Kingdom of Cambodia

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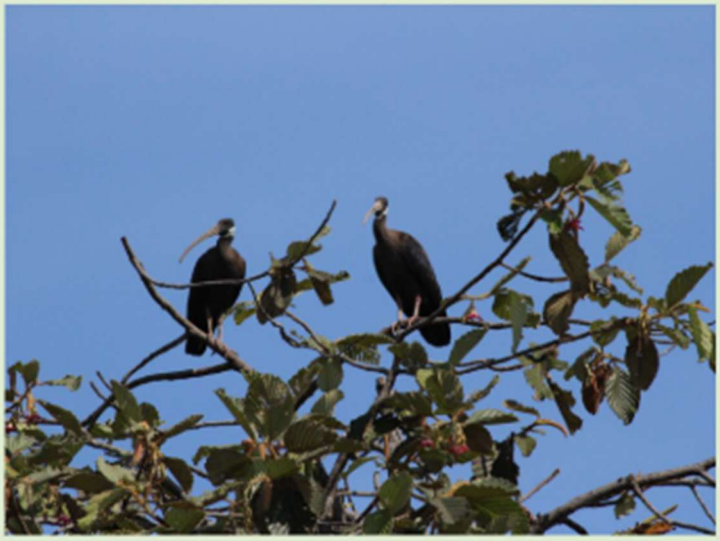
Stung Treng Ramsar Site Management Plan 2026-2030



2026

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ACRONYMS

CBET	Community Based Ecotourism
CFi	Community Fishery
CITES	Convention on International Trade in Endangered Species
FiA	Fisheries Administration
GDEKI	General Directorate of Environmental Knowledge and Information
GDLC	General Directorate of Local Community
GDNPA	General Directorate of Nature Protected Areas
GDPS	General Directorate of Policy and Strategy
Ha	Hectare
IUCN	International Union for Conservation of Nature and Natural Resources
KEITI	Korea Environmental Industry & Technology Institute
KSWS	Keo Seima Wildlife Sanctuary
MAFF	Ministry of Agriculture, Forestry and Fisheries
MEF	Ministry of Economy and Finance
MoE	Ministry of Environment
MoI	Ministry of Interior
MoT	Ministry of Tourism
MoU	Memorandum of Understanding
MOWRAM	Ministry of Water Resources and Meteorology
NDC	Nationally Determined Contributions
NGO	Non-Governmental Organization
NPASMP	National Protected Area Strategic Management Plan
NTFPs	Non-Timber Forest Products
PA	Protected Area
PDoE	Provincial Department of Environment
PDR	People's Democratic Republic
REDD+	Reducing Emissions from Deforestation and Forest Degradation and the role of conservation, sustainable management and enhancement of forest carbon stocks
RGC	Royal Government of Cambodia
SMART	Spatial Monitoring and Reporting Tool
STRS	Stung Treng Ramsar Site
UNFCCC	United National Framework Convention on Climate Change
WNBR	World Network of Biosphere Reserve

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Message from the Minister

The protected area system of Cambodia is a vital component of the global protected area system and plays an essential role in protecting biodiversity, particularly rare or endangered flora and fauna. Protected areas conserve genetic resources, which also support fisheries, timber and non-timber forest products, and the associated incomes of rural people. In particular, wetlands help to maintain water sources for household use and agricultural irrigation. Investing in strengthening protected area systems will generate long-term benefits through their ecosystem services, stimulating social development and sustainable economic growth.

The Kingdom of Cambodia has 73 protected areas and biodiversity conservation corridors, including the northeastern biodiversity corridor, the northern biodiversity corridor, and the Cardamom biodiversity corridor, covering approximately 7.2 million hectares and more than 41% of the country. This is one of the highest rates of coverage across the globe. Currently, Cambodia's protected area system is under pressure due to increased population and demands on natural resources. This highlights a need for more effective management and cooperation between decision-makers and local people living around protected areas, to strengthen sustainable development across sectors.

The Stung Treng Ramsar Site Management Plan (2026-2030) is the result of collaboration between the Ministry of Environment, the Provincial Administration, and relevant stakeholders, using tools and best practices to guide Ramsar Site authorities and other stakeholders in effective site management planning. The implementation of the management plan will improve ecosystem function, restore ecological balance, and strengthen local community livelihoods and sustainable development in Stung Treng province. More broadly, better management of the site will contribute to transboundary cooperation in the Lower Mekong Region, and reduced climate impacts will provide global benefits. The management plan is in accordance with Cambodia's National Strategy for Protected Areas Management (2017-2031), the Law on Protected Areas (2003), the Circular Strategy on Environment (2023-2027), and the policies of the Royal Government of Cambodia under the leadership of **Samdach Moha Borvor Thepadei Hun Manet**, Prime Minister of Kingdom of Cambodia.

On behalf of the Ministry of Environment, I believe that through this management plan, we have a clear vision for managing the Stung Treng Ramsar site in a sustainable manner over the next five years.

I would like to express my appreciation and thanks to His Excellency, Lok Chum Teav, and the officials from the Ministry of Environment and other ministries, IUCN, development partners, local communities, and stakeholders who joined meetings to contribute to this important document. I hope that this collaboration continues and supports the implementation of the management plan to ensure effective management of natural resources and biodiversity within the site.

Phnom Penh, 25 March 2026
Minister of Environment

PREFACE

Stung Treng Ramsar Site (STRS) has a total area of 14,600 hectares, covering 37 kilometers along the Mekong River, from approximately five kilometers north of Stung Treng provincial town, to approximately two kilometers south of the border with the Lao People's Democratic Republic (Lao PDR). STRS has a high global conservation value; it is rich in natural resources and biodiversity, particularly providing habitat for flora and fauna which are globally threatened. STRS was established with a view towards regional conservation, acting as a biodiversity conservation corridor that links to protected areas, including the Chheb Wildlife Sanctuary and Siam Pang Wildlife Sanctuary. In addition, STRS has tremendous potential for eco-tourism—visitors can tour the flooded forests and sand bars in the river and observe local culture and history. The area has high potential for Nature-based Solutions, such as restoring the flooded forest planting trees on islands and increasing fishery stocks in the deep pools and along the Mekong River.

Despite its essential values and rich biodiversity, STRS has been challenged by several threats, including agricultural land encroachment, upstream hydropower dam in Lao PRD, wildlife hunting and illegal fishing, and climate change. Addressing these threats requires immediate actions and effective management with the involvement and participation of all national and sub-national stakeholders to reduce the degradation and loss of biodiversity, protect the values and functions of the ecosystem, and increase local people's livelihoods. To achieve this goal, the Stung Treng Ramsar Site Management Plan (2026-2030) was initiated by the Directorate of Protected Areas of the Ministry of Environment (MoE) with financial support from the government and the Korea Environmental Industry & Technology Institute (KEITI). The development of the plan was led by IUCN and MoE with collaboration from local authorities, ministries, agencies, development partners, local communities, and other stakeholders. Stakeholders have developed and approved the

On behalf of the Directorate of Protected Areas, I would like to appreciate and pay my respects to **His Excellency Eang Sophalleth**, Minister of Environment, who has supported the development of this management plan. I also would like to thank the management team and officials of the MoE, IUCN, other related ministries, the commune, district, municipal and provincial administrations, national and international partners, local communities, and other actors who have joined and offered their support and inputs to develop this plan.

Phnom Penh, 25 March 2026
Director General

Acknowledgments

The authors would like to express their gratitude to the management team from the Ministry of Environment for their close cooperation throughout this process. They would also like to thank the national and sub-national ministries and institutions, development partners, non-governmental organizations, higher education institutions, private sector partners, and all community stakeholders who contributed to the development of the STRS Management Plan.

We would like to express appreciation for the efforts of the Directorate of Protected Areas and the management team of the MoE, relevant ministries, institutions, management team, and officials of the Department of Freshwater Wetland Conservation who provided inputs to the management plan.

Finally, we would like to thank the Korea Environmental Industry & Technology Institute (KEITI), which provided financial support to develop the management plan through the IUCN Asia Regional Office and the IUCN Cambodia Country Office.

1 INTRODUCTION

1.1 Site Overview

The Middle Stretches of the Mekong River north of Stung Treng Ramsar site (known as Stung Treng Ramsar Site (STRS), is one of Cambodia's five Ramsar Sites, covering an area of 14,600 hectares, extending approximately 37 km along the Mekong River, from approximately five km north of Stung Treng provincial town to approximately two km south of the border with the Lao People's Democratic Republic (Lao PDR) (Figure 1). STRS was designated as the Ramsar Site by the Royal Decree dated 23 June 1999, with Ramsar site number 999.

STRS is part of a highly distinct reach of the Mekong, which extends upstream and downstream of the site. This stretch of the river is characterized by many islands, over which the river drops significantly in elevation, resulting in many areas of swift flow and various rapids and falls. The upstream end of this stretch begins in Champasak Province, Lao PDR, in an area known as Siphandone and ends downstream, to the north of Kratie, at Kampi, consisting of the main Mekong River dolphin deep pool. Much of the channel is relatively shallow and its bed becomes exposed when water levels are low, thus revealing a complex mosaic of vegetation on rocky and sedimentary substrates. The aquatic habitats within STRS are crucial for numerous species of migrating fish, as they feature deep pools that serve as important refuges. Additionally, during the dry season, the beaches and sandbars in STRS become exposed, providing essential nesting sites for birds and rare reptiles. One of the unique features of STRS is the presence of a flooded forest that can't be found anywhere else along the Mekong River. In this flooded forest, flood-resistant and fig trees often intertwine, displaying semi-aerial roots influenced by the current. This distinctive landscape not only provides abundant resources for birds and fish but also adds to the overall character of the site. On land, the terrestrial habitats in STRS are primarily located on islands and river banks and consist mainly of mixed deciduous forests. The slopes of these islands and river banks, known as strand areas, are home to a specific type of forest that has adapted to withstand seasonal flooding.

(Table 1), STRS covers 15 villages (with six villages outside the site, but near the boundary); four communes, one Sangkat, two districts, and one provincial town in Stung Treng province. 1) Koh Snaeng Commune, there are four villages with 667 families, and a total population of 4,740 people, including 1,551 women. 2) Ou Svay Commune has five villages with 1,067 families with a total population of 4,708 people, including 1,810 women. 3) Preah Rumkel commune, there are two villages (and six additional villages outside but near the STRS boundary) that consist of 316 families (plus 1,111 families outside the site) with a total population of 1,360 people (and 4,864 people outside the site). 4) Thala Barivat commune, there is one village with 248 families and a total population of 1,071 people, with 515 women. 5) Sangkat Samaki, three villages housing 649 families and 2,840 people total, including 1,397 women. The total population living in and around the STRS is 18,344 people.

The annual population growth is about 3.4% per year (2016-2022), where Koh Snaeng commune has the highest population growth, followed by Ou Svay and Preah Rumkel. Rapid population growth has been reported from 2019-2021, due to new immigrants from Kampong Cham, Prey Veng and Kratie provinces, who bought farmland for cassava and cashew nut plantation, which is mostly grown outside of STRS. The population in Samaki Sangkat has decreased, especially the population in Khampann village, who have moved to live in Kilo8 village near the national road, to pursue farming livelihoods.

The socio-economic activities in STRS are mostly dependent on agriculture, such as paddy rice cultivation, farming (cashew nut, cassava, lemon, green sweet orange, mango, and other fruits and crops), animal raising (cow, buffalo, pig, chicken and duck), fishing (both permanent and non-permanent), and working as laborer and other services.

Table 1: Population in target communes and sangkat of STRS from 2016-2022

Commune	No. of Villages	2016			2022		
		No. of families	No. of people	No. of females	No. of families	No. of people	No. of females
Koh Snaeng	4	453	2,782	1,330	667	4,740	1,551
Ou Svay	5	670	3,588	1,876	1,067	4,708	1,810
Preah Rumkel	2 (6[1])	270 (995)	1,207 (4,508)	607 (2,294)	316 (1,111)	1,360 (4,864)	689 (2,505)
Thala Barivat	1	218	1,018	505	248	1,071	515
Samaki	3	754	3,236	1,666	649	2,840	1,397
TOTAL	**15**	**2,365**	**11,831**	**5,984**	**2,947**	**14,719**	**5,962**

1.2 Ramsar Convention obligations

The Ramsar Convention on Wetlands of International Importance (Ramsar, Iran, 1971) is an intergovernmental treaty whose mission is “the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world.”

