Regional Flyway Initiative · Site Study

January 2026

RFI Priority Site · Anlung Pring (Sarus Crane Reserve)

Asian Development Bank

General Site Information

Country	Cambodia			
RFI Site Name	Anlung Pring Sarus Crane Conservation Area (SCCA)			ID012
City/ Municipality, Province, Region	Boeung Sala Khang Tboung and Prek Kroes communes, Kampong Trach district, Kampot Province			
Geographical coordinates	10.48 º N, 104.53 º E		Area (has)	220 has
Key species	Sarus Crane, Black-tailed Godwit.			
Key habitats (biomes)	Brackish coastal marshes			
Key ecosystem services	Provisioning services (fish, fresh water and other wetland products) and cultural services			
Key drivers of change	Livestock grazing, tourism and sea-level rise (in the long term)			
Conservation status (mark all that applies)	☒	Protected Area	☒	Flyway Network Site
	☐	Ramsar Site	☐	Others _____
IBA/ KBA name (and number) and other designations	Anlung Pring			
Management Stakeholders	Ministry of Environment, Kampot Provincial Department of Environment, Boeung Sala Khang Tboung Commune			
With management plan?	Yes			
Project concept themes	Nature-based tourism and expansion of biodiversity-friendly rice agriculture			
Length of project	Up to 8 years			
Sector/s	Agriculture and water management			
No. of potential beneficiaries	About 18,000 people in Boeung Sala Khang Tboung and Prek Kroes communes			
Indigenous Peoples	☒	No	☐	Yes _____
Anticipated Implementation Risks	Increased pollution and disturbance to wildlife from tourism and agricultural expansion			
Estimated Project Budget (US$)	7,930,000			
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
APPL	Anlung Pring Protected Landscape
AWC	Asian Waterbird Census
CPA	Community protected areas
CSR	Conservation Status Review
DoFWC	Department of Freshwater Wetlands Conservation
DoF	Department of Fisheries
DMC	Developing Member Country
EAAFP	East Asian-Australasian Flyway Partnership
FiA	Fisheries Administration
IBA	Important Bird and Biodiversity Area
IUCN	International Union for the Conservation of Nature
LCG	Local conservation group
MAFF	Ministry of Agriculture, Forestry and Fisheries
MOE	Ministry of Environment
NLC	NatureLife Cambodia
NGO	Non-governmental Organisation
PDoE	Provincial Department of Environment
RFI	Regional Flyway Initiative
SCWG	Sarus Crane Working Group
TESSA	Toolkit for Ecosystem Services Assessment
USD	United States Dollars
WCS	Wildlife Conservation Society
WWT	Wetlands and Wildfowl Trust

Executive summary

Anlung Pring is a brackish wetland located at the edge of the Ha Tien plain, drained by a series of creeks near the Cambodia frontier with Vietnam in Kampot province. The site is dominated by freshwater and brackish marshland, open water, and patches of remnant Melaleuca swamp forest drained by several streams and small rivers, similar to that on the Ha Tien plain in Vietnam. The site is managed by the Ministry of Environment (MOE) as a protected landscape and covers a relatively compact area of about 220 ha; the site became recently recognised as a EAAFP Flyway Network Site, the first for Cambodia, for harbouring the second largest concentration of the Sarus Cranes in Cambodia and more than 20 waterbird species. The wider landscape around the site is dominated by rice fields, which provide foraging habitats for the cranes. Recent surveys are also beginning to show the importance of the site for vast congregations of Black-tailed Godwit (more than 7,000 in some counts), and possibly the largest concentration of the species in Southeast Asia, together with staging flocks of Garganey during autumn migration.

Despite its size, Anlung Pring offers critical regulating and cultural ecosystem services, which are all projected to increase in importance in the future with the expansion of tourism activities. Regulating services, particularly flood hazard regulation, also benefit communities within the site, but may decline over time. Livestock grazing is identified as a major driver of change for the site and may lead to the degradation of wetland and shrubland habitats used by migratory birds. Saltwater intrusion due to rising sea-levels (Anlung Pring is less than 5 km from the coast) has damaged some paddy fields through salinization. Since the 2010s, there has been targeted work to expand nature-based tourism and biodiversity-friendly rice cultivation in Anlung Pring. By 2024, the 'Crane Rice' scheme has expanded to cover over 150 ha of the landscape around Anlung Pring, an extending a 'biodiversity-safe' landscape to well beyond the boundaries of APPL, while improving some of the water management infrastructure.

To improve conservation and management at the site, there is a need for: (1) strengthening management and legal protection of Anlung Pring and the landscape mosaic surrounding the wetlands, and (2) continued monitoring of Sarus Cranes, shorebirds and wetland biodiversity. Further growth is anticipated in the tourism sector at the APPL, with rising demand and needs for tourist infrastructure. To address this, there is scope to (1) improve ecotourism infrastructure such as signages, shelters and viewing structures; and (2) strengthen the capacity of local communities and tourism businesses for nature-based tourism. Biodiversity rice-farming has been piloted at Anlung Pring, and has steadily expanded since 2020, bringing over 100 households from four villages into the scheme. There is potential to work with the local government and local communities to, (1) scale up organic and biodiversity-friendly rice-farming in Kampong Trach and, (2) improve management of agro-chemical waste, to address pollution.

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 stored carbon.

