ADB

Regional Flyway Initiative · Site Study

January 2026

RFI Priority Site · Khok Kham salt pans

Prepared by Ding Li Yong & Mike Crosby, with additional input from Billy Fairburn, Kelvin Peh, Evelyn Pina-Covarrubias, Stefano Barchiesi and Radhika Bhargava

BirdLife International, University of Southampton, University of Singapore

Asian Development Bank

General Site Information

Country	Thailand			
RFI Site Name	Khok Kham salt pans			ID136
City/ Municipality, Province, Region	Khok Kham and Pantai Norasingh sub-districts and Bang Ya Praek municipality, Samut Sakhon Province			
Geographical coordinates	13.51ºN, 100.35ºE		Area (has)	13,718 ha
Key species	Spoon-billed Sandpiper, Spotted Greenshank			
Key habitats (biomes)	Salt pans and mangrove remnants			
Key ecosystem services	Provisioning and cultural services			
Key drivers of change	Expansion of settlements, infrastructure and industries; aquaculture.			
Conservation status (mark all that applies)		Protected Area		Flyway Network Site
		Ramsar Site		Others _____
IBA/ KBA name (and number) and other designations	Inner Gulf of Thailand			
Management Stakeholders	Samut Sakhon Provincial Government, Khok Kham and Pantai Norasingh subdistrict government, DMCR, ONEP			
With management plan?				
Project concept themes	Site management, tourism, sustainable salt production			
Length of project	Up to 10 years			
Sector/s	Tourism			
No. of potential beneficiaries				
Indigenous Peoples		No		Yes _____
Anticipated Implementation Risks	Impact of expanding nature-based tourism			
Estimated Project Budget (US$)	22,900,000			
Potential Source/s of Financing		Loan (to be identified)		Private Sector
		Grant (to be identified)		Public-Private Partnership

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Acronyms

ADB	Asian Development Bank
AWC	Asian Waterbird Census
BCST	Bird Conservation Society of Thailand
CSR	Conservation Status Review
DOF	Department of Fisheries
DMC	Developing Member Country
DMCR	Department of Marine and Coastal Resources
DWNP	Department of Wildlife, National Parks and Plant Resources
DWR	Department of Water Resources
EAAFP	East Asian-Australasian Flyway Partnership
ECA	Ecologically Critical Area
IBA	Important Bird and Biodiversity Area
IUCN	International Union for the Conservation of Nature
MNRE	Ministry of Natural Resources and Environment (Thailand)
NGO	Non-governmental Organisation
ONEP	Office of Natural Resources and Environmental Policy
RFI	Regional Flyway Initiative
TAO	*Tambon* Administrative Organisation
TESSA	Toolkit for Ecosystem Services Assessment
USAID	United States Agency for International Development
USD	United States Dollars

Executive summary

Khok Kham is among the most important coastal wetlands for shorebird conservation in the Inner Gulf of Thailand given its regular wintering population of the highly threatened Spoon-billed Sandpiper and has been the focus of intensive biodiversity monitoring activities led by BCST and other local stakeholders. The site is presently under the jurisdiction of Khok Kham and Pantai Norasingh *tambon* and Bang Ya Praek municipality in Samut Sakhon Province and is located immediately south of Bangkok. Compared to most other RFI landscapes, Khok Kham is relatively compact (13,718 ha including coastal waters; <7,000 ha of coastal landscapes) and spans an extensive mosaic of salt pans and aquaculture (both coastal and inland fishponds), a narrow coastal strip of intertidal mudflats and remnant strips and patches of mangrove forest. Salt production and aquaculture are the dominant economic activities, as are small-scale industries. Khok Kham is recognised internationally as an EAAFP Flyway Network Site as a result of its large congregations of migratory waterbirds, including globally significant populations of Spotted Greenshank *Tringa guttifer* (EN) and Spoon-billed Sandpiper *Calidris pygmaeus* (CR) (over 1.5% of the world population in some years) and 14 other Threatened or Near Threatened migratory waterbirds. Mangrove forests within the site fall under the jurisdiction of the Royal Forest Department, while water management infrastructure across the site is under the management of the Department of Marine and Coastal Resources.

Khok Kham provide important provisioning and cultural (ecosystem) services through seafood (e.g. shellfish) and salt production, and to some extent, nature-based tourism. The majority of households living in the Khok Kham landscape are involved in aquaculture or salt farming. Domestic tourism is potentially important, and the salt production landscapes in Samut Sakhon draw a regular stream of local tourists, together with a smaller number of international birdwatching tourists. As a direct consequence of the pressures from human use from aquaculture to light industries, the site threats range from habitat disturbance and pollution. High-impact drivers of change include household sewage and urban wastewater from towns and villages, which significantly degrades coastal water quality.

RFI interventions at this site should aim to strengthen site management of a heavily used salt production landscape, with specific activities to address water pollution, water management, while strengthening wetland restoration. A key priority for Khok Kham is to ensure that land uses that is beneficial to biodiversity (e.g. migratory shorebirds) such as salt farming is maintained. Salt farming exerts limited ecological footprint on wildlife, and the salt production process inadvertently creates (wetland) habitat for migratory species in the forms of salt pans and ponds. Maintaining this landscape will require incentives for the local communities to continue with wildlife-friendly approaches to salt production, including capacity building and market development programmes which can be driven by conservation organisations, local conservation groups and the *tambon* government.

1. Background of the Regional Flyway Initiative

In July 2021, the Asian Development Bank made a commitment to develop a long-term Regional Flyway Initiative (RFI) in the East-Asian Australasian Flyway (EAAF) (Sovereign Project 55056-001) to protect and restore priority wetland ecosystems and the associated ecosystem services they provide in the EAAF, the most threatened migratory bird flyway globally. The Initiative is slated for implementation in nine ADB developing member countries (DMCs) in East, South and Southeast Asia: Mongolia, People's Republic of China (PRC), Bangladesh, Viet Nam, Cambodia, Philippines, Thailand, Malaysia and Indonesia. In 2023, the geographic scope of the RFI was further extended to two DMCs in Southeast Asia and the Pacific respectively, Lao PDR and Papua New Guinea.

The primary aim of the RFI is to enhance and expand the existing efforts in conserving and managing wetlands of the highest priority for migratory birds within the EAAF through innovative loan and grant financing, and at scale. Consultations and analyses over the development period help identify key interventions to strengthen the management of wetlands, enabling the implementation of nature-based solutions while strengthening biodiversity protection. Over time, the RFI seeks to leverage collaborative opportunities by developing partnerships among important stakeholders including national governments, civil society organizations, communities, regional organizations like the East Asian-Australasian Flyway Partnership (EAAFP), development agencies, the private sector, and other relevant entities.

Through the RFI Technical Assistance (TA) implemented over the RFI's development phase from 2021 to 2024, BirdLife International takes the lead in providing and coordinating technical support for development of the RFI. This is carried out in collaboration with the EAAFP and a consortium of international non-governmental organizations including Wetlands International and the Paulson Institute, as well as two universities, namely the University of Southampton, UK and the National University of Singapore. Over the development phase, the TA team undertook a site selection analysis to identify priority wetland sites in all 10 countries based on recent bird data benchmarked against internationally accepted criteria under the Convention on Wetlands of International Importance (or Ramsar Convention), EAAFP Flyway Network Sites and Important Bird and Biodiversity Areas (IBAs). The team further developed ecosystem services profiles for prioritised wetlands using a multi-pronged approach used the TESSA ecosystem services assessment tool, and data-driven modelling of water-based ecosystem services and above-ground, stored carbon.