Under the Ramsar Convention, the act of designating a wetland as internationally important is the first step along a conservation and sustainable use pathway, the endpoint of which is achieving the long-term use of the site.

Contracting Parties to the Ramsar Convention are expected to manage their wetlands, including Ramsar Sites, to maintain their ecological character. The Ramsar Convention has defined ecological character as “the combination of the ecosystem components, processes, and benefits/services that characterize the wetland at a given point in time.”

The Royal Government of Cambodia, as a Contracting Party to the Ramsar Convention since 23 October 1999, has been establishing management activities at its Ramsar Sites to maintain their ecological character and, in so doing, retain those essential ecological components, ecosystem processes, and ecosystem services for which a site is important. Ecological character is therefore an indication of the ‘health’ of the wetland.

1.3 Summary of international conventions and agreements related to STRS

Cambodia is a signatory to numerous international treaties and conventions which provide a broad legal framework for the Mekong wetlands management. Cambodia has signed, ratified, and acceded to several international conventions and agreements related to environment and other natural resources management.

Table 2) including freshwater wetland-related issues. Major international conventions and agreements include the Convention on Biological Diversity, United National Framework Convention on Climate Change (UNFCCC), Ramsar Convention, Convention on International Trade in Endangered Species (CITES), and other agreements.

[1] Six villages outside of Stung Treng Ramsar Site boundary

Figure 1 Map of Stung Treng Ramsar Site

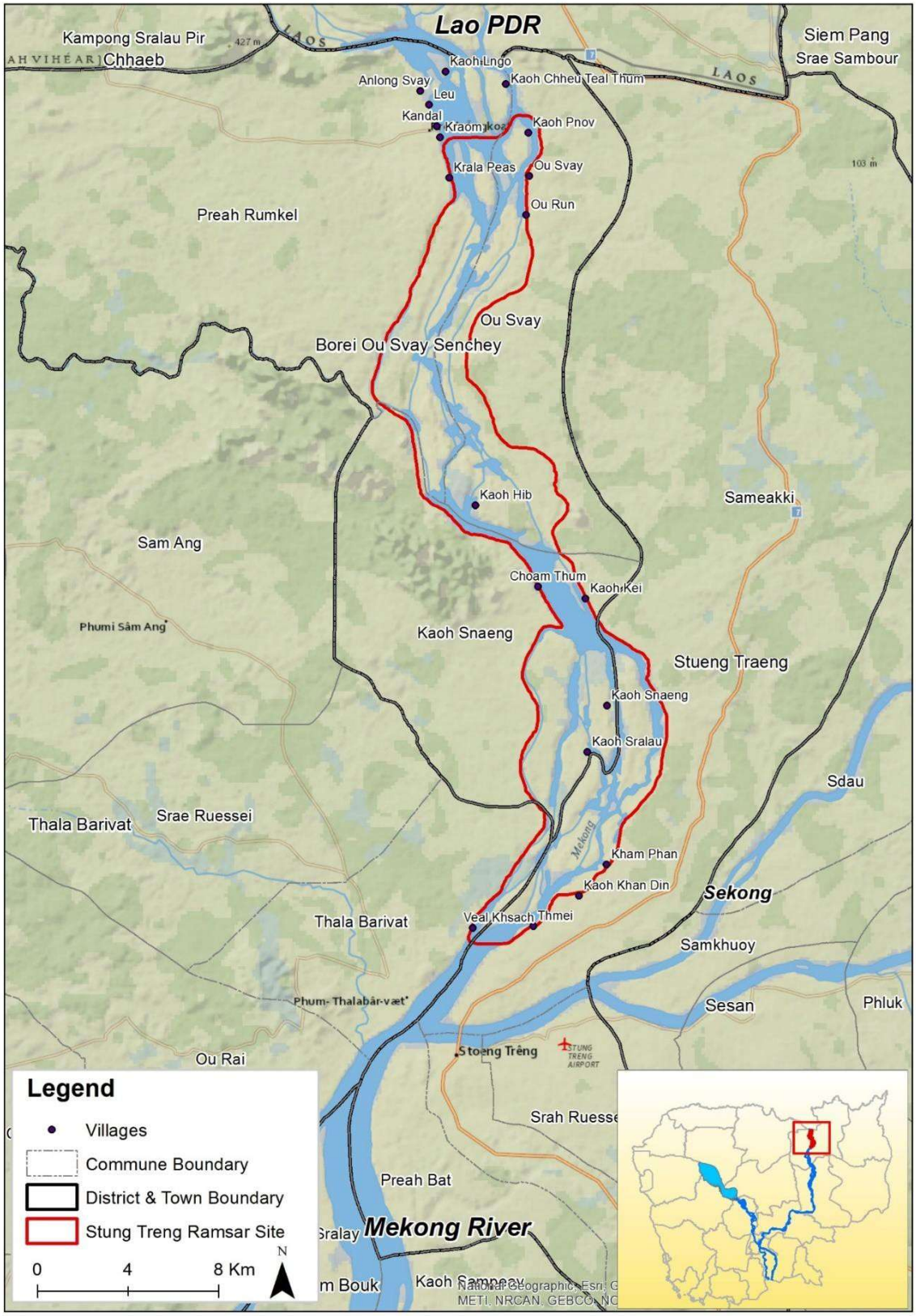

Table 2 International conventions and agreements signed by Cambodia relevant to STRS management objectives

Conventions/Laws	Date	Relevance to STRS
Ramsar Convention on Wetlands of International Importance	The convention entered into force in Cambodia on 23 October 1999. Cambodia currently has five Ramsar sites designated as Wetlands of International Importance. STRS (no.999) was designated by the Royal Decree on 23 June 1999.	- Sustainable management and wise use of wetlands. - Sustainable livelihoods and fair benefit sharing.
United Nations Convention on Biological Diversity (UN-CBD)	Cambodia signed the Convention on Biological Diversity in February 1995.	-Conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.
United Nations Framework Convention on Climate Change (UNFCCC)	Cambodia signed the Paris Agreement on Climate Change on 22 April 2016 and ratified it on 6 February 2017.	-Flooded forests in STRS can substantially support Cambodia in meeting its international commitments, particularly the Paris Agreement, Bonn Challenge, and Aichi Targets, as well as meeting its Nationally Determined Contributions (NDCs).
Convention on International Trade of Wild Floral and Faunal Species (CITES)	Cambodia became a party to this convention on 4 July 1997. Its membership became official on 2 October 1997. CITES is an agreement that stops the export or import of any rare animals and plants that have been killed or collected. The goal is to stop any species from becoming extinct due to trade. More than 76 endangered species are protected by this convention.	STRS supports > 231 species of birds, >167 species of fish and endangered species of mammals, some of which are protected under CITES.
Indo-Burma Regional Ramsar Initiative (IBRRI)	In 2017, Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam, with support from IUCN Asia, established the Indo-Burma Regional Ramsar Initiative (IBRRI), a platform for regional learning on wetlands management, which serves as a dissemination channel for information and knowledge sharing on best practices for wetland wise use.	IBRRI aims to share knowledge, ensure the conservation of key wetland species, help develop and strengthen policy on wetlands, raise awareness, and promote education in Ramsar Sites, such as STRS.
Mekong Agreement	The 1995 Mekong Agreement between Cambodia, Lao PDR, Thailand, and Viet Nam codifies many governing principles of international environmental law, and establishes mechanisms for cooperation and	STRS is the only Ramsar site on the Mekong mainstream, therefore, the management of STRS has implications for all downstream areas, including

	sustainable development and use of water-related resources including fisheries in the Mekong River Basin.	the Tonle Sap and associated fisheries.
World Network of Biosphere Reserve (WNBR)	WNBR represents a unique tool for international cooperation through sharing knowledge, exchanging experiences, building capacity, and promoting best practices.	STRS management practices are shared through this dynamic and international network to promote knowledge sharing, learning opportunities, cultural values and best practices among the 714 biosphere reserves across the globe. STRS is not a Biosphere reserve, however, its management impacts the Tonle Sap, is the only biosphere reserve in Cambodia.

1.4 Overview and status of relevant laws, policies, strategies, and institutional arrangements related to STRS management

Environmental and natural resource governance is distributed across a range of government authorities. Several ministries have laws, regulations, and frameworks related to and affecting wetlands management (e.g. fisheries, and water management legislation) (Table 3). Management of Cambodia's wetlands falls under the authority of several agencies with policies and laws specific to their mandates and is influenced by local zoning decisions. Ramsar site falls under the mandate of the MoE. As the responsible authority for the Ramsar site, the MoE plays a crucial role in the management and conservation of the site's wetlands and associated biodiversity. The complex nature of wetland resources, and the goods and services they provide, leads to an equally complex system of stakeholder claims. The coordinated management of resource use and stakeholder interests is crucial at a sub-national level to ensure effective implementation and enforcement.

The absence of a single legal context or designated authority extends to other ecosystems as well as wetlands. To integrate the shared responsibilities, the RGC has created the Natural Resource and Environment Code. The Code provides a unifying legal framework for all matters about environmental protection and natural resource conservation in Cambodia. Two sections of the code are particularly important for wetland management, namely, the Management of Protected Areas, and Management of Coastal, Island and Marine Natural Resources, and the Environmental Management sections.

The Management of Protected Areas, and Management of Coastal, Island, and Marine Natural Resources covering:

- Natural Protected Areas
- Management of natural resources, cultural properties, and eco-tourism in natural protected areas
- Coastal, island, and marine resource management

The Environmental Management section addresses:

- Control of hazardous substance release
- Solid waste management
- Water pollution control
- Air pollution, noise, and vibration control
- Management of ozone-depleting substances, coolants, and products containing or using ozone-depleting substances

In addition to the Code of Environment and Natural Resources, the Law on Protected Areas (2008) defines a zoning system for protected areas, including Ramsar sites. This law also provides that each protected area shall be divided into management zones based on the management objectives, potential values of the natural resources of the area, socio-economic and cultural implications of the area, carrying capacity of the natural resources of the area and geographical location of the area. The four zones include (1) core zone, (2) conservation zone, (3) sustainable use zone and (4) community zone.