In Cambodia, a total of 15 wetland sites, including several Asian Waterbird Census (AWC) count sites, were initially assessed through data analysis and expert consultation, of which 12 were short-listed for assessment based on the available (recent) data. Of this pool of sites, nine (9) 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. Eight (8) of the RFI sites identified are inland wetlands, most notably a cluster of sites around the Tonle Sap Great Lake, such as Prek Toal, Ang Tropeang Thmar and Boeng Tonle Chhmar. A single coastal site was identified, i.e. Koh Kapik Ramsar Site where there have been extensive surveys of its biodiversity to date, including surveys led by NatureLife Cambodia. 11 EAAF species exceeded the 1% threshold at the site level in Cambodia, with species such as the Masked Finfoot, Greater

Adjutant and Sarus Crane (ssp. *sharpii*) at their highest congregations in Southeast Asia. Other species with important populations and/or congregations in Cambodia includes Spotted Greenshank, Black-headed Ibis and Painted Stork.

2. Site profile of Anlung Pring (Sarus Crane Reserve)

Location: Anlung Pring is located in the seasonal floodplains of the Lower Mekong Delta, at the northern edge of the Ha Tien plain, a once extensive area of seasonally inundated grassland and Melaleuca (swamp) forest and scrub, which extends into Kien Giang Province, Vietnam. The site lies within Boeung Sala Khang Tboung and Prek Kroes Commune in Kampong Trach District. AP is bisected by a road embankment from east to west and lies adjacent to the communes of Boeng Sala Khang Tboung which comprises 3 villages (c. 8,000 people), and Preak Kroes, (4 villages, c. 10,000 people). The hydrology of APPL is seasonal and is strongly influenced by the monsoons. The site is in a floodplain located along the shallow Toanhan river, which flows in a meandering north-south direction towards the sea, and to which the Anlung Pring stream is linked during the wet season. The last stretch of this river, approximately 25 km long, lies in Vietnam.

Area: The Anlung Pring RFI site has an area of 220 ha

Altitude: The altitude of this site ranges from 1-5 m asl, with an average of 3 m asl.

Geographical coordinates: 10.48 º N, 104.53 º E

Description of site: Anlung Pring includes an important area of wet grasslands with a high density of *Eleocharis* and *Melaleuca* shrubs, a landscape that was once characteristic of the floodplains of the Lower Mekong Delta. The wetlands there are influenced by the saline tidal stream of the Giang Thanh River, which is connected to the sea (the Gulf of Thailand) at Ha Tien city in Viet Nam. During the dry season, the water in the wetland becomes more brackish and saline, and during the wet season the wetland is again converted back to a freshwater ecosystem. As a result of these changes in salinity, Anlung Pring has a high level of aquatic productivity that supports a wide array of migratory birds. The wetland is bisected by a road into northern and southern parts; the northern part contains predominantly freshwater wetlands while the southern part is brackish because of a regular tidal inflow.

Site administration, management and land tenure: Anlung Pring Protected Landscape was established and managed by the Forestry Administration of the Ministry of Agriculture, Forestry and Fishery, in collaboration with the Wildfowl & Wetland Trust (WWT) and BirdLife International Cambodia Programme between 2004- 2016. The management of the site was then transferred to the Ministry of Environment, WWT, and BirdLife in early 2016. The Government of Cambodia, Kampot Province has territorial jurisdiction over the site, and the Ministry of Environment, Department of Environment of Kampot has sectoral jurisdiction. Anlung Pring Protected Landscape is owned by the Royal Government of Cambodia, and the surrounding areas are owned by the local communities or the private sector. The management

authority is the Director, Department of Freshwater Wetland Conservation of General Directorate of Administration for Nature and Conservation, Ministry of Environment, and the Director, Department of Environment, Kampot Province. A five-years management plan (2014 to 2018) for Anlung Pring Protected Landscape was developed under the authority of the Forestry Administration of the Ministry of Agriculture, Forestry and Fisheries. However, as the Ministry of Environment became the management authority in 2016, the management plan needs to be updated.

AP is a source of fresh water, help recharge groundwater and control floods during the wet season. The wetlands also provide subsistence collection of direct goods to local people, including charcoal and firewood, shrimps, fish and grass for construction and thatching. An ecosystem assessment conducted by BirdLife and Wildfowl and Wetlands Trust (WWT) in 2012 estimated that the total net annual value (NAV) of the wider AP area for cultivated and wild goods was US$1,148,662. Of this, 87% ($1,004,474) was based on wild goods. 24.5% of this is derived from firewood, 12.5% water released for rice crops, and 11% grass collection. Fisheries contributed to 60% of all wild goods NAV at $597,405. Fish comprises over three quarters of animal protein consumed by Cambodians and the local diet is often supplemented with frogs and molluscs. In the surrounding area, there are shrimp farms, paddy fields and several local settlements. Recently, a community-based ecotourism centre was constructed in the northern part of the wetlands to provide birdwatching and rural tourism experiences to visitors, and to conduct CEPA activities targeting local communities around the wetlands. The Sarus Cranes hold significant cultural value to the people of Cambodia, and at Anlung Pring local communities once believed that when a pair of Sarus Cranes flew over a house, this signified that young lovers from that house were on the verge of eloping.