In Thailand, a total of 36 wetland sites, including several Asian Waterbird Census (AWC) count sites, were initially assessed through data analysis and expert consultation, of which 18 were short-listed for assessment. Of this pool of sites, twelve (12) were defined and identified to be RFI priority sites on the basis that they support more than 1% the flyway population of at least one EAAF migratory waterbird species. Nine (9) of the RFI sites identified are coastal wetlands, a consequence of the country's long coastline along the Gulf of Thailand and Peninsular Thailand, with the largest cluster of priority sites concentrated in the Inner Gulf of Thailand (four: Pak Thale-Laem Pak Bia, Khok Kham, Bang Pu, Khlong Tamru). 15 EAAF species exceeded the 1% threshold at the site level in Thailand, with species such as Spotted Greenshank exceeding 10% of the estimated population in just one site (Laem Pak Bia) on a

regular basis. Other species with important non-breeding populations in Thailand includes Spoon-billed Sandpiper, Great Knot, and Sarus Crane.

2. Site profile of Khok Kham salt pans

Location: This site is located in Khok Kham and Pantai Norasingh sub-districts and Bang Ya Praek municipality, in Samut Sakhon Province, about 45 kilometres southwest of central Bangkok. It is bordered to the north by Mueang Samut Sakhon District, to the east by Bang Khun Thian District of Bangkok, to the west by three sub-districts of Samut Sakhon Province (Ban Bo, Kalong and Na Khok), and to the south by the Inner Gulf of Thailand.

Area: The Khok Kham saltpan landscape covers an area of 13,718 ha (less than 7,400 ha if coastal waters is excluded), including a stretch of coastal waters in the Inner Gulf of Thailand.

Altitude: 1-2 m asl.

Geographical coordinates: 13.51ºN, 100.35ºE

Description of site: Khok Kham lies on the low-lying coastal floodplain abutting the Gulf of Thailand. The Tachin River, a deltaic branch of the Chao Phraya River, runs through the centre of the site and flows into the Inner Gulf of Thailand in Muang Samut Sakhon sub-district. At the heart of the site, there are networks of canals that also flow into the sea. Along the coastline there are mangrove forests, mudflats and sandy beaches, which are influenced by the tidal flow and seasonal monsoons, and the sediments and nutrients carried by the rivers from Thailand's Lower Central Plain into the Inner Gulf, causing changes to the sandy beaches and mudflats throughout the year. The mangrove forests in the estuary and along the coast collect sediments from the water, reducing the impact of monsoons and tidal waves and preventing coastal erosion, as well as being important habitat for waterbirds. At high tide, the extensive traditionally managed salt pans, and the aquaculture areas, provide feeding and roosting sites for resident and migratory waterbirds.

Site administration, management and land tenure: Khok Kham is part of Inner Gulf of Thailand, which was considered a nationally important wetland under a Government of Thailand cabinet resolution of 1 August 2000. Khok Kham was designated as an East Asian-Australasian Flyway Partnership (EAAFP) Network Site in 2010 and as an Important Bird and Biodiversity Area in 2004. Part of the site lies within Pantai Norasingh Non-hunting Area, which is managed by the Department of National Parks, Wildlife and Plant Conservation (DNP). There are no official national management plans, but some coastal conservation and restoration plans have been developed by government agencies such as the Department of Marine and Coastal Resources. Khok Kham is under the jurisdiction of Samut Sakhon Province, and the site is mainly managed by the relevant government agencies from three sub-district management authorities, Pantai

Norasingh, Khok Kham and Bang Ya Praek. Most of mangrove forests along the coastline are reserved forests and are protected by the Royal Forest Department and Department of Marine and Coastal Resources. The canals in Khok Kham are managed by the Marine Department, and the mudflats and the sea are the responsibility of the Department of Marine and Coastal Resources and the Department of Fisheries. Local Conservation Groups such as the 'Khok Kham Birding Club' have been established at Khok Kham which have developed conservation strategies such as the protection of marine animals, coastal erosion protection, mangrove forest restoration, bird surveys, and meetings to raise the conservation awareness of the local communities; these strategies are being implemented by local government agencies in collaboration with private sector organisations and NGOs.

Social and economic values: The current land uses and economic activities within Khok Kham include human settlements, industrial zones and marketplaces, agricultural land, aquaculture ponds, salt pans, coastal shellfish (cockle and mussel) farms, and mangrove forest restoration. In the surrounding area, the economic activities include fisheries operating in the canals, coastal commercial fisheries and cargo ship navigation through the Tachin River estuary.

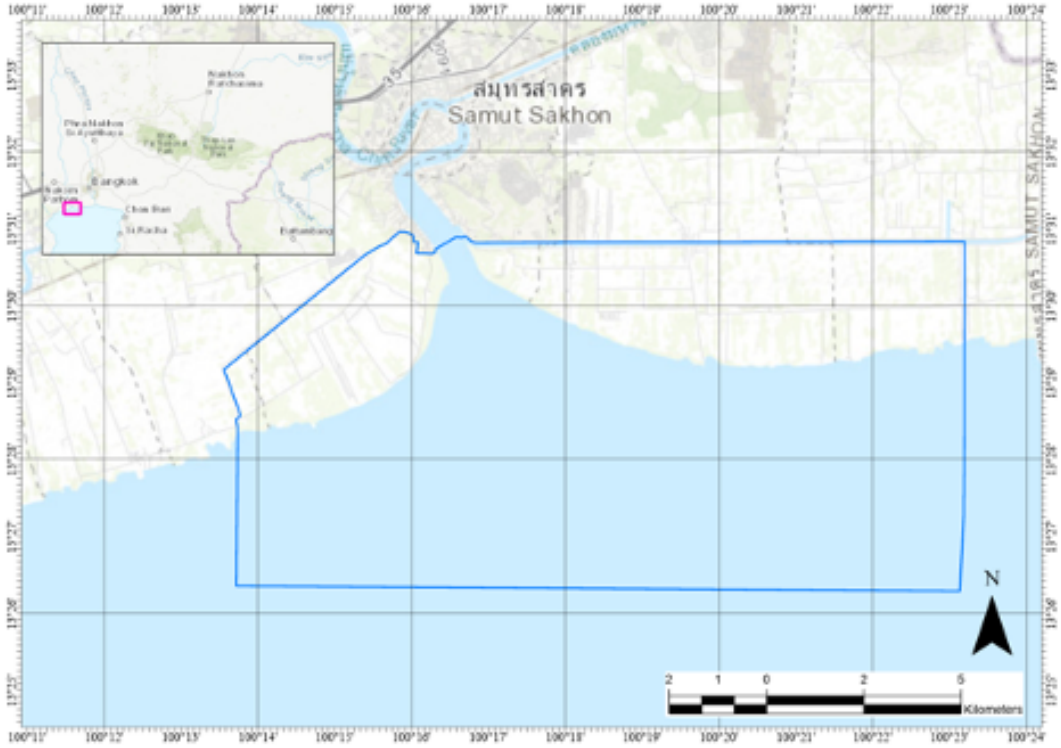

Figure 1. Map of Khok Kham salt pans, showing its boundary (in blue) and location within Thailand (in pink) (map: Evelyn Pina Covarrubias).