Table 3 Summary of the legislation, policies, and plans relevant to STRS

Legislation/ Policies/ Strategies/ Plans	Institution	Relevance to STRS management objectives and needs
Circular Strategy (2023-2028)	MoE	The Circular Strategy on Environment 2023-2028 was developed following the Pentagon Strategy (Phase 1) 2023-2028 of the Royal Government of Cambodia. The Circular Strategy is designed to guide and prioritize environmental protection, natural resources conservation, and sustainable development through three angles: 1) Clean, 2) green, and 3) Sustainable.
Code of Environment and Natural Resources (2023)	MoE	The Code of Environment and Natural Resources updated Cambodia's out-of-date environmental legal framework by harmonizing all existing laws (PA law, Fisheries Law, Forestry Law, etc.), mainstreaming environmental protection into all sectoral planning, and enhancing inter-ministerial coordination to support sustainable development and protection of natural resources. It would help the country meet its international environmental commitments and the sustainable development agenda. The Code requires ministries to take into account their activities which may have negative impacts on the environment and to recognize the environmental implications of their portfolios, thus providing higher levels of environmental protection and accountability.
National Protected Area Strategic Management Plan (2017-2031)	MoE	National Protected Area Strategic Management Plan (NPASMP) to guide the conservation planning and management of individual protected areas. This consists of four strategic objectives, 1) Prioritize and Strengthen Conservation, 2) Enhance Sustainable Management, 3) Expand Community Participation and Benefits, 4) Strengthen Institutional Capacity and Collaboration

Cambodia NDC 3.0 (2025–2035)	MoE	Cambodia's Third Nationally Determined Contribution (NDC 3.0), submitted to the UNFCCC on 8 August 2025, sets out the country's strengthened climate commitments for 2025–2035 under the Paris Agreement. It aims to accelerate a low-carbon, climate-resilient and inclusive development pathway, while supporting Cambodia's economic and social priorities.
Cambodia's Long-Term Strategy for Carbon Neutrality (LTS4CN)	MoE	Cambodia's Long-Term Strategy for Carbon Neutrality (LTS4CN) was approved and submitted to the UNFCCC on 30 December 2021. It provides a long-term pathway for Cambodia to achieve a carbon-neutral economy by 2050, while balancing climate action with economic growth, social equity, sustainable livelihoods and climate resilience.
Prakas on transfer of key functions	MOE	To strengthen the decentralization reform process of the Royal Government, the Ministry of Environment has transferred five main functions to the municipal, district, and khan administrations, including: 1. Management of protected area systems, 2. Management of community protected areas, 3. Environmental protection, 4. Environmental knowledge and information; and 5. Sustainable development.
Law on Water Resources Management (29 June 2007)	MOWARM	This law strengthens the effective and sustainable management of the water resources of the Kingdom of Cambodia to attain socio-economic development and improve the welfare of the people. The Ministry and Water Resources and Meteorology (MoWRAM) is mandated to manage, lead, and supervise the implementation of the law and transboundary water governance and cooperation.
Organic Law on Administrative Management of Capital, Provinces, Municipalities, Districts and Khans (2008)	MoI	Priority is given to forestry, natural resources, and environment; and special needs of particular subnational administrations including tourism, historical sites, and cultural heritage.
Sub-Decree on Community Fisheries Management (June 2005)	MAFF	Aims to manage the inland fisheries areas where fishing lots have been abolished and protect fishing areas and inundated forests to improve livelihoods. 17 community fisheries have been established in STRS to protect and manage fisheries resources.
Technical Guideline for Developing Management Plans for Protected Areas and Biodiversity Conservation Corridors in the Kingdom of Cambodia (May 2018)	MOE	Provides direction and helps facilitate the process of developing management plans and action plans for protected areas in Cambodia. The development of the STRS management plan is based on these guidelines.

National Environment Strategy and Action Plan 2016-2023	MOE	Objective 1.2 highlights the need to strengthen and scale up inter-ministerial collaboration for promoting sustainable use of the environment and natural resources through cross-sectoral collaboration for sustainable eco-tourism and the prevention of forest conversion and forest fires in key watersheds of Tonle Sap and the Mekong.
Strategic Planning Framework for Fisheries 2015-2024	FiA/MAFF	The framework supports reforestation of the flooded forest to provide a sustainable basis for fisheries resources. It also strengthens the governance of community fisheries including boundary demarcation and law enforcement. Demarcation of flooded forests and fisheries conservation zones is also promoted. There is a focus on institutional capacity building of relevant sub-national stakeholders including community fisheries to develop viable, sustainable, and beneficial livelihood alternatives for local people. The framework also highlights the need to research to better understand best practices.
Provincial Development Plan (2025-2029)	Stung Treng	The plan lays out a clear strategy for natural resources and environmental management, which focuses on addressing illegal fishing, environmental pollution and conservation of flooded forest and community fish refugees. It also highlights the need to raise public awareness on relevant laws, especially protected area and fisheries laws.

1.5 Management Planning Process

The STRS Management Plan provides an update on the previous management plan covering 2015-2019, jointly developed by WWF Cambodia and the Ministry of Environment. The updated management plan (2026-2030) was developed based on Cambodia's Protected Areas Management Plan Development Guidelines and guidance adopted by the Ramsar Convention, specifically the information provided in Ramsar Handbook 18: Managing Wetlands: Frameworks for managing Wetlands of International Importance and other wetland sites, published by Ramsar Convention Secretariat in 2010.

The management planning process has also adhered to national standards for management planning which mandates multi-stakeholder consultations.

In November 2023, MoE and IUCN conducted community-level stakeholder consultations at O Svay and Koh Sneng communes, as well as at the Ramsar Site station. These workshops aimed to define values, identify threats and priority actions, and gather recommendations for the next steps of Stung Treng Ramsar Site (STRS) management planning.

Furthermore, a provincial stakeholder consultation workshop was organized in December 2023 at the Provincial Department of Environment. The purpose of this workshop was to present the preliminary data from the community-level stakeholder consultations for discussion and to collect additional input, particularly regarding threats, challenges, management actions, and key actors.

To gather relevant data, key challenges, and recommendations, face-to-face meetings were also organized with key provincial departments. These meetings aimed to ensure comprehensive information for the management planning process.

In January 2024, an NGO meeting was held to gather input on management actions for the Stung

Treng Ramsar Management Plan. The workshop included participation from various NGOs, such as WorldFish, WWF, FACT, CEPA, CRDT, Mekong of Wonder, and UNESCO.

The draft management action was presented to the STRS management plan development working group, allowing them to provide feedback and integrate their suggestions into the final management plan.

Additionally, IUCN's technical team reviewed the management plan to ensure alignment with the requirements outlined under the Ramsar Convention.

2 ECOLOGICAL CHARACTER DESCRIPTION

2.1 Ecological character

Contracting Parties to the Ramsar Convention are expected to manage their wetlands, including Ramsar Sites, to maintain their ecological character. The Ramsar Convention has defined ecological character as “the combination of the ecosystem components, processes, and benefits/services that characterize the wetland at a given point in time.”

Given the definition above, a change in the ecological character of wetlands is defined as “the human-induced adverse alteration of any ecosystem components, processes, and benefits/services.” To understand whether there has been a change in ecological character, it is essential to define and describe the ecosystem components, processes, and services within the management plan.

As a part of the management plan development process, the Ramsar Management Effectiveness Tracking Tool (R-METT) was conducted to assess the status of the Ramsar Site. The assessment illustrated the current ecological character status of STRS has been under threat in high concern and decreasing trend which required conservation actions (immediate, short-term, medium-term, and long-term) to address those threats.

The wet season flow deficits compared to the average 2008-2017 indicate that tributary in-flows are lower than normal, and dry season water levels are higher than the historical and 2008-2017 average, indicating that upstream dams are releasing water during the dry period. These changes caused most deep pools to become shallow and resulted in the continuous dieback of acacia trees, which play a vital role in providing habitats and sustenance for various bird and fish species. The acacia trees with strangler figs, some as tall as 25 meters, change with the seasonal fluctuations of the river. When the Mekong swells with monsoon rains and the trees become submerged and lose their leaves. When the water levels drop during the dry season, typically from October to early May, the trees dry out and grow new leaves (Herranz Muñoz et al., 2023).

The loss of inundated forests exacerbates the ecological imbalance, while the disappearance of mega fish species, like the Mekong Giant Catfish, signifies the severity of the challenges faced. Moreover, the declining rare species populations, including the White-shouldered Ibis, Giant Softshell Turtle, Mekong Giant Stingray, River Tern, and otter species, raise concerns about the long-term viability of these important ecological components.

2.2 Qualifying features under the Ramsar Convention

STRS was designated as a Ramsar Site on 23 June 1999, meeting four of nine criteria under the Ramsar Convention, namely Criteria 1, 2, 4, and 8. A review was conducted as part of the management planning process to evaluate the status of the site concerning satisfying these criteria

and to assess whether the site may qualify under additional criteria.

Criterion 1: *A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.*

The area provides a unique example of wetlands in the middle stretches of the Mekong River. It hosts a biogeographic region encompassing a wide area of seasonally exposed vegetation. The wetland mosaic at the site lends itself to high ecological diversity due to several different habitats ranging from permanently and seasonally flooded environments as well as dry dipterocarp forests away from the direct influence of the river itself. The area is distinct in its fluctuating elevation, giving rise to areas of swift rapids, falls, and deeper pools. However, areas within stretches of large river ecosystems are under threats from illegal fishing, dam operations, and land use change, (Kong, 2022).

Criterion 2: *A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.*

STRS supports a variety of vulnerable, endangered, or critically endangered species. Based on consultation with the local community, local experts, and NGO partners, at least 25 species of conservation concern are found within the site (Table 4).

Table 4 Vulnerable, endangered, and critically endangered species in STRS Key:

Red List: DD: Data Deficient; LC: Least Concern; NT: Near Threatened; VU: Vulnerable; EN: Endangered; CR: Critically Endangered; EW: Extinct in the Wild; EX: Extinct; NE: Not Evaluated

National Status: R: Rare; M: Moderate; C: Common

Current Status: P: Present – recorded in surveys/studies; A: Absent – Not recorded in recent published data; U – Unknown.

English name	Scientific name	Red List	CITES	National status	In original RIS	Current status*	Habitats	Notes
Fishes								
Giant Mekong catfish	*Pangasianodon gigas*	CR	I	R	Y	A	Deep pools and main channel pools	Local consultation (2022), fish expert consultation (2022)
Giant freshwater stingray	*Urogymnus polylepis*	EN	N/A	R	Y	P	Deep pools and main channel pools	IFReDI (2022) Local consultation (2022)
Small-scaled mud carp	*Cirrhinus microlepis*	VU	N/A	R	Y	A	Deep pool, main channel pool, flooded forest and shrub	Local consultation (2022), fish expert consultation (2022)

English name	Scientific name	Red List	CITES	National status	In original RIS	Current status*	Habitats	Notes
No English name (Local name: Trei Papean)	*Hypsibarbus lagleri*	VU	N/A	R	Y	A	Main channel pools, flooded forest and shrubs	Local consultation (2022), fish expert consultation (2022)
No English name (Local name: Trei Kanchoss kdoang)	*Mystus bocourti*	VU	N/A	R	Y	A	Main channel pools, flooded forest and shrubs	Local consultation (2022), fish expert consultation (2022)
Elephant ear gourami	*Osphronemus exodon*	VU	N/A	R	Y	A	Main channel pools, flooded forest and shrubs	Local consultation (2022), fish expert consultation (2022)
Pangasid-catfish	*Pangasius sanitwongsei*	CR	N/A	R	Y	A	Main channel pools, flooded forest and shrubs	Local consultation (2022), fish expert consultation (2022)
Yellow tail brook barb	*Poropuntius deauratus*	EN	N/A	R	Y	A	Main channel pools, flooded forest and shrubs	Local consultation (2022), fish expert consultation (2022)
Mekong herring	*Tenualosa thibaudeaui*	VU	N/A	R	Y	A	Main channel pools, flooded forest and shrubs	Local consultation (2022), fish expert consultation (2022)
Giant carp (barb)	*Catlocarpio siamensis*	CR	N/A	R	N	P	Deep pools, main channel pools, flooded forest and shrubs	Local consultation (2022), fish expert consultation (2022)
Reptiles								
Siamese crocodile	*Crocodylus siamensis*	CR	I	R	Y	A	Main channel pools, flooded forest and shrubs	Local people (2022) reported no evidence in recent years. Research is required to confirm it.
Cantor's giant softshell turtle	*Pelochelys cantorii*	CR	II	R	N	A	Sand bars	Local community and expert consultation (2022)
Southeast Asian softshell turtle	*Amyda cartilaginea*	VU	II	R	Y	A	Sand bars	Local community and expert consultation (2022)

English name	Scientific name	Red List	CITES	National status	In original RIS	Current status*	Habitats	Notes
Elongated tortoise	*Indotestudo elongata*	CR	II	M	N	A	Forest Land – DD forest	Local community and expert consultation (2022)
Asian box turtle	*Cuora amboinensis*	EN	II	M	N	A	Creeks and ponds	Local community and expert consultation (2022)
Black marsh turtle	*Siebenrockiella crassicollis*	EN	II	M	N	A	Creeks and ponds	Local community and expert consultation (2022)
Birds								
Green peafowl	*Pavo muticus*	EN	II	C	Y	A	Mixed and semi-evergreen forest	Local community and expert consultation (2022)
White-shouldered Ibis	*Pseudibis davisoni*	CR	N/A	R	Y	A	Inundated forest, woodlands, Anogeissus trees reaching 25m or more in height	Mittermeier et al. (2019) Local consultation (2022) and bird expert consultation (2022)
River tern	*Sterna aurantia*	VU	N/A	R	Y	P	Sand bars	WWF 2019 Local consultation (2022) and bird expert consultation (2022)
Lesser adjutant	*Leptoptilos javanicus*	VU	N/A	M	Y	P	Flooded forest	Mittermeier et al. (2019) and bird expert and local consultation (2022)
Alexandrine parakeet	*Psittacula eupatria*	NT	II	M	N	P	Inundated forest, woodlands, Anogeissus trees reaching 25m or more in height	Local consultation (2022) and bird expert consultation (2022)
Mekong wagtail	*Motacilla samveasnae*	NT	N/A	R	N	A	Sand bars and shrub lands	Bird expert consultation (2022)
Great thick-knee	*Esacus recurvirostris*	NT	N/A	R	N	P	Sand bars and shrub land	Bird expert consultation (2022)

