorn Phayakwan	Ban Ko Klang School
64	Theeritsara Mankha	Ban Ko Klang School
65	Surin Krueawan	Ban Ko Klang School
66	Sunee Krueawan	Ban Ko Klang School
67	Salwanee Adae	Ban Ko Klang School
68	Sirinda Maraya	Ban Ko Klang School
69	Tawan Saiting	Ban Ko Klang School
70	Kamonchanok Thonghom	Ban Ko Klang School
71	Fauzi Raiyai	Ban Ko Klang School
72	Phumidon Theprak	Ban Ko Klang School
73	Surasak Nanphalang	Ban Ko Klang School
74	Pruetsara Nadee	Ban Ko Klang School
75	Hatsaya Nadee	Ban Ko Klang School
76	Ameena Kosaman	Ban Ko Klang School
77	Sakir Koklang	Ban Ko Klang School
78	Passakorn Korsadee	Yasirah Wittayanusorn School
79	Thaksina Damkun	Yasirah Wittayanusorn School
80	Pitchayaphat Khaolek	Yasirah Wittayanusorn School

No.	Name	School/ Institution
81	Ketsara Sophee	Ammartpanichnukul School
82	Noppadon Choengchuan	What Wild
83	Chitmas Silpaprommas	Eco Thailand
84	Sansanee Charitngam	Nature Mind
85	Kornkaew Nokkaew	Krabi Eco Walk

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