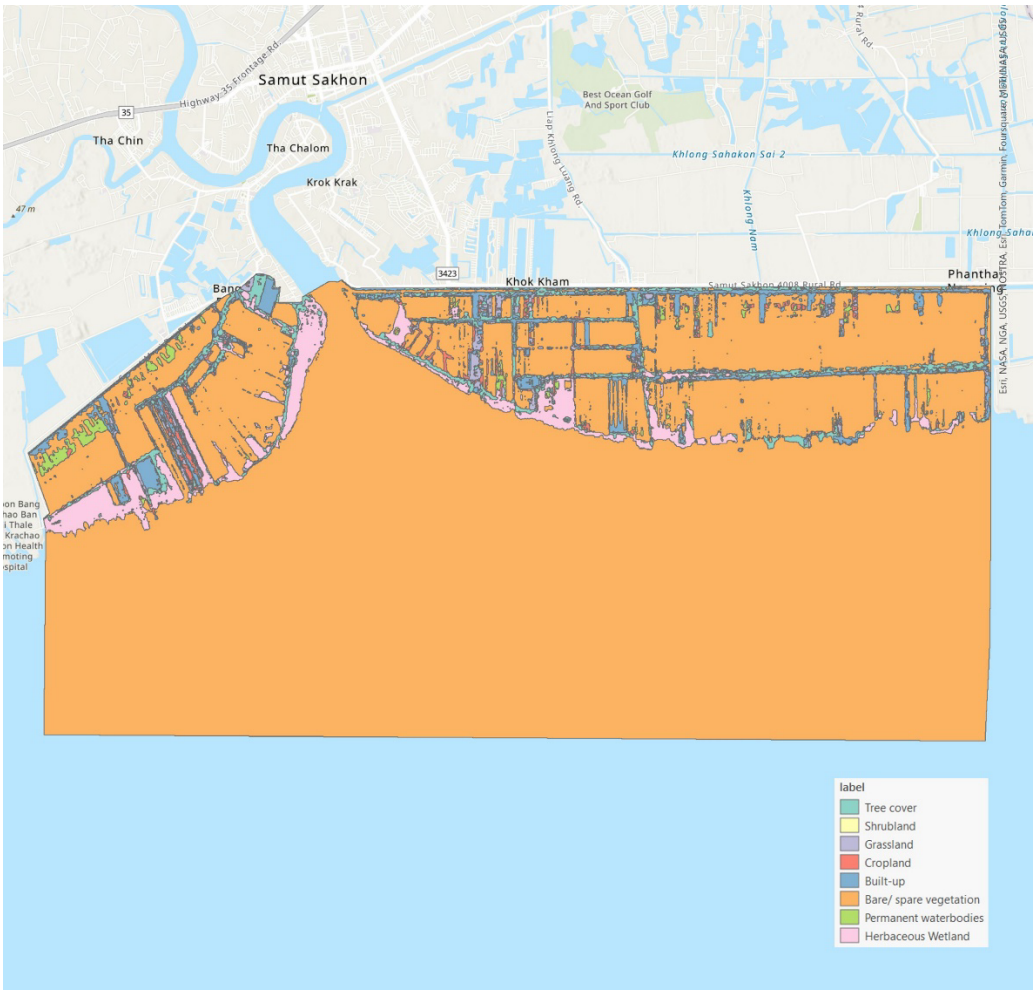

Figure 2. Land cover types in the Khok Kham coast (Map: Radhika Bhargava)

3. Biodiversity value of Khok Kham salt pans

3.1. Key habitats

Along the coastline there are mangrove forests, mudflats and sandy beaches, which are influenced by the tidal flow and seasonal monsoons, and the sediments and nutrients carried by the rivers from Thailand's Lower Central Plain into the Inner Gulf, causing changes to the sandy beaches and mudflats throughout the year. The mangrove forests in the estuary and along the coast collect sediments from the water, reducing the impact of monsoons and tidal waves and preventing coastal erosion, as well as being important habitat for waterbirds. At high tide, the extensive traditionally managed salt pans, and the aquaculture areas, provide feeding and roosting sites for resident and migratory waterbirds.

3.2. Importance of Khok Kham salt pans for migratory waterbird species

Large numbers of shorebirds, egrets and terns congregate on the salt pans and other wetland habitats in Khok Kham, and it is known to be the easier site to observe Spoon-billed Sandpiper, of which small numbers winter each season. Count data from the 2017 and 2018 Asian Waterbird Census (AWC), supplemented by data on Spotted Greenshank from Zöckler et al. (2018), was averaged in the RFI analysis for Khok Kham salt pans, and then compared to the Conservation Status Review (CSR1) 1% population estimates to calculate a score for each species. Spotted Greenshank was found to regularly exceed the 1% population estimate during these two years (Table 1). The Khok Kham salt pans were also found to support significant numbers of three near-threatened waterbird species, Black-tailed Godwit *Limosa limosa*, Red-necked Stint *Calidris ruficollis* and Curlew Sandpiper *Calidris ferruginea*.

Table 1. List of migratory species (based on the EAAFP list of species) with globally significant congregations in Khok Kham.

Scientific name	IUCN	Average count	CSR1	CSR1 score
Spotted Greenshank *Tringa guttifer*	EN	19	10	1.9

Other waterbird counts by BCST and other researchers have recorded internationally important numbers of several migratory waterbird species, including Black-tailed Godwit *Limosa limosa* (possibly over 4,000); Great Knot *Calidris tenuirostris* (VU) (maximum about 1,000); Spoon-billed Sandpiper *Calidris pygmaea* (maximum 7; typically 3-4 each winter); Asian Dowitcher *Limnodromus semipalmatus* (NT) (maximum 400) and Spotted Greenshank *Tringa guttifer* (EN) (maximum 70) (EAAFP Network Site Information Sheet).

Recent eBird checklists (post RFI analyses) show high counts of species such as the Tibetan Sandplover *Anarhynchus atrifrons*, c. 2,500-22,000, Asian Dowitcher *Limnodromus semipalmatus* (NT) c. 1,100, Red Knot *Calidris canutus* (NT), c. 2,400. Additional Threatened and Near Threatened species recorded in smaller numbers include, Grey Plover *Pluvialis squatarola* (VU), Eurasian Curlew *Numenius arquata* (NT), Bar-tailed Godwit *Limosa lapponica* (NT), Chinese Egret *Egretta eulophotes* (VU), Ruddy Turnstone *Arenaria interpres* (NT), and Broad-billed Sandpiper *Calidris falcinellus* (VU).

3.3. Other notable biodiversity

Several globally threatened mammal species are known to Khok Kham, including Long-tailed Macaque *Macaca fascicularis* (EN), an important population of the Smooth-coated Otter *Lutrogale perspicillata* (VU), Fishing Cat *Prionailurus viverrinus* (VU) and Lyle's Flying Fox *Pteropus lylei* (VU), while Irrawaddy Dolphin *Orcaella brevirostris* (EN) occurs in the coastal waters of the Gulf of Thailand.

4. Ecosystem services

4.1. Ecosystem services provided by Khok Kham salt pans

The Khok Kham salt pans overlap with diverse coastal habitats, offering valuable provisioning, regulating, and cultural ecosystem services (Figure 3). Provisioning services, particularly food provision, benefit communities within, adjacent to, and distant from the site (Table 2). This service has remained stable in the past but is projected to decrease in the future, indicating potential concerns for food availability. Regulating services such as air quality regulation and erosion regulation positively impact communities at all distances. Both services have experienced a decrease in the past and are expected to continue declining in the future, highlighting the need for conservation measures. Cultural services, including recreation ecotourism and knowledge systems and education, significantly benefit communities at all distances. Recreation ecotourism has seen an increase in the past and is projected to continue growing, reinforcing the site's importance for both local and broader tourism. Conversely, knowledge systems and education have decreased and are expected to decline further in the future, suggesting challenges in preserving cultural and educational values.