English name	Scientific name	Red List	CITES	National status	In original RIS	Current status*	Habitats	Notes
Grey-headed fish eagle	*Ichthyophaga ichthyaetus*	NT	II	R	N	P	Inundated forest, woodlands, Anogeissus trees reaching 25m or more in height	Local consultation (2022) and bird expert consultation (2022)
Spotted greenshank	*Tringa guttifer*	EN	I	N/A	N	P	Sand bars and shrub land	Mittermeier et al. (2019) and bird expert consultation (2022)
Mammals								
Smooth-coated otter	*Lutrogale perspicillata*	VU	I	M	Y	A	Creeks and main channel pools	Local consultation (2022)
Long-tailed macaque	*Macaca fascicularis*	VU	N/A	C	N	P	Inundated forest, woodlands, Anogeissus trees reaching 25m or more in height	Local community and expert consultation (2022)
Germain's silver langur	*Trachypithecus germaini*	EN	N/A	M	N	P	Inundated forest, woodlands, Anogeissus trees reaching 25m or more in height	Local community and expert consultation (2022)
Pileated gibbon	*Hylobates pileatus*	EN	I	R	N	P	Semi-evergreen forest in some larger islands	Local community and expert consultation (2022)

Criterion 4: *A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.*

STRS is home to a wide diversity of birds. It is a resident and breeding habitat of a least 20-30 Critically Endangered white-shouldered ibis (*Pseudibis davisoni*). The sandbars within the river channel support breeding river terns (*Sterna aurantia*), the Near Threatened great thick-knee (*Esacus recurvirostris*) and the Cantor's giant softshell turtle (*Pelochelys cantorii*). Many of the deep pools in STRS provide the last natural refuge, feeding and spawning habitats for megafish such as the Mekong giant catfish (*Pangasianodon gigas)* and the giant carp (*Catlocarpio siamensis*) and broodstock species.

Criterion 8: *A wetland should be considered internationally important if it is an important source of food for fish, spawning ground, nursery and/or migration path on which fish stocks,*

either within the wetland or elsewhere, depend.

This site contains many deep pool areas that provide critical refuges for migratory fish species such as the Siamese mud carp (*Henicorhynchus siamensis*) and the notched mud carp (*Henicorhynchus cryptopogon*) during the dry season. Inundated islands and forests also provide an important food source and refuge area for fish during peak flows in the wet season.

2.3 Ecological components: Habitats and land uses

The site occupies an area on the Mekong River floodplain and is subject to the seasonal hydrology of the region. Recent land use analysis shows that the STRS comprises the following six main habitat types or land uses (see the definition of each habitat in Table 5):

1. Agriculture land (paddy rice, farming, and annual crops)
2. Settlements (village centre and nearby home garden vegetation)
3. Barren land (thin soil, bare rock)
4. Shrubland and semi-flooded forest
5. Intact forest (deciduous forest and semi-evergreen forest)
6. Water (river channels and deep pools)

2.3.1 Agricultural land

Agriculture and secondary formations are widespread and often predominant in the terrestrial areas and some larger islands. Most agriculture is generally found in the form of paddy rice, farmed land, and annual crops.

2.3.2 Settlements

Residents (Khmer people with some Lao migrants) have lived within STRS since before its establishment as a protected area. Various housing structures have been built along the river bank and larger islands, including village centers, homes, and gardens.

2.3.3 Barren land

Sand features are widespread within the channel and take several forms. Most sandbanks remain bare of vegetation. On some higher sandbanks, there is abundant grass growth, especially tall cane grasses. Channel mosaic areas contain a mix of various habitat types. They have heterogeneous substrates with varying heights above the dry season minimum water level.

2.3.4 Shrubs and channel bushlands

These bushlands are totally submerged during the high-flow season. Bushlands take on several forms characterized by a variety of shrub species, substrates, and hydrological conditions. Some of the most striking bushlands are dominated by *Phyllanthus cf. P. jullienii*, mainly occurs in channel areas that are exposed for only short periods, such as in Preah Sakhon, where the current is swift when inundated, and the substrate is mainly rock. Another type of bushland is dominated by *Telectadium cf. T. edule* which occurs in rocky channel areas. Other areas of bushland are more mixed and in these *Homonoia cf. H. riparia* is common, along with both *Telectadium* and *Phyllanthus*.

Riparian habitats include gallery forests and tall floodplain grasslands. As with riverbank

vegetation, riparian 'gallery' forests have been heavily modified and cleared. Most riparian areas are now a mix of agriculture (of various ages) and relatively short, dense secondary vegetation.

Scattered throughout the terrestrial habitats (including on many of the larger islands), but particularly in areas of deciduous dipterocarp forest are small grasslands and pools. The distribution of small grasslands and pools varies, some areas are particularly rich in them, while in other areas they are scarce. The grasslands are found in varying sizes, but have much shorter swards than the floodplain grasslands, presumably due to a combination of factors, including local hydrology and soils, for example, soils that are easily saturated in the wet season, but have poor moisture retention in the dry season, ungulate grazing and historical patterns of human land-use such as those areas repeatedly used for rice paddies.

The invasive alien species *Mimosa pigra* is present at the site, favouring mostly disturbed areas of river bank, where the natural vegetation has been removed. It is also present, sometimes as the sole species, on seasonally exposed sand islands, though they only appear to be one season old. This suggests the species does not cope with inundation and is therefore having minimal impact on vegetation dynamics of the sand features (Timmins 2006).

2.3.5 Forest land

One of the most unique channel habitats is the channel woodland, dominated by the tree *Anogeissus rivularis*. The branches and trunks of the trees are swept horizontally in the direction of wet season water flow and the crowns of the trees, which are lower than the maximum flood level, become totally submerged during the wet season. In other places *Anogeissus* trees take on a different form with taller trees reaching 25 m or more in height.

During the wet season (May-October), areas of the riparian forest become inundated, creating a seasonal inundated forest. The inundated forest has a height of 15-30 meters, and includes water jambolana (genus *Syzgium*), freshwater mangrove (*Barringtonia acutangula*), banyan tree (*Ficus benghalensis*), *Crataeva nurvala*, and swamp bushwillow (*Combretum trifoliatum Vent*).

The riverine or gallery forest runs along the river banks and the larger islands and deciduous dipterocarp forests are mostly outside of the Ramsar site, but nearby. These forest are dominated by a small number of dipterocarp species (*Shorea siamensis, S. obtusa, Dipterocarpus tuberculatus, D. obtusifolia, D. intricatus)* that lose their leaves in the dry season. The mixed deciduous forest is similar to semi-evergreen forests but with a higher proportion of deciduous species. Its occurrence in the Ramsar site is therefore open to debate and not well documented. A further vegetation type common in the Ramsar site is dense stands of bamboo. This occurs where the original vegetation has been cleared. It is common along the river banks and throughout the villages. The semi-evergreen forest is mostly outside but close to the northwest part of the Ramsar site. The occurrence and distribution of this forest type are not well known in the Ramsar site, but it does occur along the road to O'Svay and the Lao border. It may also occur on some larger islands in STRS.

2.3.6 Water (permanent channels and deep pools)

The aquatic habitats in the permanent channel take several forms and these differ by season. The aquatic habitats are most visually diverse in the dry season, with long sections of the channel becoming narrow, fast flowing and turbulent. The narrow (<100m) sections of the

main channel have a depth of well over 15 m. Other sections remain wide and shallow with a slow current. The deep pools occur at several points in the Ramsar site, and range in depth from 30 m to 77 m (Viravong et al. 2006). A survey conducted as part of an R-METT assessment (updated in 2022) demonstrated that there are 92 deep pools within STRS, which provide key habitats for a variety of fish species.

Channel mosaic areas, as the label suggests, are mosaic areas of channels and small islands. They have heterogeneous substrates with varying heights above the dry season minimum water level. Such areas are the richest parts of the channel for plant species.

Table 5 Habitats of STRS

Main Habitats	Definition	Example Habitats
Agricultural land	- Paddy rice – cultivated and managed vegetation with field size ranging from 0.2 – 2.0 hectares; - Annual crops - herbaceous growth forms, cultivated and managed vegetation; - Shifting cultivation - temporary sequence between herbaceous growth forms of cultivated and managed vegetation and woody growth forms of natural/semi-natural vegetation	Paddy rice, farmed land, and annual crops
Settlement	Built-up areas	Village centres, homes, and gardens
Barren land	Bare soil, often with coarse mineral fragments	Thin soil, sandbars, and rocks
Shrubland	Shrubs, natural or semi-natural vegetation, covering 10–80% of the area	Shrub/channel bushland, grassland and seasonally inundated vegetation
Forest land	- Broadleaf Deciduous Forest –tree cover 10-100% of the area; natural or semi-natural vegetation; deciduous and broadleaved plants - Broadleaf Evergreen Forest –tree cover 10-100%; natural or semi-natural vegetation; evergreen.	Channel woodland, mixed deciduous, deciduous dipterocarp forest, evergreen or semi-evergreen forest.
Water body	Water	The main channel, shallow and deep pools; sandy and rocky bed channels.

2.3.7 Land Use Change

Over the last six years, between 2016 and 2022, STRS has witnessed significant land use change due to agricultural land expansion, upstream hydropower dam operation altered hydrological flows, riverbank erosion, and shrubland and intact forest loss. The changes are described in Table 6 and summarised in Table 7 and also in Figure 2 and Figure 3.

Table 6 Land use changes between 2016 and 2022.

Habitat	Year		Change over 6 year period	Reasons for change	Location of changes
	2016	2022			
Agri-culture	519 ha	948 ha	*Increased* by 430 ha: - 115 ha from barren land, - 232 ha from forest land - 85 ha from shrubland *Decreased* by 2.49 ha to settlement.	Agriculture land expansion has accelerated due to illegal land encroachment to meet the growing demand for industrial and cash crops. Immigrants from Kampong Cham, Prey Veng, and Kratie provinces have purchased land for farming and can encroach on the site due to a lack of site zonation and boundary demarcation. The commonly grown crops are paddy rice and farm crops such as lemon, cashew nut, cassava, pomelo, green sweet orange, tangerine, corn, soybeans, green beans, black sesame, peanut, sweet potato, banana, coconut, pineapple, mango, watermelon, tobacco, and tamarind.	Agriculture expansion has taken place in several residential areas and larger island areas across STRS, particularly in Koh Tonlemoi (paddy rice) and Koh Snaeng, Koh Han, Koh Lai, Koh Salao, Koh Khonhang and Koh Sanamchee.
Settle-ment	629 ha	675 ha	*Increased* by 45 ha:	Increase in settlement areas was the result of local population growth,	Koh Phnov, Ou Run, Choam Thom, Koh Hip, Koh Kei, Koh