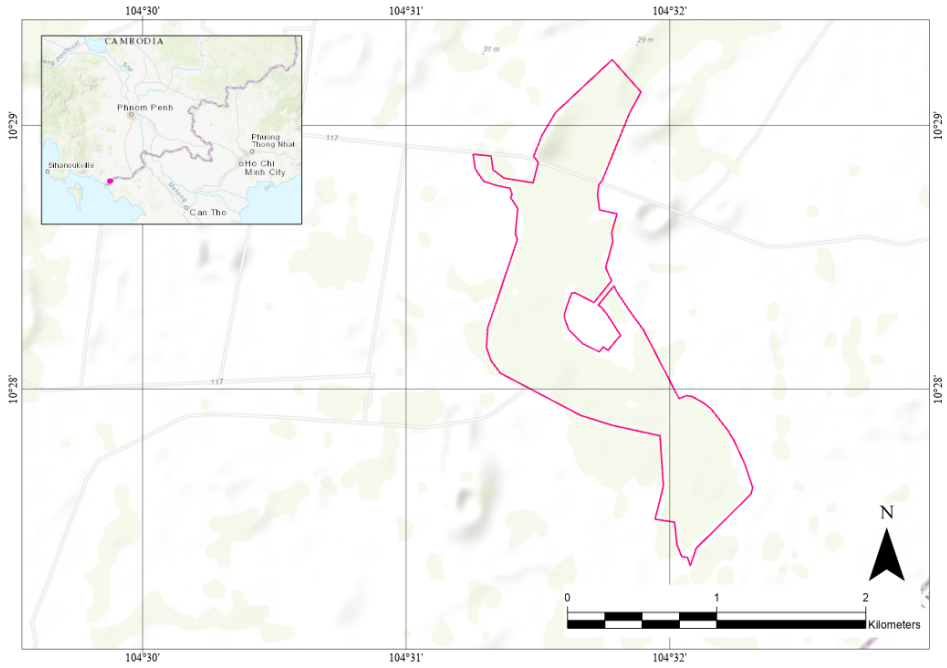

Figure 1. Map of the Anlung Pring protected landscape (Map: Evelyn Pina Covarrubias)

3. Biodiversity value of Anlung Pring (Sarus Crane Reserve)

3.1. Key habitats

Anlung Pring includes an important area of wet grasslands with a high density of *Eleocharis* and *Melaleuca* shrubs, a landscape that was once characteristic of the floodplains of the Lower Mekong Delta. The wetlands there are influenced by the saline tidal stream of the Giang Thanh River, which is connected to the sea (the Gulf of Thailand) at Ha Tien city in Viet Nam. During the dry season, the water in the wetland becomes more brackish and saline, and during the wet season the wetland is again converted back to a freshwater ecosystem.

3.2. Importance of Anlung Pring for migratory waterbird species

The seasonally inundated grasslands in Anlung Pring Protected Landscape protect one of the largest non-breeding populations of Sarus Crane in Cambodia during the dry season, although their numbers have declined there in recent years. The Black-tailed Godwit (ssp. *bohaii*) occurs in very large congregations at the site, with recent counts finding several thousands of individuals using the site as a high tide roost although it is unclear where these individuals feed. Anlung Pring also support small numbers of the Eurasian Curlew (NT) and at least 10 other shorebird species.

Count data from the 2017, 2019 and 2022 Asian Waterbird Census (AWC) was used in the RFI analysis for Anlung Pring. The results of these counts were averaged for these three years and then compared to the Conservation Status Review (CSR1) 1% population estimates to calculate a score for each species. The two migratory waterbird species were found to regularly exceed the 1% population estimates during these three years (see Table 1), and the CSR1 scores for these species were summed to produce the overall site score.

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

Species name	IUCN	Average count	CSR1	CSR1 score
Sarus Crane *Antigone antigone sharpii*	VU	39.3	2	19.7
Black-tailed Godwit *Limosa limosa bohaii*	NT	2,575	1,600	1.6

3.3. Other notable biodiversity

Two aquatic plants, *Eleocharis spiralios* and *E. dulcis* are an important food source for Sarus Crane at Anlung Pring, and stands of *Melaleuca* shrubs are important roosting sites for the cranes.

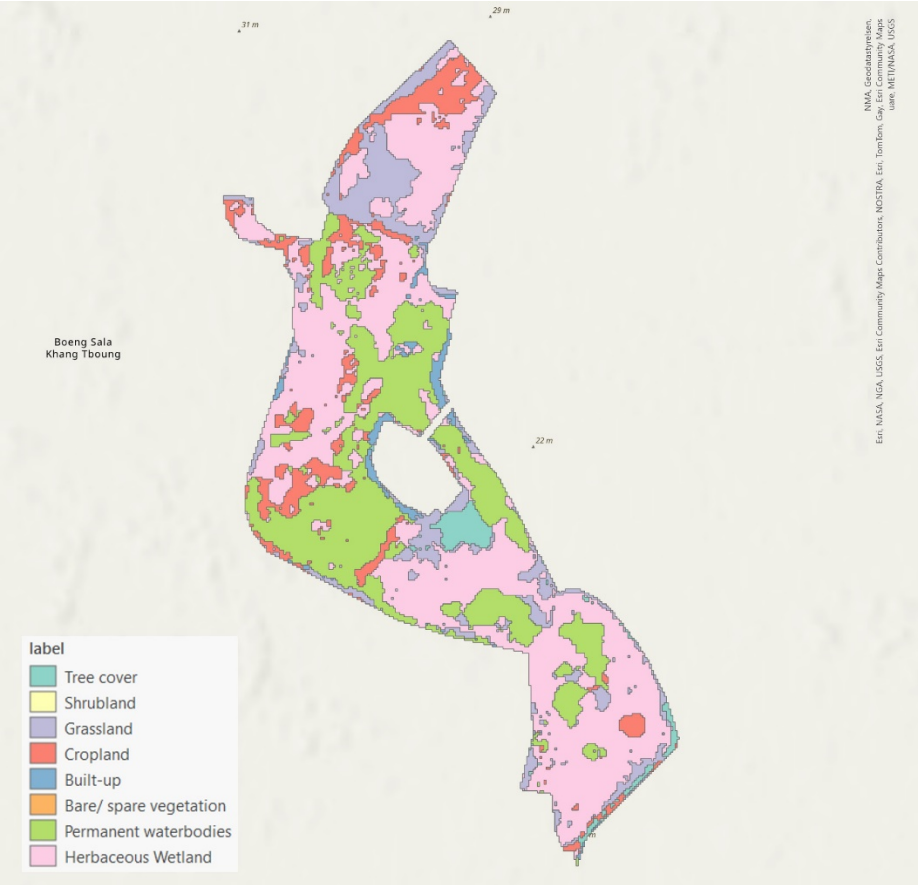

Figure 2. Major land cover types in Anlung Pring wetlands based on remotely sensed data (Map: Radhika Bhargava)