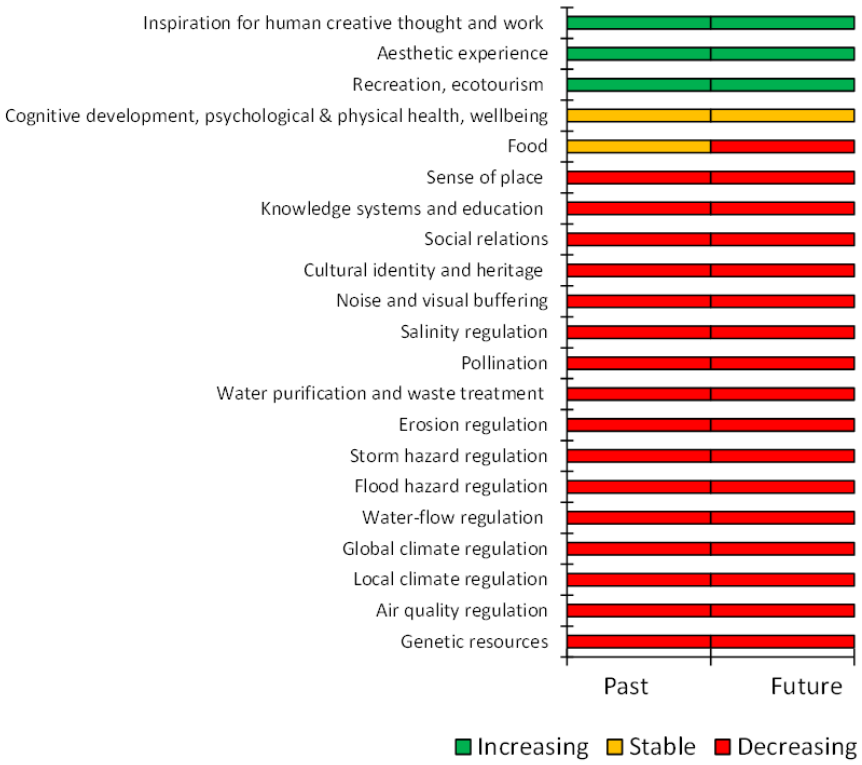

Figure 3. List of ecosystem services provided by Khok Kham salt pans, as identified through stakeholder consultation at the Regional Flyway Initiative workshop.

Table 2. List of top ecosystem services provided by Khok Kham salt pans.

Ecosystem services	Essential or non-substitutable	Benefits to communities			Change	
		Within the site	Adjacent to the site	Distant to the site	Past	Future
Provision services						
Food	Yes	✓	✓	✓	No change	Decrease
Regulating services						
Air quality regulation	Yes	✓	✓	✓	Decrease	Decrease
Erosion regulation	Yes	✓	✓	✓	Decrease	Decrease
Cultural services						
Recreation, ecotourism	Yes	✓	✓	✓	Increase	Increase
Knowledge systems and education	Yes	✓	✓	✓	Decrease	Decrease

4.2. Global climate regulating services

Based on systematic reviews (Chen and Lee, 2022; Stankovic et al., 2023), the amount of carbon stored in Khok Kham salt pans is estimated to range from 44,300 to 114,000 tonnes, while the annual carbon sequestration rate is estimated to be between 671 and 2,080 tonnes per year.

4.3. Coastal protection services

The coastal protection services provided by Khok Kham salt pans were assessed using both biophysical indices and monetary values (see Tables A1 and A2, and Annex 1 for details). When compared to both the average of the nine RFI coastal sites and the average of all other coastal areas in Thailand (Table A3 in Annex 1), Khok Kham salt pans show some fairly consistent results in terms of risk level:

(1) for the potential exposure to coastal hazards, Khok Kham salt pans are consistently above average (index: 3.02 vs. 2.75 for RFI coastal sites and 2.70 for all other coastal areas);

(2) for the contribution to reducing coastal risk as a proportion of population density with 2.5 km of the coast, Khok Kham salt pans are below average (0 vs. 63 people/ha for RFI coastal sites and 30 people/ha for all other coastal areas); and

(3) for the contribution to reducing coastal risk as a percentage of the maximum potential exposure, Khok Kham salt pans are below average compared to RFI coastal sites (5.18% vs. 5.44%) but above average compared to all other coastal areas (5.18% vs. 3.92%).

In monetary terms (Table A4 in Annex 1), Khok Kham salt pans rank well above the national RFI average (12,815 vs. 1,987 USD/ha) in terms of total annual benefits per ha of mangroves. Consequently, these benefits for the total area of Khok Kham salt pans are consistently above average (9.7 vs. 1.8 million USD for RFI coastal sites and 0.8 million USD for all other coastal areas in Thailand).

5. Drivers of change and their potential impacts on Khok Kham salt pans

5.1. Current drivers of change and their level of impact

Stakeholders at the RFI workshop[1] identified several drivers of change impacting Khok Kham. High-impact drivers include household sewage and urban wastewater from outside the wetland, which significantly degrades water quality (see Table 3). Housing and settlement developments pose substantial threats by altering the landscape and contributing to habitat fragmentation. Other high-impact factors include industrial mining and military effluents, invasive animal and plant species, sewage from wetland site facilities, and tourism and recreation infrastructure.

Medium-impact drivers of change consist of air-borne pollutants and commercial and industrial areas, which contribute to environmental pollution, given the proximity of Khok Kham to Bangkok. Additional medium-impact factors include dams that alter the hydrological regime, drought conditions, erosion and siltation, and fishing and harvesting of aquatic resources. Garbage and solid waste, habitat clearing, habitat shifting, and the loss of cultural links further modify the wetland. Restoration for conservation, storm and flooding events, and annual and perennial non-timber crop production also moderately impact the site's integrity.

Khok Kham, as with all low-lying coastal sites across the Inner Gulf of Thailand are at immediate risk from the effects of climate change and sea level rise. Chaiyarak et al. (2019) estimated that sea levels will increase by 0.2m by 2049, whereas Norris et al. (2024) indicate that sea-level at the site will increase by 0.3m up to 2050 and 0.7m by the late century under a high emissions pathway. In both cases there are scenarios for increased flooding and increased saline intrusion, which changes to the extent of mangroves and changes to the available area for sea-bird food foraging. These effects are expected to impact biodiversity and local livelihoods.

[1] Asian Development Bank. (2023, November 27-29). Thailand: Wetland Ecosystem Services Workshop [Workshop]. Thailand. https://events.development.asia/learning-events/thailand-wetland-ecosystem-services-workshop

Table 3. Drivers of change and their potential impact on the integrity of Khok Kham salt pans based on consultations with stakeholders.

Driver of change	Impact
Household sewage and urban wastewater from outside the wetland site	High
Housing and settlement	
Industrial, mining and military effluents	
Invasive animal species	
Invasive plant species	
Sewage and wastewater from wetland site facilities	
Tourism and recreation infrastructure	
Air-borne pollutants	Medium
Commercial and industrial areas	
Dams within or upstream of the wetland site, which alter the hydrological regime	
Drought conditions	
Droughts	
Erosion and siltation/deposition	
Fishing, killing and harvesting of aquatic resources	
Garbage and solid waste	
Habitat clearing	
Habitat shifting and alteration	
Loss of cultural links, traditional knowledge and/or management practices	
Restoration for conservation	
Storm and flooding	
Annual and perennial non-timber crop production	Low
Energy generation, including from hydropower dams, wind farms and solar panels	
Excess ponding of water onsite	
Loss of hydrological connectivity	
Loss of keystone species	
Marine and freshwater aquaculture	
Natural deterioration of important cultural wetland site values	
Other 'edge effects' that degrade the wetland site values	
Recreational activities and tourism	
Research, education and other work-related activities	
Roads and railroads	
Temperature extremes	
Water extraction/diversion within the wetland site or catchment	

5.2. Potential alternative state of Khok Kham salt pans under current drivers of change

Stakeholders at the RFI workshop[2] defined the most plausible future alternative state (to 2035), and how this will translate to a net change in the cover of different types of wetland habitat types within this site (current habitat cover vs future alternative cover; Figure 4). The alternative state of the site assumes there will be no changes in the current drivers of change impacting the site, and the current management regime.