			- 2 ha from agriculture, - 3 ha from barren land, - 37 ha from shrubland, - 3 ha from forest land.	from family expansion and immigration, with an annual growth rate of 3%.	Snaeng, Kham Phann, Koh Khandin, Thmey and Veal Ksach villages.
Barren Land	641 ha	1,076 ha	*Increased* by 436 ha: - 511 ha from shrubland, - 27 ha from forest land, - 15 ha from water body *Decreased* by 117 ha: - 114 ha to agriculture - 3 ha to settlement.	The change is the result of new emerging sandbar areas, which changed from shrubland and forest land and water bodies. In addition, some barren land was converted to agricultural land at Koh Salao of Ou Run village and Koh Tonlemoi of Koh Snaeng village.	New sandbars have emerged in the upper and middle islands of STRS, particularly in Krolapeas, Ou Run, Veunsean, and Koh Hib (Koh Reussei, Koh Kalai & Koh Hib) villages.
Shrub-land	6,532 ha	5,898 ha	*Decreased* by 634 ha: - 511 ha to barren land - 85 ha to agriculture - 38 ha to settlement	The disappearing shrubland has been mostly lost to barren land, agriculture, and settlements, due to population growth and illegal land encroachment.	The upper and middle islands STRS in Krolapeas, Ou Run, Veunsean (Koh Reussei), and Koh Hib (Koh Kalai & Koh Hib) villages.
Forest Land	2,051 ha	1,790 ha	*Decreased* by 262 ha: - 232 ha to agriculture - 3 ha to settlement - 27 ha to barren land.	Forest areas have mostly been lost to conversion to agricultural land, for cashew nut and cassava farming, due to market demands. Some parts of intact forests have changed to barren land. The local MoE ranger, Mr. Phok Nimol, and local villager, Mr. Kong Chanthy, reported that the change might be due to the continued dying of woodland/gallery inundated forest such as the locally known Duem Anchheng (*Anogeissus rivularis*), Duem Chrey (*Ficus spp.*) and Duem	Local ranger, Mr. Nimol, said that the continued dying of trees might be caused by the recent dry season hydrology change. He also observed that there are a lot of new seedlings along the channel banks around the upper islands of STRS, particularly in Veun Sean, Ou Run and Preah Sakhon of Krola Peas villages of Ou Svay and Preah Romkel communes, Borey Ou Svay Senchey district. However, according to Mr. Ly Mina, the

				Thmea (*Acacia harmandiana*), which is potentially caused by the changes in dry season flows due to upstream hydropower dams. They added that since 2019, the dry season flows in STRS have increased by 1-1.5 meters higher than the normal level, due to the dry season water release from Don Sahong dam operation.	governor of Borei Ou Svay Senchey district, the Provincial Department of Rural Development plan to build a new 50km road line along the eastern riverbank of STRS. This new road would act as a physical barrier to flooded forest migrating to higher and drier land. Forest land changed to agriculture land, reflecting the agricultural expansion areas found in Koh Tonlemoi (paddy rice) and Koh Snaeng of Koh Snaeng village, Koh Han and Koh Lai of Kham Phan village, Koh Salao of Ou Run village, Koh Khonhang of Veunsean village and Koh Sanamchee of Veal Ksach village.
Water Bodies	4,593 ha	4,578 ha	*Decreased* by 15 ha to barren land	Water bodies have decreased by 15 ha to barren land with new emerging sandbars. The change reflects the hydrological changes in the river, as mentioned above, due to upstream dam operation and climate change.	Veunsean (Koh Reussei), Koh Hib and Choam Thom, Koh Sralao villages.

Table 7 Land Use Change in 2016 and 2022

Class Code	Class Name	2016		2022		Relative change	
		ha	%	ha	%	ha	%
1	Agriculture land	518.80	3.47	948.31	6.34	429.51	2.87
2	Settlement	629.38	4.21	674.52	4.51	45.14	0.30
3	Barren land	640.55	4.28	1,076.05	7.19	435.50	2.91

4	Shrubland	6,532.00	43.65	5,898.21	39.41	(633.79)	(4.24)
5	Forest land	2,051.13	13.71	1,789.56	11.96	(261.56)	(1.75)
6	Water body	4,592.91	30.69	4,578.11	30.59	(14.80)	(0.10)
Total		14,964.76	100.00	14,964.76	100.00	0.00	0.00

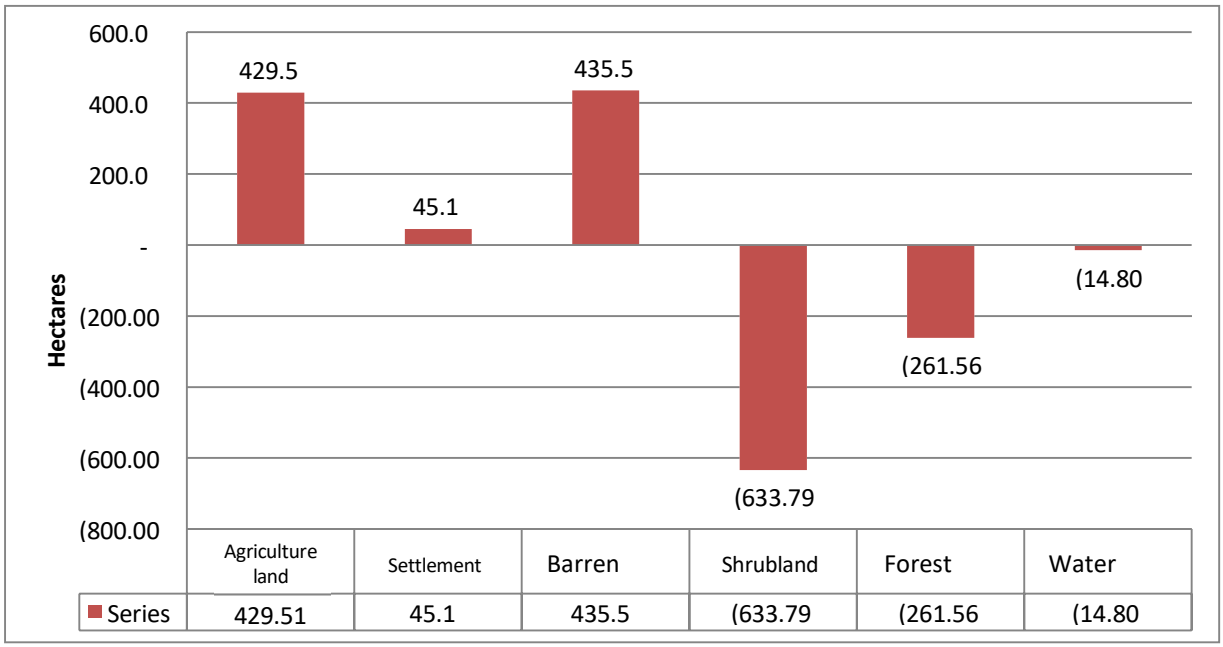

Figure 2 Relative land use change (hectares) 2016 to 2022

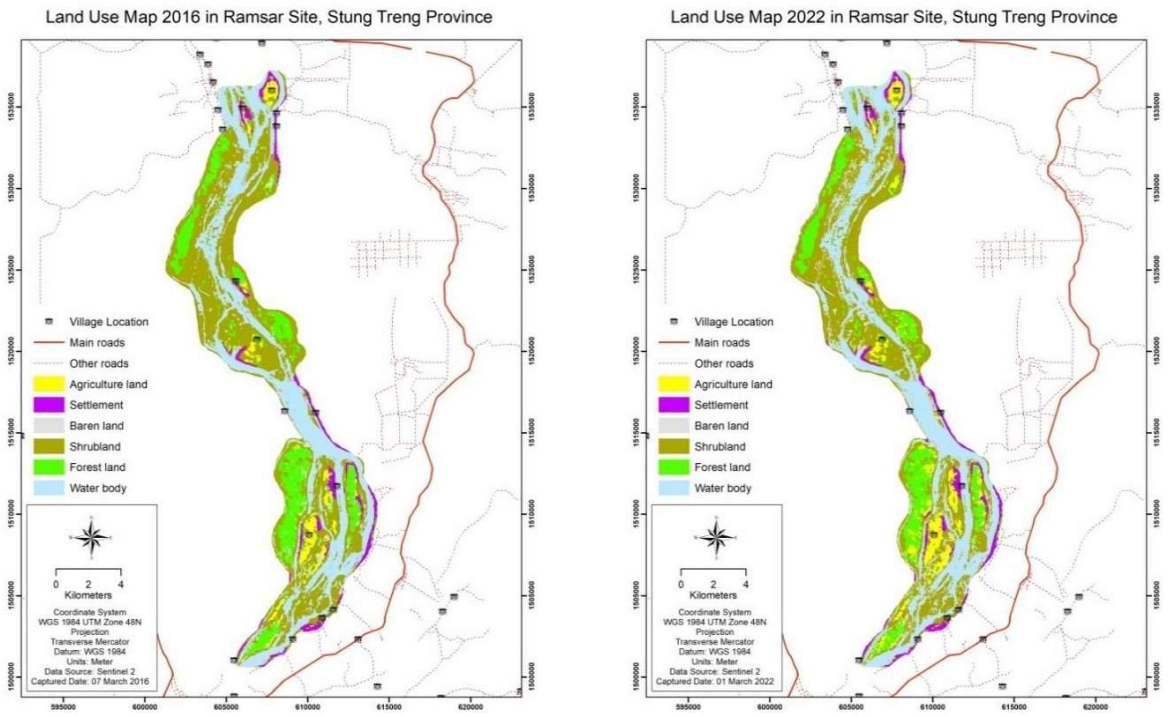

Figure 3 Land Use 2016 and 2022 in Stung Treng Ramsar Site

2.4 Ecological components: Flora

The Ramsar site and adjacent terrestrial areas have a variety of distinctive vegetation types. These occur because of the differing ecological conditions created by the Mekong River channel, the seasonally flooded sandy and rocky islands of the river bed, and the northern and eastern plains through which the river flows. Much of this vegetation, away from the river, is minimally disturbed and provides attractive landscapes for ecotourism with high wilderness appeal. This variety of vegetation is the basis for much of the animal diversity that occurs within and adjacent to the Ramsar site.

The Ramsar site and adjacent areas have the following distinct vegetation types (Rundel, 1999):

- forests on the seasonally flooded sandy and rocky islands;
- riverine or gallery forest along the river banks and the larger islands;
- deciduous dipterocarp forests mostly outside but close to the Ramsar site;
- semi-evergreen forest mostly outside but close to the Ramsar site.

The important forest communities in the area are locally known as “Deum AnChenh” *Anogeissus rivularis* and are considered to contain the only species of tall trees in the area, however, most areas of commercially valuable timber species at the site have already been removed (Allen et. al 2008). The dominant tall trees on the channel areas are extremely resilient to the harsh conditions of the site and have seemingly site-specific adaptation measures. *Anogeissus* spp. are striking in appearance with their branches swept horizontally with the flow of the current. These trees support abundant mistletoe growth and seem to be the predominant host tree for strangler figs (Timmins 2006). *Acacia harmandiana* dominate

sandier substrates that are subject to relatively long periods of seasonal drying and will experience significant leaf drop towards the end of the dry season.

The exotic *Mimosa pigra* is present at the site, favouring mostly disturbed areas of river bank where the natural vegetation has been removed. It is also present, sometimes as the sole species, on seasonally exposed sand islands though only appear to be one season old. This suggests the species does not cope with inundation and is therefore having minimal impact on vegetation dynamics of the sand features (Timmins 2006).

A 2011 study confirmed that the Ramsar Site is home to up to 96 plant species, 11 species of which are herbal, 33 species are vines, 13 are softwood species and 39 are hardwood species (CEPA 2011).

2.5 Ecological components: Fauna

Studies of fauna within STRS have been limited in recent years. Table 8 summarises the state of the knowledge for different taxa within the site. Historically, the site has been studied in more detail for mammals, birds, reptiles and fish (Try and Chambers 2006).

Table 8 Studies of fauna in STRS

Taxa	Date of last survey	Comment
Mammals	Unknown	Limited knowledge of mammals. Incidental reporting in Ladd et al. (2022).
Birds	2018	Survey site at the southernmost part of the site. Limited knowledge on multiple species within the site. River tern surveys conducted along the Mekong and Sekong River.
Fish	2022	Report synthesised catch data, recent reports and surveys and public consultation.
Reptiles	Unknown	Limited knowledge and data deficiences for reptiles.
Amphibians	Unknown	Limited knowledge and data deficiencies for amphibians.
Invertebrates	Unknown	Very limited knowledge on invertebrates. Assessment on patterns of spatial variation in macroinvertebrate assemblages in the Lower Mekong Basin (Sor et al, 2017), but specific to only Stung Treng Ramsar Site.
Invasive species	Unknown	Incidental and anecdotal reporting of water hyacinth *Eichhornia crassipes* and golden apple snail *Pomacea canaliculata*

2.5.1 Mammals

There is limited data on mammal species at STRS, with no systematic studies completed in recent years. A 2006 assessment recorded a number of large mammals in the Ramsar site. Long-tailed macaque (*Macaca fascicularis)* and Germain's silver langur (*Trachypithecus cristatus*) were confirmed at the site low numbers. Other mammal species historically recorded include sambar (*Rusa unicolor*), dhole (*Cuon alpinus*), pileated gibbon (*Hylobates pileatus*), red muntjac (*Muntiacus muntjak*), black giant squirrel (*Callosciurus finlaysonii*), smooth-coated otter (*Lutrogale perspicillata*) and the Siamese hare (*Lepus peguensis*).