4. Ecosystem services

4.1. Ecosystem services provided by Anlung Pring (Sarus Crane Reserve)

Anlung Pring encompasses diverse wetland habitats, providing crucial regulating and cultural ecosystem services (Figure 3). The results from the RFI workshop[1] highlights the top ecosystem services provided by the site, emphasising their essential and non-substitutable nature (Table 2). Regulating services, such as water purification and waste treatment, salinity regulation, and noise and visual buffering, benefit communities within, and adjacent to the site. Cultural services such as recreation and ecotourism significantly benefit communities at all distances, whereas knowledge systems and education benefit only adjacent and distant communities.

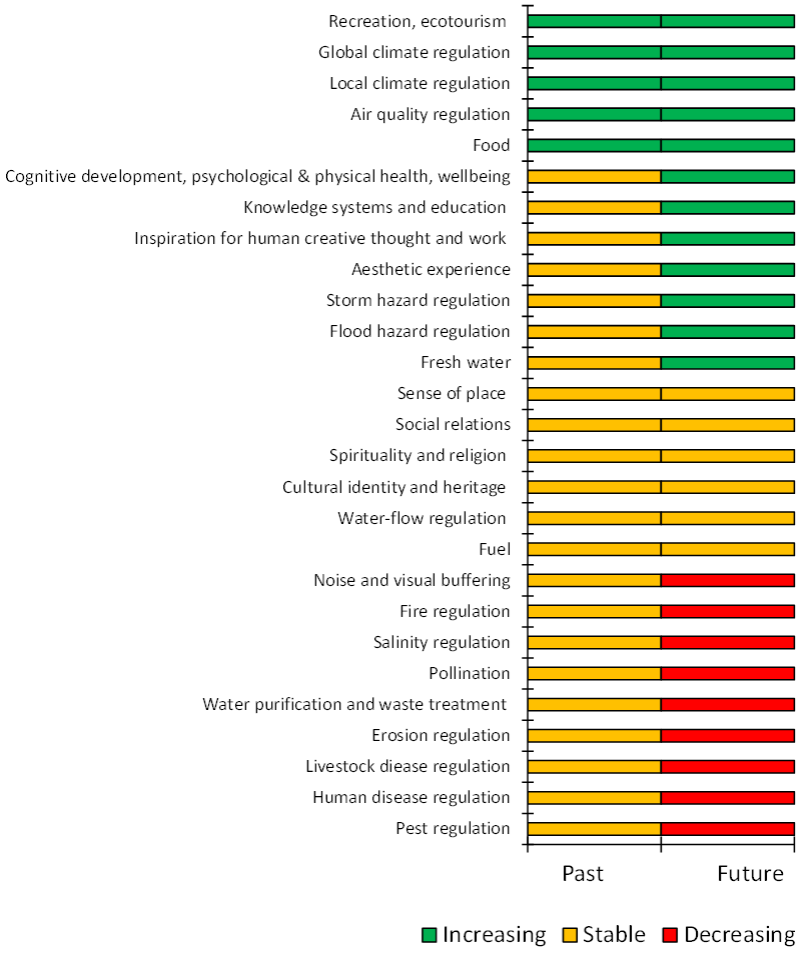

Figure 3. List of ecosystem services provided by Anlung Pring (Sarus Crane Reserve), as identified through stakeholder consultation at the Regional Flyway Initiative workshop.

[1] Asian Development Bank. (2023, September 13-14). Cambodia: Wetland Ecosystem Services Workshop [Workshop]. Phnom Pehn, Cambodia. https://events.development.asia/learning-events/cambodia-wetland-ecosystem-services-workshop

Table 2. List of top ecosystem services provided by Anlung Pring (Sarus Crane Reserve)

Ecosystem services	Essential or non-substitutable	Benefits to communities			Change	
		Within the site	Adjacent to the site	Distant to the site	Past	Future
Regulating services						
Water purification and waste treatment	Yes	✓	✓		No change	Decrease
Salinity regulation	Yes	✓	✓		No change	Decrease
Noise and visual buffering	Yes	✓	✓		No change	Decrease
Cultural services						
Recreation, ecotourism	Yes	✓	✓	✓	Increase	Increase
Knowledge systems and education	Yes		✓	✓	No change	Increase

4.2. Global climate regulating services

Based on the look-up values from a FAO report (Dondini et al. 2023) and IPCC (2006), the amount of carbon stored in Anlung Pring is estimated to range from 3,720 to 5,380 tonnes, while the annual carbon sequestration rate is estimated at 262 tonnes per year.