[2] Asian Development Bank. (2023, November 27-29). Thailand: Wetland Ecosystem Services Workshop [Workshop]. Thailand. https://events.development.asia/learning-events/thailand-wetland-ecosystem-services-workshop

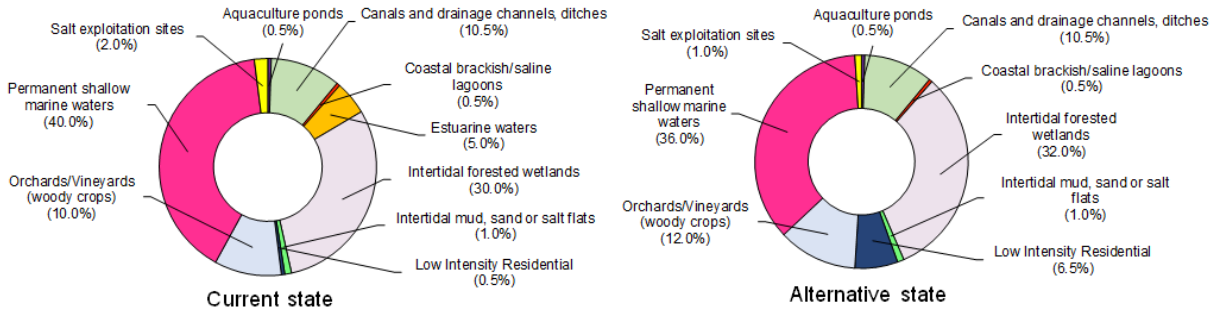

Figure 4. The proportional change in the extent of different habitat types between the current and alternative states of Khok Kham salt pans.

5.3. Expected changes in the ecosystem services of Khok Kham salt pans

Stakeholders at the RFI workshop[3] documented the future trends in the provision of ecosystem services in Khok Kham salt pans, indicating if the ecosystem services provided by this site (to 2035) will increase, decrease, or will remain stable if the current drivers of change impacting this site will continue in their present condition, with the intervention remains unchanged.

Figure 3 and Table 2 highlight that provisioning services, particularly food provision, are expected to increase in the long term. However, there is concern that regulating services, such as air quality and global climate regulation, as well as flood and storm hazard regulations may decrease in the long term, while cultural services, particularly recreation and tourism, remain stable.

The Khok Kham salt pans overlap with diverse coastal habitats, offering valuable provisioning, regulating, and cultural ecosystem services (Figure 3). The results from the RFI workshop[4] highlight the top ecosystem services provided by the site, emphasising their essential and non-substitutable nature (Table 2). Provisioning services, particularly food provision, benefit communities within, adjacent to, and distant from the site. This service has remained stable in the past but is projected to decrease in the future, indicating potential concerns for food availability. Regulating services such as air quality regulation and erosion regulation positively impact communities at all distances. Both services have experienced a decrease in the past and are expected to continue declining in the future, highlighting the need for conservation measures. Cultural services, including recreation ecotourism and knowledge systems and education, significantly benefit communities at all distances. Recreation ecotourism has seen an increase in the past and is projected to continue growing, reinforcing the site's importance for both local and broader tourism. Conversely, knowledge systems and education have decreased and are expected to decline further in the future, suggesting challenges in preserving cultural and educational values.

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[4] Asian Development Bank. (2023, November 27-29). Thailand: Wetland Ecosystem Services Workshop [Workshop]. Thailand. https://events.development.asia/learning-events/thailand-wetland-ecosystem-services-workshop

In the alternative state, the gain of 20% of mangrove and the loss of 9% of intertidal mudflat and salt pans will result in a gain of stored carbon, estimated at 1,930 tonnes, and an increase in carbon sequestration rate (carbon accumulation) by approximately 118 tonnes per year.

A gain of 274.4 ha of mangroves as presented in Table A5, however equivalent to only 2% of the total land use for the site, is expected to result in roughly a 36% increase in coastal protection. This may amount to approximately 3.5 million USD in gained total benefits per year (based on 12,815 USD per hectare of mangroves) and 6.4 million USD in lost total benefits per 100-year return period storm (based on the same 36% increase in coastal protection).

6. Capacity needs in Khok Kham salt pans

Stakeholder consultations and analyses with government and civil society identified six stakeholder groups with clear roles in the long-term sustainable management of the Khok Kham salt pans. Table 4 summarizes the current and potential roles of these stakeholder groups in managing the Khok Kham salt pans. There are opportunities for community participation, financing, establishing a product market, and conserving migratory waterbirds.

Table 4. Capacity needs for the management of Khok Kham, based on stakeholder consultations at the RFI workshop in Bangkok, 2023.

Stakeholder group	Current role in wetland management	Possible future role in wetland management	Current capacity for sustainable wetland management	Capacity development needed to improve wetland management	Form of capacity development (e.g. training, organisational strengthening etc.)
Government: Department of Marine and Coastal Resources (DMCR).	Biodiversity data collection to serve as a source of data to guide land management (e.g. appropriate planting of mangrove saplings)	Use data for broader land management planning work.	-	Organise activities that prioritise conservation and local community participation.	Build a common understanding with department personnel/relevant government parties and collocate activities to support as such.

Stakeholder group	Current role in wetland management	Possible future role in wetland management	Current capacity for sustainable wetland management	Capacity development needed to improve wetland management	Form of capacity development (e.g. training, organisational strengthening etc.)
Government: District/Provincial administrative office.	Arrange for activities that promote conservation. Find ways to add product value and ecological value.	Organize comprehensive activities/Promote bird watching/Salt farm collective wisdom.	Conservation/operation/budget plan available.	Collaborate with site stakeholders to develop, resolve issues and conserve the site	Upskill district/provincial administrative personnel in project development and reporting
Salt farmers and cooperatives.	Establish group initiatives in salt production and processing.	Seek collaborations with universities and the private sector for research and development efforts for salt production and processing, and ecotourism.	Support conservation efforts where possible.	Exposure to explore new product strengths, find new markets, and price negotiations with buyers.	Further improve branding and product development. Take advantage of available historical accounts. Secure funding from private sector.
Bird Conservation Society of Thailand (BCST).	Provide knowledge and promote conservation of migratory bird habitat; support for alternative livelihoods.	Supporting/fundraising to scale up habitat conservation for migratory birds.	Plans to increase the migratory bird habitats, guide the local community on the concept of ecotourism.	Resources and skillsets to increase the migratory bird habitats. /Expand network of stakeholders.	Strengthen human resources (support staff)
Universities.	-	Research and development of salt production and its uses, salt products.	-	More research initiatives and mobilisation of research resources	Support to establish a flagship academic service to support conservation/salt farms and ecotourism.
Private sector	-	Fund conservation initiatives/migratory birds habitat conservation.	-	CSR/Budget to supplement conservation initiatives.	A financial mechanism to help personnel better understand conservation.