Stung Treng Ramsar Site has been significant for supporting the Mekong River Irrawaddy dolphin (*Orcaella brevirostris*). The area including STRS has been identified as being a buffer zone between two core zones for the protection of this iconic species (Thomas and Gulland, 2017). However, recent reports from the area highlight that the last remaining Mekong Irrawaddy Dolphin died in a fishing net in February 2022.

2.5.2 Birds

There have been 231 bird species recorded at STRS, including the following: Siamese fireback (*Lophura diardi*) (LC), green peafowl (*Pavo muticus*) (EN), wreathed hornbill (*Aceros undulatus*) (LC), great hornbill (*Buceros bicomis*) (NT), river tern (*Sterna aurantia*) (VU), grey-headed fish eagle (*Icthyophanga ichthyaetus*) (NT), Oriental darter (*Anhinga meleanogaster*) (NT), great cormorant (*Phalacrocorax carbo*) (LC), and the Indian cormorant (*Phalacrocorax fuscicollis*) (LC). Three species of large waterbirds, the great cormorant, the Indian cormorant, and the Oriental darter are commonly seen feeding along Mekong River, especially in the Ramsar Site. These water birds are migratory birds, visiting the wetland for feeding at the beginning of the wet season and during the dry season, and found throughout the Ramsar Site.

At least 95 bird species were recorded by a Darwin project team during a three-week field assessment in 2007. Apart from the species mentioned in under the Ramsar designation Criterion 2, the following key species were also listed: river tern (*Sterna aurantia*) (LC), grey-headed fish eagle (*Ichthyophaga ichthyaetus*) (NT), Oriental darter (*Anhinga melanogaster*) (NT), Mekong wagtail (*Motacilla samveasnae*) (LC), spot-billed pelican (*Pelecanus phillippensis*) (NT), and great thick-knee (*Esacus recurvirostris*). This assessment estimated that the site is a resident and breeding habitat of at least 20-30 white-shouldered Ibis (CE).

Figure 4 Wetland birds at STRS

2.5.3 Amphibians

Amphibian species richness in the area around STRS is known to be between 20-25 species (Geissler et al., 2015). However, there is very limited data on amphibians within the site.

2.5.4 Reptiles

The wetlands habitat remains as a suitable habitat for several globally threatened reptile species such as Cantor's giant softshell turtle (*Pelochelys cantorii)*, Asiatic soft-shelled turtle (*Amyda cartilaginea)*, elongated tortoise (*Indotestudo elongata)*, Asian box turtle (*Cuora amboinensis)*, and black marsh turtle *(Siebenrockiella crassicollis)* (S.Sitha per comm. 2022). The other reptile species known to be present include Bengal monitor (*Varanus bengalensis)* and water monitor (*Varanus salvator)*. In 2022, local people reported no evidence of Siamese crocodiles (*Crocodylus siamensis)* in recent years, and they are likely locally extinct. Further research is required to confirm this.

2.5.5 Fish

The fisheries assessment (Kong, 2022) showed that 11 endangered and threatened fish species were encountered within the Stung Treng Ramsar Site (Table 4). A field consultation with local community fishers found that numbers of large-bodied fish species have decreased dramatically over the last ten years. However, among the 11 endangered species, four species have been found to have decreased at a worrying rate, namely *Lycothrissa crocodilus, Catlocarpio siamensis, Wallago micropogon and Incisilabeo behri*. Moreover, catch observations from 2015 to 2019 also found individuals to be relatively small in comparison with historical records, particularly for *Datrioides undeeimradiatus, Mekong erythrospila* and *Osphronemus goramy*. Moreover, there may be other threatened and endangered species in this critical habitat, therefore further scientific research is needed to better understand the capacity of the system and intra-species relationships, in order to inform future management actions.

2.5.6 Invertebrates

Eleven species of molluscs were found in the Ramsar Site in 2008. *Mekongia swainsoni flavida* and *Filopaludina martensi* species were very common in the channel woodland and sand bar. *Filopaludina martensi cambodjensis* are very common, found in seasonal pools (Allen et. al 2008). However, there are no current systematic studies of the invertebrates present within the site.

2.5.7 Invasive species

Mimosa pigra is reported to be present throughout Stung Treng Ramsar Site. This invasive species can be spread rapidly, throughout long distances in flood water and via natural grassland floodplain ecosystems. *M. pigra* has the potential to convert natural ecosystems to unproductive scrubland, which provides fewer benefits for biodiversity. The Golden Apple Snail (*Pomacea canaliculata*) is known to spread throughout the Stung Treng Ramsar Site and according to local villagers, the golden apple snail was introduced to the Ramsar site more than five years ago. Local villagers have collected this snail for family consumption and food fish in ponds, however this species is also reported to have impacts on rice paddy crops, leading to a loss in income for farmers.

2.5.8 Climatic functioning

Temperatures at STRS peak during March and April and are at their lowest during December and January. The minimum temperature is 16.3°C and the maximum temperature is 34.8°C. Annual rainfall at STRS can be more than 1600 mm, with the majority of the rain falling in the monsoonal period between May and November (Figure 5)

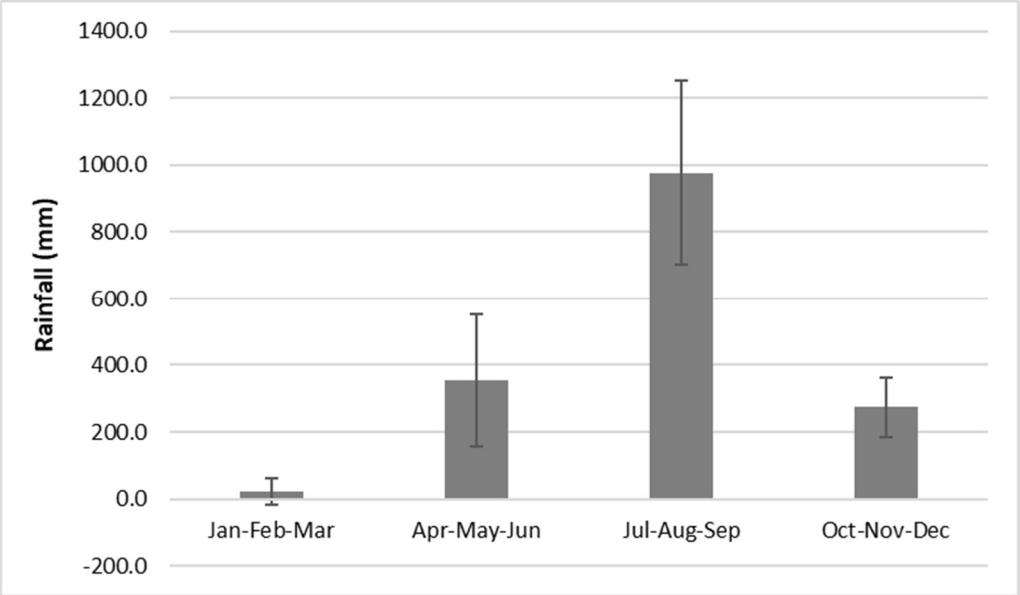

Figure 5 Mean rainfall at Stung Treng monitoring station 2007-2021.

(Data from Mekong River Commission and used under license. Standard deviation is shown).

2.5.9 Flood Pulse Hydrology

STRS has an overall catchment area of approximately 5,010 km^2. The main factor impacting the hydrology within the catchment and the flows received by STRS is the tropical monsoonal climate with its distinct dry and wet seasons. The site receives hydrological inputs from the Upper Mekong River and portions of the Lower Mekong River in Thailand and Lao PDR. The monsoonal climate drives an annual monomodal flood pulse along the Mekong, producing a distinct seasonality to the river flows (Figure 6). Over the last fifty years, the mean peak discharge in the river recorded at Stung Treng monitoring station has been 47,892m^3/s and the mean minimum flow during the dry season for the same period is 1,998m^3/s. When a longer-term perspective is considered, subtle changes are observed in the river flow (Figure 7). The annual maximum flow at Stung Treng has exhibited a progressive reduction over the last 100 years or so. Conversely, the annual minimum flows have slightly increased over the same period whilst the mean annual flow has remained relatively static. Studies on the wider Mekong River system have also highlighted this gradual reduction in flow in the river. Chua et al. (2022) indicated that between 2010 and 2019 there was a reduction in wet-season discharge at Stung Treng by 300m^3/s.

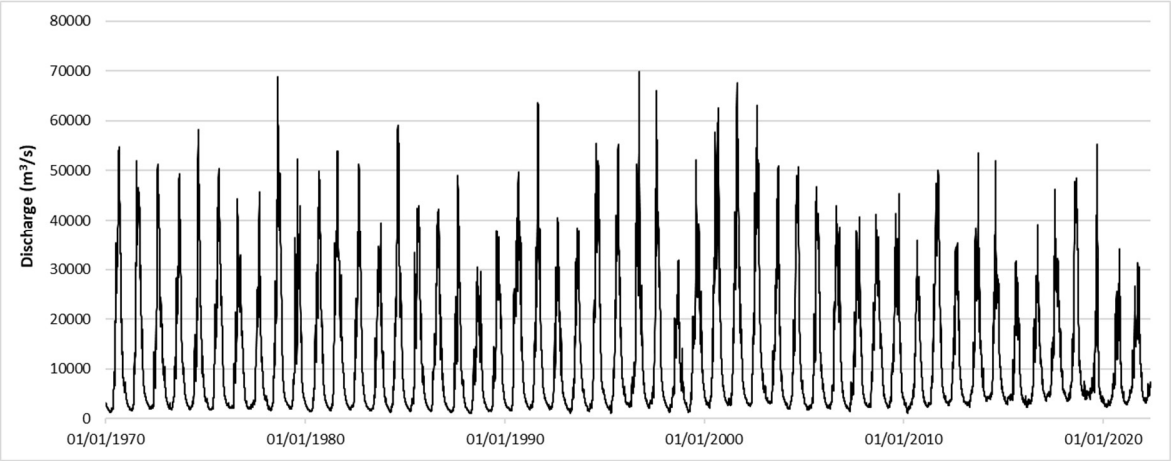

Figure 6 Daily discharge at Stung Treng monitoring station January 1970-May 2022.

(Data from Mekong River Commission and used under licence).