4.3. Flood mitigation services

The flood mitigation services provided by Anlung Pring were assessed using biophysical values only (see Table A1 and Annex 1 for details). When compared to both the average of the eight RFI inland sites and the average of all other inland wetlands in Cambodia (Table A2 in Annex 1), Anlung Pring shows some consistent results in terms of benefits and beneficiaries:

(1) for the average green storage capacity per sq. km of wetland, Anlung Pring is below average (264 Giga Litres or GL of water per km^2 vs. 384 GL/km^2 for RFI inland sites and 458 GL/km2 for all other inland wetlands);

(2) for the average population uniquely benefitting from influential green storage upstream per sq. km of wetland, Anlung Pring is also below average (0 vs. 81 people/km^2 RFI inland sites and 110 people/km^2 for all other inland wetlands); and

(3) for the average built-up area uniquely benefitting from influential green storage upstream per sq. km of wetland, Anlung Pring is again well below average (1.22 ha/km^2 vs. 4.89 ha/km^2 for RFI inland sites and 3.92 ha/km^2 for all other inland wetlands).

5. Drivers of change and their potential impacts on Anlung Pring (Sarus Crane Reserve)

5.1. Current drivers of change and their level of impact

Stakeholders at the RFI workshop[2] identified 18 drivers of change impacting Anlung Pring, and their corresponding levels of impact on the wetland site (see Table 3). High-impact drivers include livestock farming and grazing, which significantly alter the habitat and contribute to degradation. Tourism and recreation infrastructure also pose a high threat to the wetland, leading to habitat disturbance and fragmentation.

Medium-impact drivers encompass activities such as fishing, killing, and harvesting of aquatic resources, which threaten the biodiversity within the site. Restoration for conservation has moderately modified the site. Other medium-impact factors include the presence of shipping lanes and canals, storm and flooding events, temperature extremes, and utility and service lines, all of which moderately affect the wetland's ecological balance.

Table 3. Drivers of change and their potential impact on the integrity of Anlung Pring (Sarus Crane Reserve) based on consultations with stakeholders.

Driver of change	Impact
Livestock farming and grazing	High
Tourism and recreation infrastructure	
Fishing, killing and harvesting of aquatic resources	Medium
Restoration for conservation	
Shipping lanes and canals	
Storm and flooding	
Temperature extremes	
Utility and service lines	
Activities of site managers	Low
Agricultural and forestry effluents	
Collecting terrestrial plants or plant products (non-timber)	
Droughts	
Drug cultivation	
Garbage and solid waste	
Other 'edge effects' that degrade the wetland site values	
Recreational activities and tourism	
Roads and railroads	
Water extraction/diversion within the wetland site or catchment	

[2] Asian Development Bank. (2023, September 13-14). Cambodia: Wetland Ecosystem Services Workshop [Workshop]. Phnom Pehn, Cambodia. https://events.development.asia/learning-events/cambodia-wetland-ecosystem-services-workshop

5.2. Potential alternative state of Anlung Pring (Sarus Crane Reserve) under current drivers of change

Stakeholders at the RFI workshop[3] 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 3). 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.

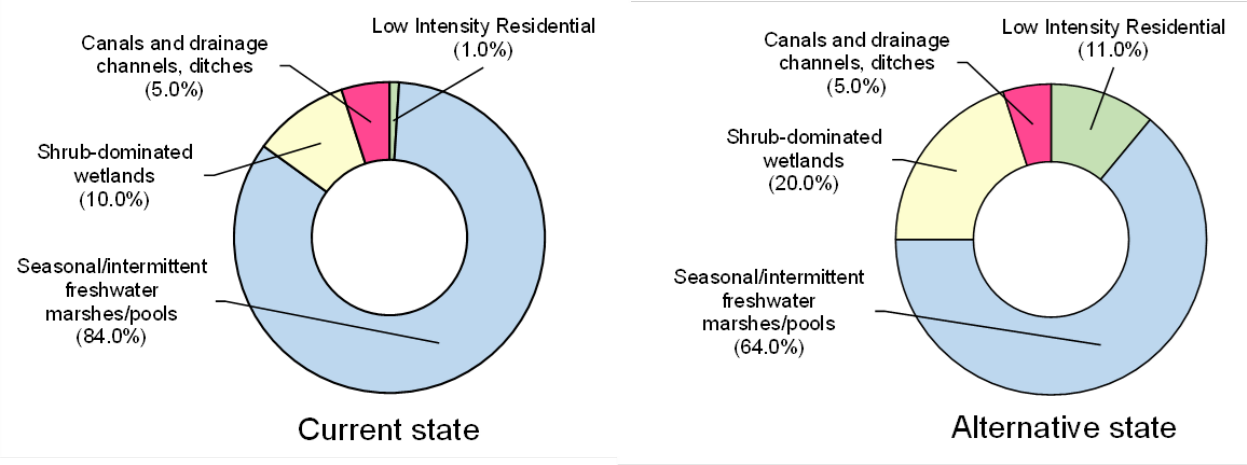

Figure 4. The proportional change in the extent of different habitat types between the current and alternative states of Anlung Pring (Sarus Crane Reserve)

5.3. Expected changes in the ecosystem services of Anlung Pring (Sarus Crane Reserve)

Stakeholders at the RFI workshop[4] documented the future trends in the provision of ecosystem services in Anlung Pring (Sarus Crane Reserve), indicating whether 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.