7. Opportunities for RFI interventions

7.1. Recommended Interventions

Khok Kham is among the most important coastal wetlands for shorebird conservation in Thailand given its population of Spoon-billed Sandpiper, and has been the focus of extensive biodiversity monitoring, led by BCST, research institutions and other organisations over the past 10 years (Eiam-ampai et al. 2011; Sripanomyom et al. 2018). The site also offers good tourism potential because of its proximity to Bangkok and is frequently visited by birdwatching groups and tourists with an interest in wetland conservation. There are strong opportunities to develop tourism products around biodiversity and continue existing work to build local capacity and knowledge for the tourism industry. This may involve the expansion of infrastructure for ecotourism, including the construction of signages, birdwatching hides and wetland centre, which complement existing facilities. Community engagement, including the establishment of local conservation group to address coastal wetland conservation issues remains important, and unlike many wetland sites, there has been protracted efforts to establish conservation groups to drive shorebird conservation. The Khok Kham Birdwatching Club is one of the products of the community engagement work at the site since the 2010s. To this end there is a need to strengthen capacity for local communities to engage in nature-based tourism and biodiversity monitoring. This should also aim to promote sustainable management of salt production landscapes and production processes for salt, and the development of salt-based products.

Table 5. Summary of key RFI interventions proposed for Khok Kham salt pans

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
Component 1. Strengthening landscape management in the Khok Kham coast					
Conduct a scoping study of existing interventions implemented Khok Kham area. Identify, successes failures, gaps and lessons for RFI interventions.	Best practices, guidelines, and standards for proposed RFI interventions	Assessment report with key threats identified and recommendations for improved management, including targeted work on long-term threats (from climate change and changing hydrology) published and disseminated to key stakeholders. Number of consultations	50,000	1 year	ONEP DMCR BCST Samut Sakhon provincial government Consultancy companies

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		conducted for participatory processes in the scoping study Number of stakeholder groups engaged in the scoping study			
Strengthen and expand site management and zonation of the Khok Kham landscape	Improved site management for Khok Kham landscape through site management, increased patrol and enforcement, identification of sensitive shorebird areas, and co-management.	Site management plan and zonation plan over short to medium term agreed by key stakeholders and endorsed by the management authority (expected to be DWR) Number of consultations conducted to strengthen engagement of local stakeholders for participatory processes Number of implemented activities in the developed site management and zonation plans. Number of stakeholder groups engaged in the development of site management and zonation plans. Co-management framework developed and piloted.	100,000	2 years	DWR ONEP DNP EAAFP Samut Sakhon Provincial Government *Mueang* Samut Sakhon District Government Khok Kham *tambon* administration BCST and local conservation groups (Khok Kham Birding Club)

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		A co-management council, leading to community and stakeholder led site management plan (including zonation), developed with representatives from key stakeholders. Area demarcated as important and sensitive for waterbird conservation identified and integrated in the site management and zonation plans.			
Restore targeted mangrove strips and buffers (and back-mangrove), and degraded areas (including ex-aquaculture areas)	Improved site management through the identification and restoration of degraded wetland areas, including ex-aquaculture ponds and salt pans Degraded areas restored while ecological connectivity is strengthened.	At least 10 plots of disused aquaculture and salt pans identified for mangrove restoration. Number of stakeholders engaged in the mangrove restoration efforts.	200,000	5 years	DMCR ONEP Royal Forest Department
Strengthen coastal defences using nature-based solutions	Coastal defences to mitigate coastal erosion strengthened using environmentally friendly methods at the most vulnerable coastal sites.	Up to 10 km of coastal 'barriers' using natural material established (e.g. bamboo poles, rubble). Number of stakeholders engaged in implementing the	200,000	5 years	

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		nature-based solution.			
Establish a long-term biodiversity and threat monitoring framework	Improved waterbird conservation through increased capacity on biodiversity monitoring Strong local participation in site management through co-management frameworks and biodiversity monitoring (e.g. bird counts)	One biodiversity monitoring programme focused on shorebirds established, with regular field-based counts and assessments of threats Adaptative management framework for biodiversity monitoring established and implemented by the local community. Number of biodiversity monitoring activities conducted. A biodiversity monitoring group established. Number of stakeholder groups engaged in biodiversity monitoring.	30,000	5 years	ONEP Research institutions Mueang Samut Sakhon District Government Khok Kham *tambon* administration BCST and local conservation groups (including Khok Kham Bird Club)

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
Strengthen the local capacity for site management (co-management across stakeholders) and biodiversity monitoring		A capacity-building program on biodiversity monitoring and co-management developed and implemented. Number of training activities implemented for target participants Number of people trained on biodiversity monitoring.	50,000	5 years	
Component 2. Improvement of waste management infrastructure to address coastal pollution					
Assess the extent of water and solid waste pollution in the associated coastal waters of Khok Kham (e.g. point source discharges from aquaculture and factories)	Improved site management through good water quality.	Assessment study to determine the main causes of coastal pollution and methods to address wastewater management conducted. Strategy for pollution management developed, with a focus on aquaculture and industrial effluents, co-developed and disseminated to key stakeholders. Guidelines and recommendations for businesses especially aquaculture and light industries developed and promoted.	100,000	1 year	ONEP DWR DMCR *Mueang* Samut Sakhon District Government Khok Kham *tambon* administration Samut Sakhon provincial government Tourism businesses Aquaculture businesses

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		Number of consultations conducted to strengthen engagement of local stakeholders for participatory processes Number of stakeholder groups engaged in the assessments.			
Improve the management of wastewater (industrial effluents and pollutants from industries and aquaculture) from canals and drains draining into the site.	Improved wetland conservation through better wastewater and pollution management, including canals and storage ponds Possible contamination in water and harvest assessed, measured, and reduced.	Number of wastewater management infrastructure (including canals, wastewater disposal areas, and waste treatment facilities) improved. Regulations and guidelines on wastewater and pollution management improved and disseminated with key stakeholders. Baseline and targets metrics on key chemical and biological contamination in water and harvested shellfish developed. Set target reduction on key chemical and biological contamination in water and harvested shellfish achieved.	1,000,000	10 years	DWR DMCR Businesses, including light industries and aquaculture Local community groups

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		Number of consultations conducted with key stakeholders, ensuring a participatory process. Number of people engaged in wastewater and pollution management			
Address plastic pollution from light industries, aquaculture and salt farms	Improved wetland conservation through better solid waste management Possible contamination in water and harvest assessed, measured, and reduced.	Strategy for plastic pollution management developed, with a focus on light industries, aquaculture, and salt farms. Study on causes and impact of plastic pollution completed Guidelines and recommendations on plastic waste management for businesses especially farms and light industries developed and promoted. Number of waste management facilities to control plastic waste established and improved. Number of consultations conducted with key	500,000	10 years	

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		stakeholders on the assessment and strategy development for solid waste management Number of stakeholder groups engaged in solid waste management.			
Component 3. Upscaling of tourism infrastructure and other biodiversity-friendly livelihoods					
Strengthen the local capacity for nature-based tourism Exchange visits organised with Pak Thale.	Improved site management through nature-based tourism benefits, increased local capacity for alternative livelihoods and businesses, and expanded infrastructure for tourism	Training programme on alternative livelihood and nature-based tourism established for nature guides, with regular training activities. Up to 100 new local nature guides trained. Number of training activities implemented.	100,000	5 years	Department of Tourism ONEP BCST Khok Kham *tambon* administration Local conservation groups (e.g. Khok Kham Bird Club)
Build local capacity (for local operators) to support tourism		Training programme established for supporting businesses (cafes, shops) Number of local tourism operators trained and supported.	100,000	5 years	
Expand infrastructure for tourism, including signages, trails and wetland		Number of tourism infrastructure (i.e., signage, 3 new bird observation hides, shelters, visitor center on wetland	150,000	2 years	