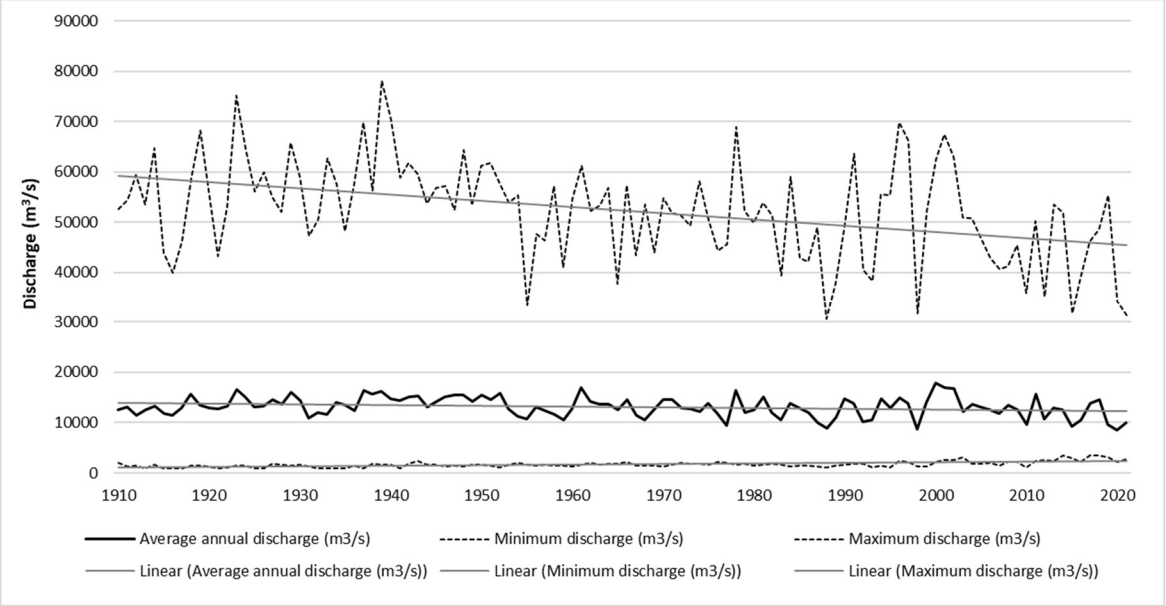

Figure 7 Long-term average annual, minimum and maximum discharge at Stung Treng monitoring station January 1910-May 2022.

(Data from Mekong River Commission and used under licence).

The river discharge regulates the inundation levels experienced across STRS and there is a close correlation between discharge and depth of flooding (Figure 8). At low flows, the relationship is slightly weaker, possibly reflecting the importance of local topography during the dry season. The flood pulse can raise water levels over 10m above the dry season level. The floodwaters inundated much of the surrounding floodplain forests, grassland, sand bars, and agricultural land. In addition, as the high-water levels extend across STRS, water can back up in the tributaries contributing to flooding in the surrounding areas. Any alteration in the flow regime, through climatic or anthropogenic factors, will have implications for the depth and extent of flooding within STRS and will impact the ecological character of the site. Furthermore, the storage of water at STRS during the wet season has implications for downstream water resource use and supply.

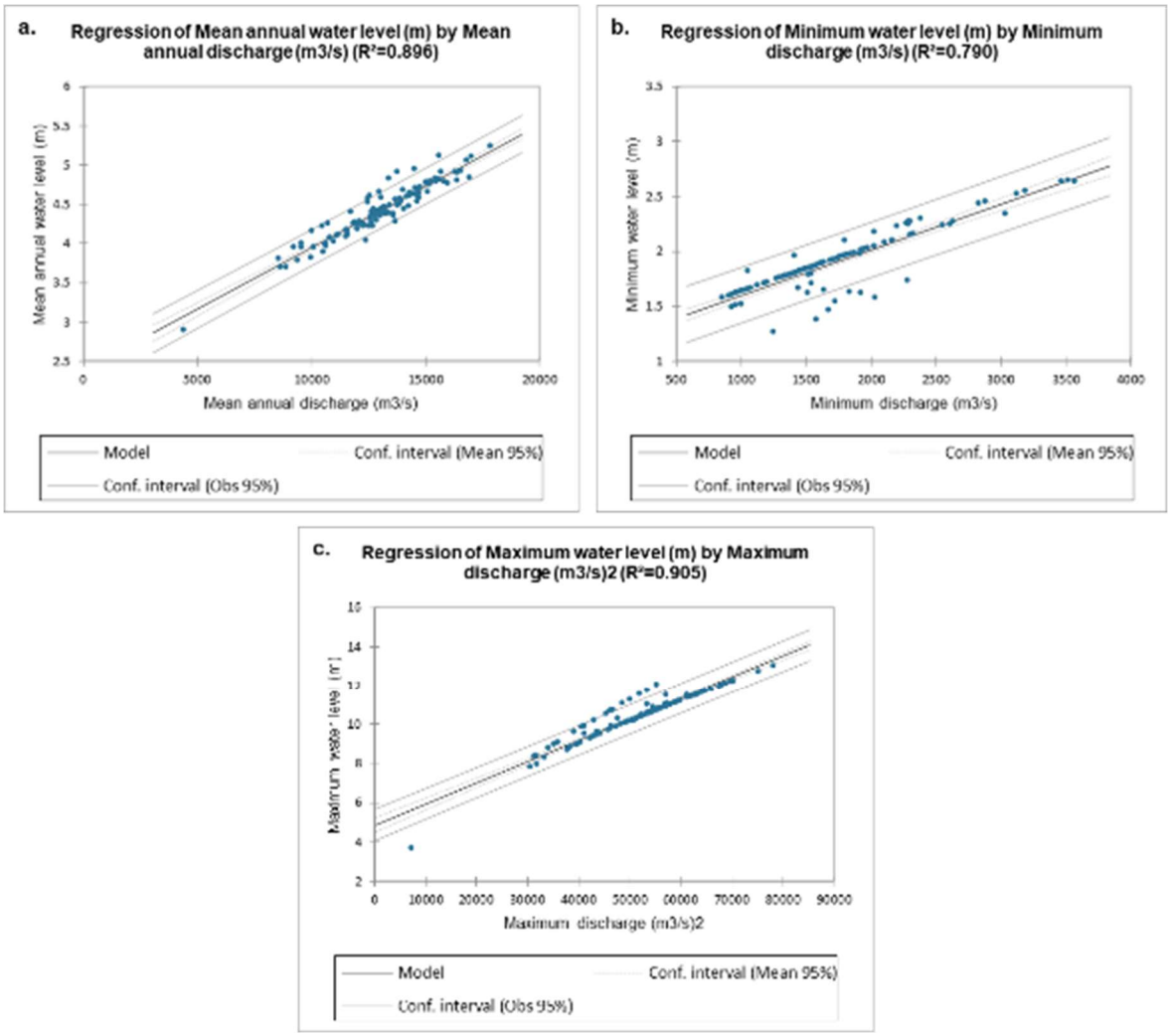

Figure 8 Relationship between mean river discharge and depth of flooding at Stung Treng monitoring station January 1910-May 2022

a. mean; b. minima; c. maxima. (Data from Mekong River Commission and used under licence).

The monomodal flood pulse hydrology is critical to the maintenance of the ecological character of STRS. Decreased water flows and a lowered incidence and extent of flooding at STRS could lead to several significant changes in the wetland system. For example, vegetation structure would likely change, particularly for the important wet grassland veals associated with the seasonal trapaengs (ponds). Similarly, the depth within and the connectivity among the important deep pools in the river system could result in impacts on the fish ecology.

Changes in the river discharge will also impact the distribution of energy across STRS. Water currents are stronger in the northern section of the site, where the riverbed is shallower, giving rise to rapids, riffles, and gravel beds, whereas the southern section comprises several deep pools, some of which attain depths of over 70m (Annex 3). During the dry season, when water levels are significantly lower, only the deeper pools and the larger channels provide habitats with relatively strong flow conditions. However, at low flows, along with permanently exposed islands, a mosaic of vegetated islands and sand bars are exposed, providing diverse habitats for a variety of animals.

2.5.10 Water quality

Overall, the water quality for human health at Stung Treng has been classified as 'excellent quality' between 2010 and 2019 (MRC 2022). The water quality rating for the protection of aquatic life has been classified as being 'good,' between 2010 and 2016, and as 'excellent' in 2017, potentially demonstrating an improvement.

The concentrations of nutrients at STRS are relatively low, from 2008-2021 (Figure 9).

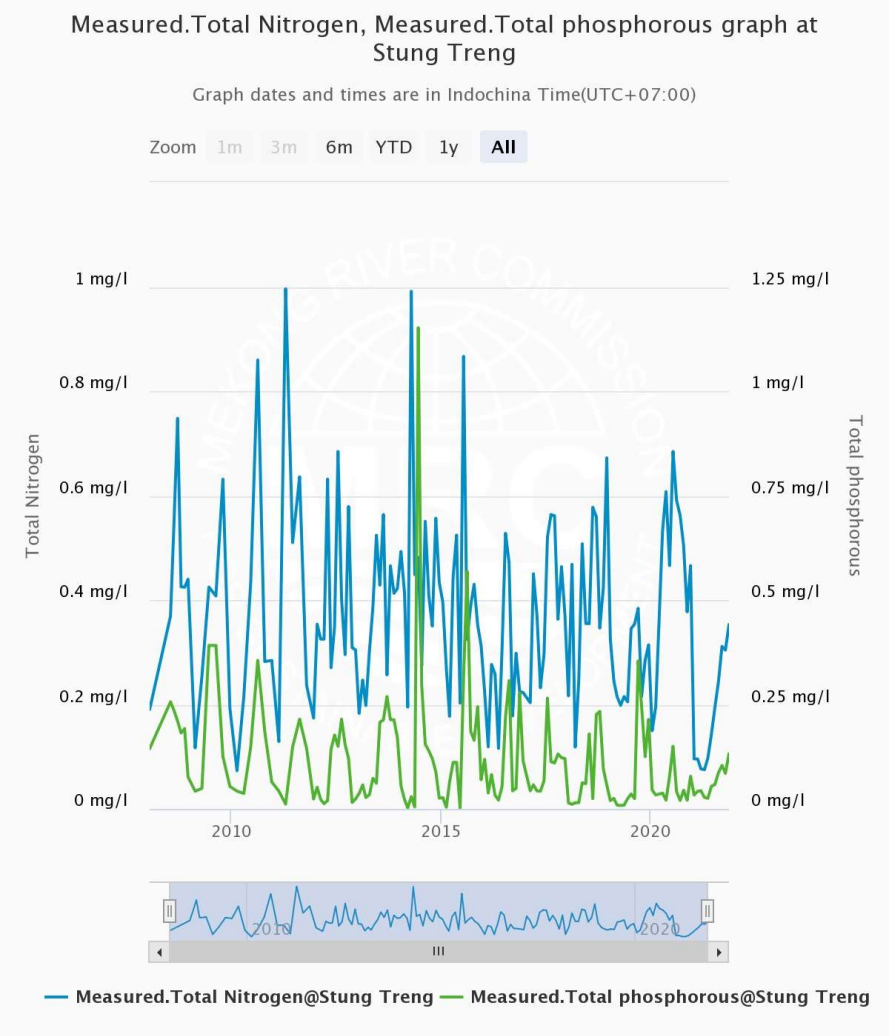

Figure 9 Measured total phosphorous (green) and total nitrogen (blue) at Stung Treng monitoring station January 2008 to November 2021.

(Graphs from Mekong River Commission).

2.5.11 Sediment dynamics

The sediment load in the river varies with the discharge and follows the annual wet-dry cycle (Figure 10). No discernible variation in the long-term sediment load is observed over the last 15 years. Base loads during the dry season are relatively low and characteristically less than 7mg/l. Peak sediment loads tend to be between 175 and 250 mg/l but with occasional peaks in excess of 40 mg/l.

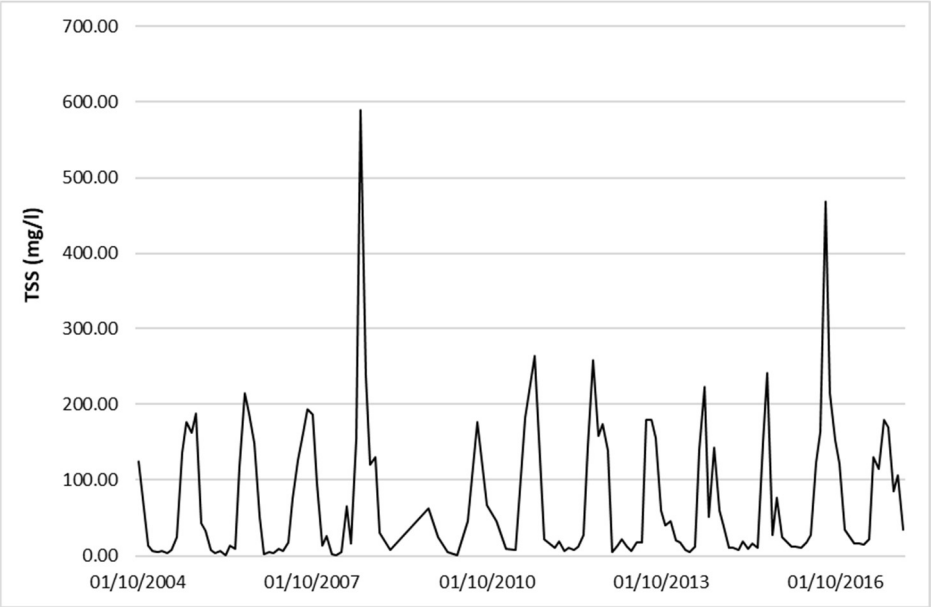

Figure 10 Total suspended sediments (TSS) at Stung Treng monitoring station October 2004- December 2017.