Regulating services, such as water purification and waste treatment, salinity regulation, and noise and visual buffering, have remained unchanged in the past but are projected to decrease in the future (see also Figure 3, Table 2). Cultural services, particularly recreation and ecotourism, has seen an increase in

[3] Asian Development Bank. (2023, September 13-14). Cambodia: Wetland Ecosystem Services Workshop [Workshop]. Phnom Pehn, Cambodia. https://events.development.asia/learning-events/cambodia-wetland-ecosystem-services-workshop

[4] Asian Development Bank. (2023, September 13-14). Cambodia: Wetland Ecosystem Services Workshop [Workshop]. Phnom Pehn, Cambodia. https://events.development.asia/learning-events/cambodia-wetland-ecosystem-services-workshop

the past and is expected to continue growing in importance. Knowledge systems and education have remained stable in the past but are anticipated to increase in the future.

In the alternative state, a 11% loss of wetland at Anlung Pring will result in a loss of stored carbon estimated to be between 396 and 572 tonnes, and a decrease in carbon sequestration rate (carbon accumulation) by approximately 28 tonnes per year.

As presented in Table A5, a net loss of 22.0 hectares of green water habitats, primarily from seasonal/intermittent freshwater marshes/pools, is expected to result in an effective reduction of 10.6% or 28.0 Giga Litres of green storage capacity per km². While this reduction occurs, the downstream population per km² remains zero. The loss may amount to 0.13 hectares of built-up areas losing flood mitigation benefits per km² of wetland.

6. Capacity needs in Anlung Pring (Sarus Crane Reserve)

The stakeholder consultation and analyses with government and civil society stakeholders identified at least 6 stakeholder groups with clear roles in the long-term sustainable management of Anlung Pring Protected Landscape (Sarus Crane Reserve). Table 4 summarizes the current and potential roles of these stakeholder groups in relation to the management of Anlung Pring. There are opportunities to strengthen patrolling and law enforcement, site management, and biodiversity monitoring.

Table 4. Capacity needs for key stakeholders involved in the management of Anlung Pring wetlands

Stakeholder Group	Current role in the wetland management	Current capacity for sustainable wetland management	Capacity Development support needed to improve wetland management	Form of capacity development
Ministry of Environment	Oversee site management and policymaking. Provide technical support	N/A	N/A	N/A
Kampot Provincial Department of Environment		N/A	N/A	N/A
AP Site management and rangers	Management of site, undertake patrols and enforcement. Engage local communities	GPS utilization Documentation of infringements and violations at site	GPS and GIS approaches SMART Patrol approaches	Training (online + In person) Site visit (local and oversea)

Stakeholder Group	Current role in the wetland management	Current capacity for sustainable wetland management	Capacity Development support needed to improve wetland management	Form of capacity development
		Proficiency in law enforcement procedures Report writing skills Boat driving expertise Bird photography and identification Managing tourism	Documentation of infringes and violations Biodiversity monitoring First aid support and tourism management Site management Law enforcement	Equipment and tools (laptop, camera, GPS, Drone)
Local (commune) authorities	Support with enforcement against illegal activities. Support site management	Raising awareness of wetland issues Coordination skills Intervention in law enforcement Administrative proficiency Develop action plans	Guidelines for wetland management Strengthen grievance mechanism for local conflicts Law enforcement	Training Site exchange visit Internship
Conservation organisations (NGOs)	Support site management and provide capacity building for local communities	N/A	N/A	N/A
Local communities	Direct beneficiaries of site	N/A	Support site management activities, enforcement and biodiversity monitoring.	Training programmes on site management and biodiversity monitoring Site and exchange visits

Figure 5. Land cultivated with 'Crane Rice' around Anlung Pring (in pink) (Map: NatureLife Cambodia)

7. Opportunities for RFI interventions

7.1. Recommended Interventions

Anlung Pring is the smallest RFI site in Cambodia, but has a disproportionate importance given that a large proportion of Cambodia's extent Sarus Crane uses the site each winter, together with internationally important congregation of shorebirds. There are at least 6 villages across two districts communes (under Kampong Trach district), and local communities are largely dependent on wet-season rice farming as a major source of livelihood, collection of wetland products, together with nature-based tourism activities from mostly domestic visitors. Encroachment activities such as illegal land clearance (and land grab activities) have damaged or resulted in the damage of limited areas of APPL but strong enforcement activities have helped to limit the impact of encroachment, and the site is probably among the best protected wetlands in Cambodia.

To strengthen management and conservation of APPL there is a clear need for: (1) continued investment into legal protection and improved management of the wetlands, addressing dry-season fires and invasive species such as giant mimosa which can harm the ecological integrity of a small wetland like Anlung Pring. Although there have been some investments into nature-based tourism ecotourism such as the construction of a wetland centre, tourism at APPL remains limited along it and is projected to increase over time. This needs to be supported by a commensurate investment into tourism, including (1) improvement of ecotourism infrastructure such as signages, jetties and viewing structures. This then needs to be supported by targeted work to build the capacity of local communities and tourism businesses (e.g. skills-based training, hospitality training for soft skills) to scale up tourism operations in an environmentally friendly manner. Anlung Pring is where the 'Crane Rice' initiative has been trialled since 2019 and which have expanded to cover over 150 ha of the landscape mosaic, with strong likelihood of continued up-scaling. There are major opportunities for up-scaling rice agriculture transition with a focus on biodiversity-friendly rice farming using approaches that has been trialled in, tackle agro-chemical waste pollution from improper disposal of agricultural waste, while addressing broader livelihood issues for local communities.