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
interpretation facilities, shelters and bird hides		conservation) constructed. Number of people benefitting from ecotourism.			
Component 4. Maintain and sustain the current land use for salt farming and other sustainable livelihoods					
Undertake feasibility studies to explore frameworks for nature-credits for biodiversity-friendly salt farming process.	Long-term investment in livelihoods and biodiversity, generated by nature credits-based investments better understood.	Feasibility studies on nature credits completed, with outcomes promoted to potential investing institutions, and disseminated with key stakeholders Number of consultations conducted for feasibility studies, ensuring a participatory process Number of stakeholder groups engaged in the feasibility studies.	50,000	1 year	ONEP
Strengthen and develop salt-farming cooperatives, while creating the enabling conditions for local communities for salt farming	Economic conditions for salt production businesses improved, in consulted with stakeholders. Reduction in the use of plastic, to reduce plastic waste pollution in salt farming landscapes.	At least one (new) salt farming cooperative established and supported A capacity program for salt-farming cooperatives. Number of business and marketing plans developed to promote salt-based products, including obtaining certification	100,000	5 years	ONEP DMCR Mueang Samut Sakhon District Government Khok Kham *tambon* administration BCST

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		Number of salt-farming cooperatives trained			
Improve and renovate of water management infrastructure such as canals and sluice gates	Better site management through improved water management in salt farms.	Number of water management infrastructure (i.e., canals and sluice gates between salt pans and the sea, canals for water transfer) constructed. Number of people engaged in water management.	1,000,000	3 years	DMCR DWR
Build the capacity and develop (artisanal) businesses for salt-based products (such as wildlife-friendly salt); loans and grants to incentivise biodiversity-friendly salt production Exchange visits with Pak Thale.	Livelihoods of local communities, including cooperatives strengthened through new opportunities from salt products.	Grant/loan scheme targeting local salt-farming communities established. At least 10 new salt-based products developed by the local communities. Number of people benefitting from the microfinancing scheme.	100,000	3 years	Khok Kham *tambon* administration BCST Salt farming cooperatives
Total investment for 10 years			**USD 22,900,000**		

7.2. Potential Financing

The estimated project cost is USD 22,900,000 for 10 years. This budget supports the development of site management and zoning plans, wastewater and pollution management, water and solid waste management, support for salt farmers, upscale tourism, establishment of a microfinancing mechanism, and capacity-building for local stakeholders in biodiversity monitoring, nature-based tourism

development, and financial management. Table 5 summarizes the projected budget distribution across the proposed project components.

If the proposed USD 200,000 investment over five years is allocated to restoring degraded wetland areas, including disused aquaculture ponds and salt pans in Khok Kham, it could enable the rehabilitation of at least 10 priority plots with mangrove buffers and back-mangrove restoration. With estimated coastal protection benefits of USD 12,815 per hectare annually (see Section 5.3), this intervention could yield substantial annual benefits depending on the restored area – potentially exceeding USD 128,150 annually if 10 hectares are restored, amounting to over USD 640,000 over five years. This suggests a benefit–cost ratio of over 3:1 for the restoration component alone, underscoring its cost-effectiveness. When combined with a complementary investment in strengthening coastal defences using nature-based solutions – such as installing up to 10 km of environmentally friendly barriers – this integrated approach would reduce vulnerability to coastal erosion while enhancing ecological connectivity and wetland resilience. Forgoing these interventions would mean continued habitat degradation, weakened natural protection, and missed opportunities to secure long-term benefits for local communities and ecosystems.

7.3. Proposed Institutional Arrangements

Prior to implementation interventions would be discussed with stakeholders from across the landscape. Scoping opinions would be sought from the national/local regulators to determine what documentation/permissions are needed for the planned interventions. Within the project assessment of climate change impacts will mitigate against lost investment e.g. by planning mangrove planting in suitable areas it can avoid loss by flooding / inundation

7.4. Project Beneficiaries

There are no indigenous peoples present in the landscape. However, there is considerable scope in the involvement of women in project development. Conservation groups established for ongoing projects in Pak Thale, led by the Bird Conservation Society of Thailand already demonstrate strong representation of women from the local communities. These groups may be expected to play a role in the implementation of the proposed project activities.

7.5. Anticipated Implementation Risks

Stakeholder engagement: Proposed interventions rely on support from local communities, particularly for supporting salt-farming, ecotourism, and co-management. Establishing strong stakeholder buy-in from local leaders and community engagement will facilitate better implementation of the proposed interventions.

Environment: Most proposed interventions are relatively soft and have a low environmental impact, but it may be necessary to consider the effects of expanding tourism in Khok Kham salt pans, which could increase anthropogenic pressures and lead to greater disturbance of wildlife. Planning with stakeholders to reduce noise pollution during the construction of ecotourism facilities and during ongoing ecotourism activities, as well as managing waste pollution associated with increased tourist traffic, is essential.

References

Asian Waterbird Census (AWC): Thailand data for 2017-2018. See https://eaaflyway.net/asian-waterbird-census

Bangkok Post (2024): Salt, sea and spoonbills. Available at: https://www.bangkokpost.com/life/travel/2754581/salt-sea-and-spoonbills

Birdfinding.info: Khok Kham, Samut Sakhon, Thailand. Available at: https://birdfinding.info/thailand-khok-kham/

BirdLife International Important Bird Area factsheet: Inner Gulf of Thailand (Thailand). Available at: https://datazone.birdlife.org/site/factsheet/inner-gulf-of-thailand-iba-thailand

EAAFP Flyway Network Site Information Sheet: Khok Kham. Available at: https://eaaflyway.net/thailand/

Eiam-ampai, K., Nimnuan, S., Sonsa, T., Sutibut, S., & Round, P. D. (2011). The first record of over-summering Spoon-billed Sandpiper *Eurynorhynchus pygmeus* in Thailand. *Stilt*, 60, 56-57.

IUCN Red List of Threatened Species. Available at: www.iucnredlist.org

Mundkur, T. & Langendoen, T. (2022) *Report on the Conservation Status of Migratory Waterbirds of the East Asian – Australasian Flyway Partnership*. First Edition. Draft Report to the East Asian – Australasian Flyway Partnership. Wetlands International, Ede, The Netherlands. Available at: https://www.wetlands.org/publication/eaaf-conservation-status-review1/

Pimathi, R., Jukmongkol, R., Round, P. D. and Tordoff, A. W. (eds) (2004) *Directory of Important Bird Areas in the Kingdom of Thailand: key sites for conservation*. Bangkok, Thailand: Bird Conservation Society of Thailand and BirdLife International.

Sripanomyom, S., Round, P. D., Savini, T., Trisurat, Y., & Gale, G. A. (2011). Traditional saltpans hold major concentrations of overwintering shorebirds in Southeast Asia. *Biological Conservation*, *144*(1), 526-537.

Thaibirding.com: Khok Kham. Available at: https://www.thaibirding.com/locations/central/kkham.htm

Zöckler, C., Li, D., Chowdhury, S. U., Iqbal, M., & Yu, C. (2018) Winter distribution, habitat and feeding behaviour of Nordmann's Greenshank Tringa guttifer. Wader Study 125(1): 7-14. Available at: https://www.waderstudygroup.org/article/10820/ DOI 10.18194/ws.00106

Annex 1. Supplementary information on coastal protection services

To further validate the identification of the top ecosystem services by means of stakeholder consultation, an expectedly essential or non-substitutable regulating service across all RFI sites, namely coastal protection and flood mitigation (i.e., storm and flood hazard regulation), was assessed based on a combination of globally available datasets supplemented by web-based tool Co$tingNature (Mulligan, 2022). Estimates for coastal protection by mangroves (after the effects of coral reefs) were spatially inferred in QGIS from a selection of metrics expressing different biophysical and monetary values modelled by Chaplin-Kramer et al. (2023) and Menéndez et al. (2020), respectively.