Table 5. Summary of key RFI interventions proposed for Anlung Pring (Sarus Crane Reserve)

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
Component 1. Strengthening site management and protection of Anlung Pring.					
Conduct a scoping study of existing interventions and threats and disturbance at Anlung Pring, including targeted work on long-term threats (from climate change, salt intrusion and invasive species management).	Best practices, guidelines, and standards for proposed RFI interventions	Assessment report with key threats identified and recommendations for improved management published and disseminated to key stakeholders.	30,000	1 year	MOE Kampot Provincial Department of Environment and APPL management board Consultancy companies Conservation organisations ADB

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
Strengthen and expand site management and zonation of the Anlung Pring Protected Landscape	Strengthened management of the AP protected landscape, through co-management with key stakeholders APPL site management plan over short to medium-term updated and revised, in consultation with key stakeholders Establishment of a co- management framework, with stronger involvement of local stakeholders.	Site management and zonation plans over short to medium-term for APPL developed, presented to key stakeholders including all villages in the boundary and within the protected area, and endorsed by the DPOE and management board Number of consultations conducted to strengthen engagement of local stakeholders for participatory processes, understand local needs, and engage national stakeholders for mandates on zonation. Number of implemented activities in the developed site management and zonation plans. Co-management framework developed and piloted. Number of stakeholder groups engaged in the development of site management and zonation plans.	100,000	2 years	Kampot Provincial Department of Environment and APPL management board Kampong Trach district government Community groups Conservation organisations (NatureLife)

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
Improve water management infrastructure to ensure that APPL is kept 'wet'.	Mitigation measures for fire risk during dry seasons are in place and better water management (including canals, and the reservoir)	Number of water management infrastructure (including drainage canals and sluice gates) repaired and improved. Number of facilitated localized dredging works for addressing siltation and vegetation. Recorded bush fires reduced substantially over baselines (at least 20%)	500,000	3 years	MOE MOWRAM Kampot Provincial Department of Environment and APPL management board
Strengthen legal protection of APPL, through patrol capacity.	Increased wildlife protection and reduced encroachment, due to improved patrolling and enforcement efforts in APPL Strengthened management of the AP protected landscape, through co-management with key stakeholders	Number of patrol and enforcement activities, using SMART approach, implemented in APPL. Co-management framework developed and piloted with representatives from villages and conservation organisations Capacity program on enforcement and monitoring developed and implemented. Number of capacity-building activities implemented	100,000	3 years	MOE Kampot Provincial Department of Environment and APPL management board Kampong Trach district government Conservation and academic organisations (including bird and community-focused NGOs)

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
		Number of trained people on enforcement and monitoring.			
Component 2. Stronger wildlife protection and monitoring, with a focus on the Sarus Crane.					
Strengthen biodiversity monitoring, with a focus on the Sarus Crane and shorebird population.	Increased awareness for Sarus Crane and support for waterbird conservation amongst local people and tourists Improved large waterbird and shorebird conservation through biodiversity monitoring	Number of awareness-raising activities implemented to preserve cranes and wetlands. Number of stakeholder groups engaged in the awareness-raising activities Biodiversity monitoring program developed, synergized with the management plans and frameworks, and implemented. Number of biodiversity monitoring activities implemented.	100,000	3 years	MOE SCWG Conservation organisations Local community groups
Component 3. Upscaling tourism infrastructure and strengthening sustainable ecotourism					
Improve and expand tourism infrastructure at Anlung Pring, including signages, shelters and viewing structures	Improved protection and management of APPL, through ecotourism benefits and increased appreciation of Sarus Cranes, other waterbirds, and the wetlands.	Number of tourism infrastructure improved and installed. Number of households benefiting from ecotourism.	500,000	2 years	Ministry of Tourism MOE Kampot provincial government Kampong Trach district government

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
Strengthen the capacity of local communities and businesses for nature-based tourism.	Improved protection and management of APPL, through nature-based tourism benefits and increased capacity of local stakeholders to support domestic and international tourists.	An Ecotourism strategy and plan, focused on Sarus Crane and migratory waterbirds, developed and tested with at least 10 tourism operators. Number of stakeholder groups engaged in the development of the ecotourism strategy and plan. A training program for ecotourism developed. Number of trained people from target communes Number of households benefitting from ecotourism activities.	200,000	3 years	Conservation organisations Tourism operators Local community groups
Component 4. Strengthening sustainable and organic rice farming (on Jasmine and native rice varieties)					
Scale up of sustainable, regenerative rice-farming in the rice farming landscape that surround APPL, using organic and/or wildlife-	Organic and biodiversity-friendly rice farming expanded and upscaled in landscapes within APPL. Financing mechanism (for local loans and grants) created for	Biodiversity-friendly and/or organic rice-farming as a source of local livelihood strengthened and increased by 50% of baselines. At least 30% of rice fields around APPL under organic/biodiversity-	500,000	5 years	MAFF Ministry of Commerce MOWRAM Kampot provincial government

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
friendly approaches such as 'Crane Rice'	local communities and supported by key lending institutions for farmers. Improved management of APPL, through the practice of biodiversity-friendly farming.	friendly 'Crane Rice' cultivation. Certification of 'Crane Rice' as biodiversity-friendly by accreditation bodies nationally and/or internationally. Number of social enterprises established to manage and oversee the production and sale of 'Crane Rice' and associated rice products. Capacity building (and training) program for organic and biodiversity-friendly rice farming techniques. Number of capacity-building activities implemented. Number of trained rice farmers on biodiversity-friendly and/or organic farming			Kampong Trach district government Community groups Conservation organisations (including bird and community-focused NGOs) Agricultural organisations
Improve the management of agro-chemical waste in the	Improved management of APPL, through the reduction of agrochemical	Agro-chemical management and disposal protocols established and communicated to all relevant villages in	500,000	3 years	

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
rice paddies around APPL.	inflow into the wetlands Increase in biodiversity in rice fields against baseline metrics.	Kamping Trach district. Metrics for agrochemical inflow established and monitored. Reduced inflow of agro-chemicals into APPL wetlands against baselines and based on set metrics. Number of biodiversity monitoring activities Number of people involved in monitoring the agro-chemical inflow and biodiversity survey			
Total investment for five years			**7,930,000 USD**		

7.2. Potential Financing

The estimated project cost is USD 7,930,000 over five years. This budget supports the development of a site management plan that addresses zoning, fire risk during the dry season, enforcement and patrolling activities, biodiversity monitoring, improvements to nature-based tourism infrastructure, capacity-building in sustainable agriculture, and piloting the transition to sustainable rice farms. Table 5 summarizes the projected budget distribution across the proposed project components.

There are ongoing projects being implemented at APPL by conservation organisations such as NatureLife Cambodia and BirdLife International to strengthen biodiversity monitoring and 'Crane Rice', which can provide substantive co-financing.

7.3. Proposed Institutional Arrangements

The proposed project is expected to be implemented over a period of five years, with main project components focusing on improved site management for APPL (led by the Ministry of Environment and the Kampot Provincial Department of Environment) and expanding organic and/or biodiversity-friendly rice agriculture (with the Ministry of Agriculture, Forestry and Fisheries). Conservation organisations are expected to play a major role in the project by supporting project activities focused on biodiversity monitoring, stakeholder engagement and targeted capacity building to expand biodiversity-friendly rice (or 'Crane Rice') agriculture.

7.4. Project Beneficiaries

APPL is bisected by a road embankment running east to west and lies adjacent to the communes of Boeng Sala Khang Tboung (3 villages) and Preak Kroes (4 villages). There are approximately 8,000 people in the covered 3 villages in Sala Khang Tboung and 10,000 in the covered 4 villages in Preak Kroes, who are directly and/or indirectly benefiting from APPL.

This proposed project is expected to undertake activities to promote gender inclusion and participation in livelihood activities, through capacity building activities for rice farming agriculture, and nature-based tourism.

There are no indigenous communities in the project landscape.

7.5. Anticipated Implementation Risks

Stakeholder engagement: Proposed interventions rely on support from local communities, particularly in adopting biodiversity-friendly and organic farming, patrolling, 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 Anlung Pring, which could increase anthropogenic pressures on the wetland and lead to greater disturbance of wildlife. Planning with stakeholders to reduce noise pollution during the construction of ecotourism facilities and ongoing ecotourism activities, as well as managing waste pollution from increased tourist traffic, is essential.

It is also important to assess how major infrastructural expansion at Kampong Trach commune (including energy infrastructure), canals, and access roads may potentially impact Anlung Pring in the long term.

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Annex 1. Supplementary information on flood mitigation 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 flood mitigation were spatially inferred in QGIS from a selection of metrics expressing different biophysical values modelled online by the Water World component of this tool. Equivalent data to assess monetary values similarly to coastal protection were not available for the RFI region.

The key metrics selected for biophysical values (Table A1) were the average green storage capacity, which is the volume of water stored by each square kilometre of wetland itself as well as its soil and vegetation, and the direct influence of this storage capacity on beneficiaries found downstream of the wetland, both as the average number of people and the average built-up area that are uniquely benefitting from the resulting flood mitigation (and not from other green storage found upstream).

Table A1. Contribution of the wetland habitats to flood mitigation in Anlung Pring based on site-level (biophysical) values inferred from Mulligan (2022) and expressed as ranges to represent the resulting uncertainty.

Influence of the wetland on flood mitigation (metrics)	**Benefit/Beneficiaries**
Average green storage capacity per sq. km of wetland in million cubic metres (GigaLitres/km^2)	202 – 327
Average population uniquely benefitting from influential green storage upstream per sq. km of wetland (n/km^2)	0 – 0
Average built-up area uniquely benefitting from influential green storage upstream per sq. km of wetland (ha/km^2)	0.93 – 1.50

Table A2. Biophysical benefits from and beneficiaries of RFI inland wetland sites (expressed as ranges to represent the resulting uncertainty) and at the national level.

Site name	**Green storage capacity (GigaLitres/km^2)**	**Downstream population (n /km^2)**	**Downstream built-up area (ha /km^2)**
Prek Toal Core Area	486 (±29)	112 (±7)	7.19 (±0.42)
Ang Tropeang Thmor	411 (±38)	73 (±7)	3.84 (±0.36)
Boeung Prek Lapouv	448 (±37)	139 (±12)	8.40 (±0.71)
Anlung Pring	264 (±63)	0 (±0)	1.22 (±0.29)
Boeng Chhmar	406 (±27)	102 (±7)	6.57 (±0.43)
Chikraeng / Stoung	206 (±23)	45 (±5)	2.84 (±0.32)
Kulen Promtep WS	456 (±6)	87 (±1)	4.20 (±0.05)
Cambodia RFI average	384	81	4.89
Cambodia national average	458	110	3.92

Table A5. Key habitat types in Anlung Pring (Sarus Crane Reserve) based on stakeholder-based assessment at the Regional Flyway Initiative workshop in September 2023.

Habitat type	Current state		Alternative state (2035)	
	Area (ha)	Cover (%)	Area (ha)	Cover (%)
Low Intensity Residential	2.2	1.0	24.2	11.0
Seasonal/intermittent freshwater marshes/pools	184.8	84.0	140.8	64.0
Shrub-dominated wetlands	22.0	10.0	44.0	20.0
Canals and drainage channels, ditches	11.0	5.0	11.0	5.0
Total	219.9	100.0	219.9	100.0