The key metrics selected for biophysical values (Table A1) were current maximum potential exposure to coastal hazards, which is a vulnerability risk index calculated in InVEST[1] for several hazard variables (i.e., wind, waves, sea level rise, geomorphology, and bathymetry) in the hypothetical absence of current mangrove extent, and nature's (i.e., the mangroves') contribution to reducing this coastal risk, both as an absolute value multiplied by the local population affected and a percentage of the maximum potential exposure.

Table A1. Contribution of mangroves to coastal protection as a critical natural asset in Khok Kham salt pans based on site-level (biophysical) values inferred from Chaplin-Kramer et al. (2023) and expressed as ranges to represent the resulting uncertainty. Key metrics are in italics.

Critical contribution of mangroves to coastal protection (metrics)	**Risk levels**
Current population density within 2.5 km of the coast (number of people per hectare)	960 – 1,266
Current maximum coastal risk to be mitigated, or potential exposure to coastal hazards (unitless index)	*2.93 - 3.11*
Maximum coastal risk to be mitigated, or potential exposure to coastal hazards in 2050 according to IPCC's Shared Socioeconomic Pathway #1 'Sustainability' (unitless index)	2.93 - 3.11
Maximum coastal risk to be mitigated, or potential exposure to coastal hazards in 2050 according to IPCC's Shared Socioeconomic Pathway #3 'Regional Rivalry' (unitless index)	3.14 - 3.33
Maximum coastal risk to be mitigated, or potential exposure to coastal hazards in 2050 according to IPCC's Shared Socioeconomic Pathway #5 'Fossil-fueled Development' (unitless index)	3.41- 3.63
Current proportional risk reduction, nature's contribution to reducing coastal risk as a proportion of maximum coastal risk (unitless index)	0.16- 0.16
Nature's contribution to reducing coastal risk as a proportion of population density within 2.5 km of the coast (# of people per hectare)	*0*
Nature's contribution to reducing coastal risk as a percentage of the maximum potential exposure (%)	*5.02 - 5.34*

The key metrics selected for economic values (Table A2) were the annual expected flood protection benefits to total stock, which is the monetary value of the averted damages to the industrial and residential stocks (i.e., property) in 2015 US$, the same total annual benefits expressed per hectare of mangroves, and the total benefits in the event of a 100-year return period storm, which are the rarest of cyclonic conditions but cause the most flood damages to property (i.e., maximum level of coastal protection by mangroves).

Table A2. Coastal protection benefits offered by mangroves in Khok Kham salt pans based on site-level (monetary) values inferred from Menéndez et al. (2020) and expressed as ranges to represent the resulting uncertainty. Key metrics are in italics.

Benefits of mangroves in terms of coastal protection (metrics)	**Avoided costs (US$)**
Mangrove extent (hectares)[2]	682 – 1,217
Annual expected flood protection benefits to people (number of people)	3,170 – 11,283
Annual expected flood protection benefits to Industrial Stock (US$)	2,725,169 – 9,697,965
Annual expected flood protection benefits to Residential Stock (US$)	1,859,270 – 6,616,518
Annual expected flood protection benefits to Total Stock (US$)	*4,255,607 – 15,144,280*
Annual expected flood protection benefits to Industrial Stock per hectare of mangroves (US$ per hectare)	*5,622 – 20,007*
1-in-100-year return period damage in terms of area flooded (number of hectares)	346 – 3,461
Total expected flood protection benefits of mangroves per 100-year return period storms (US$)	*3,192,999 – 31,931,945*

Table A3. Biophysical benefits from RFI coastal wetland sites (expressed as ranges to represent the resulting uncertainty) and at the national level.

Site name	**Max pot exp (index)**	**Risk reduction (index * pop)**	**Risk reduction (% max pot exp)**
Bang Pu	No Data	No Data	No Data
Khlong Tamru (Bang Pakong)	3.22 (±0.17)	147 (±39)	4.87 (±0.25)
Khlong Yai	2.15 (±0.07)	59 (±16)	7.27 (±1.91)
Koh Kham	3.02 (±0.09)	0 (±0)	5.18 (±0.16)
Ta Libong	2.63 (±0.07)	21 (±1)	6.21 (±0.34)
Krabi Estuary	2.69 (±0.07)	17 (±1)	5.68 (±0.28)
Pak Nam Prasae	2.63 (±0.20)	53 (±1)	5.94 (±0.44)
Pak Thale	3.23 (±0.08)	28 (±8)	3.36 (±0.85)
Ao Phang Nga	2.45 (±0.10)	12 (±1)	6.02 (±0.35)
Thailand RFI average	2.75	63	5.44
Thailand national average	2,70	30	3.92

Table A4. Monetary benefits from RFI coastal wetland sites (expressed as ranges to represent the resulting uncertainty) and at the national level.

Site name	**Total annual benefits (US$)**	**Per mangrove area (US$/ha)**	**For 100-yr return period storms (US$)**
Bang Pu	723,608 (±1,023,384)	985 (±1,393)	1,252,086 (±1,252,144)
Khlong Tamru (Bang Pakong)	4,064,792 (±101.810)	1,698 (±43)	1,028,638 (±46,938)
Khlong Yai	299,013 (±35,045)	37 (±4)	0 (±0)
Koh Kham	9,699,944 (±5,444,336)	12,815 (±7,193)	17,562,472 (±14,369473)

Site name	Total annual benefits (US$)	Per mangrove area (US$/ha)	For 100-yr return period storms (US$)
Ta Libong	0 (±0)	0 (±0)	3,564,916 (±55,274)
Krabi Estuary	0 (±0)	0 (±0)	4,150,201 (±45,319)
Pak Nam Prasae	557,410 (±3,584,456)	300 (±1,929)	1,464,757 (±2,408,230)
Pak Thale	806,609 (±1,685,154)	1,967 (±4,109)	962,707 (±1,130,299)
Ao Phang Nga	81,744 (±96,861)	86 (±102)	5,723,399 (±12,351,015)
Thailand RFI average	1,803,680	1,987	3,967,686
Thailand RFI total	16,233,119	Not Applicable	18,146,703
Thailand national average	789,242	2,702	9,197,142
Thailand national total	85,257,773	Not Applicable	377,082,842

Table A5. Key habitat types in Khok Kham salt pans based on stakeholder-based assessment at the Regional Flyway Initiative workshop in November 2023.

Habitat type	Current state		Alternative state (2035)	
	Area (ha)	Cover (%)	Area (ha)	Cover (%)
Aquaculture ponds	68.6	0.5	68.6	0.5
Canals and drainage channels, ditches	1441.1	10.5	1441.1	10.5
Coastal brackish/saline lagoons	68.6	0.5	68.6	0.5
Estuarine waters	686.2	5.0	0.0	0
Intertidal forested wetlands	4117.4	30.0	4391.8	32
Intertidal mud, sand or salt flats	137.2	1.0	137.2	1
Low Intensity Residential	68.6	0.5	892.1	6.5
Orchards/Vineyards (woody crops)	1372.5	10.0	1646.9	12
Permanent shallow marine waters	5489.8	40.0	4940.8	36
Salt exploitation sites	274.5	2.0	137.2	1
Total	13724.5	100.0	13724.5	100.0