(Data from Mekong River Commission and used under licence).

There is a positive correlation between river discharge and sediment load, with sediment loads increasing as the river flows increase (Figure 11). Therefore, any alteration in the flow of the river could have an impact on the sediment loads, which in turn, could alter the overall sediment dynamics within the system.

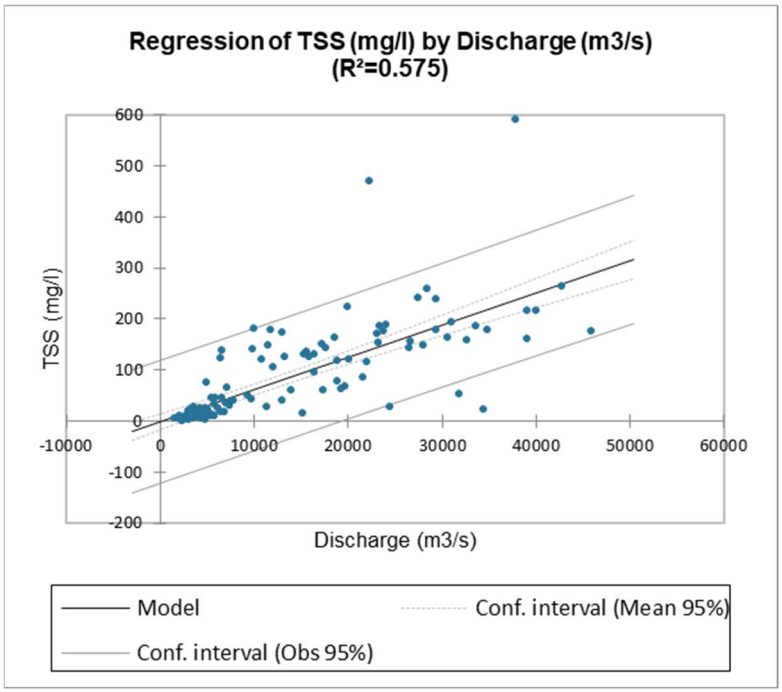

Figure 11 Relationship between mean river discharge and total suspended sediment at Stung Treng monitoring station October 2004- December 2017.

(Data from Mekong River Commission and used under licence).

2.5.12 Substrates

Shallow gravel beds and riffle sections in the north of the site increase water aeration and provide good spawning areas for fish. The soil substrates consist primarily of sand, rock, or pebbles, and bank substrates are akin to terrestrial soils and generally very silty (STRS, 2007). The variety of substrates within STRS contributes to supporting a diversity of ecological niches both within the aquatic and seasonally flooded environments.

2.5.13 Climate change

The mean annual temperature in Cambodia is predicted to increase between 0.013 and 0.036°C per annum by 2099 (Royal Government of Cambodia 2013). It is also likely that the wet season rainfall will increase in the future, but under some scenarios, it may decrease after the 2050s. Changes in rainfall and temperature will impact both the flows in the Mekong and the extent and duration of flooding at STRS. Furthermore, increases in the temperature will affect agricultural productivity, particularly rice production. This could have implications for land use within and around STRS.

2.6 Ecological functions

2.6.1 Introduction

Ecological functions arise through the interactions between biotic and abiotic processes in an ecosystem. A variety of ecological functions will exist in any wetland area; however, certain functions are more important than others and, therefore, need to be considered in the description of the ecological character of a site. The STRS will be supporting a variety of ecological functions. However, three ecological functions are highlighted as they are critical to supporting the overall ecological character of the site.

2.6.2 Habitat provision

The hydro-geomorphological dynamics of the Mekong River drive and maintain a variety of different habitats, such as permanent open water channels, dry sand bars, and seasonally inundated forests. Without human interventions, the hydro-geomorphology of the STRS would drive ecological functions such as successional change, vegetation diversity, and habitat connectivity. However, in parts of STRS, human-induced change and management have altered these habitats produced changes to natural habitats and led to the creation of human-made wetland and non-wetland areas, such as rice paddies and agricultural land. Notwithstanding human interventions, natural ecological functions are still driving the distribution and maintenance of a diversity of habitats. The provision of key habitats, such as deep pools or seasonally inundated sand bars and beaches, is critical for the survival of a range of species of conservation concern (Table 4). For instance, the dynamics of the river system drive the perpetual creation and functioning of sand bars that provide vital habitats and nesting areas for the river tern; the high-energy environment within the river channels of the Mekong continually erodes the riverbed and maintains deep pools that are essential habitats for a range of species including the giant carp and the giant Mekong catfish; and the seasonal inundation of the riparian forests provides critical habitat to support the population of white-shouldered ibis. The ecological functioning arising from the interactions among the abiotic elements of the system (including the geology, geomorphology and hydrology) and biotic

(such as the vegetation communities) combine to provide and maintain a variety of both stable and dynamic habitats that are critical to the overall ecological character of the STRS.

2.6.3 Habitat connectivity

STRS occupies a position within a considerably broader functional ecological system. The Mekong River extends both upstream and downstream for a considerable distance connecting the Himalayas and the Tibetan Plateau with the South China Sea. The site also occupies an important location within the East Asian-Australasian Flyway with the Mekong River acting as an important geographical feature for migratory birds. There is evidence that STRS may serve as an important migratory corridor for shorebirds passing through Southeast Asia along their flyway. Furthermore, the Mekong River habitats within the STRS may also be important for other migratory birds including passerines and raptors.

The Mekong River provides a critical route for a variety of migratory fish species. STRS occupies a key position close to the boundary of two fish migration systems, namely the Lower Mekong Migration System (LMMS, from the Khone Falls downstream to the sea) and the Middle Mekong Migration System (MMMS, from the Khone Falls upstream to the confluence with the Loei River in northern Thailand). Whilst anadromous (fish that spawn in the river but spend their adult life in the sea) and catadromous (fish that breed in the sea but spend their lives in the river until they are ready to spawn) species are common in the Mekong, the most important group are the potamodromous fish that live their entire life in the river. Many of the potamodrous species travel great distances to spawn, feed, or seek refuge (Poulsen et al. 2004).

The annual flood pulse cycle influences the fish migrations and the distribution of the fish species along the river channels, in the deep pools, and laterally across floodplain habitats. This results in four main migration periods: the flood season (July to November), where adult fish move laterally into floodplain habitats for feeding and increase their growth rates; the dry season (February to April) when fish concentrate in deeper water areas including deep pools; and two transitional periods marked by movements of adult and juvenile fish from seasonal to permanent water bodies (December to January) and longitudinal migration of mature fish to their spawning grounds (May to June) (Kang and Huang, 2022). The STRS plays a critical role in all these migration periods.

Historically, STRS provided an important link between populations of the Mekong River Irrawaddy Dolphin. Dolphins were believed to migrate upstream from June to October to catch fish migrating downstream, and from January to March, fish migrate upstream from Tonle Sap Lake to the upper Mekong, and dolphins are believed to have moved downstream to catch the migrating fish. However, recent observations suggest that the last Mekong River Irrawaddy Dolphin in the Cheuteal Deep pool died in February 2022. Nevertheless, the STRS remains important as a linking habitat that can provide connectivity between existing dolphin populations elsewhere in the river system, and the future possibility of restoring the distribution and numbers of this species of high conservation concern.

2.7 Ecosystem Services in STRS

The Stung Treng Ramsar Site is critical to the livelihoods of people living in and around the site. The site provides a range of ecosystem services that benefit not only the local communities but also people across the Lower Mekong region and beyond.

2.7.1 Provisioning services

Fisheries

Up to 79% of the animal protein consumed by humans in Cambodia is provided by fish, therefore the provision of fish is vital for food security in the region (Hartje et al 2016).

The annual estimated fisheries yield for the Lower Mekong Basin is approximately 2.6 million metric tons (Hortle, 2007), providing food sources, animal protein, and livelihood for more than 60 million people living in the region. In Cambodia, the latter figure is based on a conservative estimate for per caput fish consumption of 32.3 kg/person/year, while a more recent study by FReDI (FReDI, 2013) puts the average fish consumption at 57.8 kg/person/year, which would mean a total production of 927,000 MT.

During the field consultation with local community fisheries, particularly with a group of experienced fishers, it was found that large-bodied fish species had been dramatically reduced when compared to the previous ten years. Among the 11 endangered species recorded at the site, four species were found to have been reduced most dramatically, namely *Lycothrissa crocodilus*, *Catlocarpio siamensis*, *Wallago micropogon* and *Incisilabeo behri*. There is limited knowledge on the preferred habitats of threatened and endangered fish species in the site, therefore, scientific research is needed to inform future management.

Figure 12 Fisher in STRS (C) IUCN Cambodia

Rice farming

The population in and around STRS are mostly rice farmers. Table 9 shows locations, areas of rice cultivation, and total production for 2019.

Table 9 Locations, areas of rice cultivation, and total rice production in STRS

Commune	District	Area of rice cultivation (ha)	Total rice production (ton)	Average rice production (ton/ha)	Income of one person from rice cultivation (USD)
O'Svay	Borei O'Svay Sen Chey	2,180.0	3,200.0	1.5	101.1
Koh Sneng	Borei O'Svay Sen Chey	684.0	1,677.8	2.5	124.1
Preah Rumkel	in Borei O'Svay Sen Chey	1228.5	1,842.8	1.5	83.8
Sangkat Samaki	Krong Stung Treng	26.8	53.6	2.0	2.02
In Thala Borivat	Thala Borivat	10,991.6	18,705.0	1.7	108.9

Source: Planning Department of Stung Treng Province in 2020

As illustrated above, the annual income of one person from rice cultivation is USD 101.1. In O'Svay commune, the total income from rice cultivation for the 7,980 people is approximately 806,778 USD. In Koh Sneng, rice incomes total 382,848.5 USD (3,085 people); in Preah Raumkel commune, incomes from rice total 515,453.8 USD (6,151 people); in Sangkat Samaki rice incomes total 13,913.76 USD (6,888 people); and in Thalaborivat commune, rice incomes total 4,159,980 USD (38,200 people).

Water use for human consumption

All of the residents within STRS abstract water from Mekong River for drinking and household uses. Clean water supply stations have been established in almost all communes along the Mekong River.

STRS is an important area for supporting the livelihoods of about 15,549 people who live inside and around the area. People are heavily dependent on the water in the wetland for their household consumption. Based on the study of Cambodia Development Resources Institute (2018), average water use per capita per day is 90 litres in 2007. Therefore, the total water use is 510,784,650 litres (510,784.65 m^3) per year, which is abstracted from the wetland for the domestic use of the local communities.

Water for animal use

Based on the Five-Year Development Plan (2018-2022) for O'Svay Commune and Preah Rumkel commune office, there are 1,236 water buffaloes and 1,232 ducks raised in these communes, mostly relying on water in the wetland.

Water for agricultural use

A single rice crop on one hectare needs 12,000 m^3 of water and vegetable crops need 7,500 m^3 per hectare (Phon Dary et al. 2017). Based on the data collected from interviews in 2020 with Sangkat Samakki, O'Svay, Preah Rumkel and Kaoh Snaeng communes, a total of 43,555,500 m^3 of water is used annually for cultivation of 2,404 ha of rice and 1,961 ha of crops.

Timber

Almost all families in the villages collect timber for the construction of their homes, however, it is not sold more widely.

Fuelwood

Fuelwood collection is carried out by all households (2,404 families) for family consumption. Most families collect firewood from the forest areas around their village, especially in the flooded forest along the channels. It is estimated that each family uses about 4-5 stores of firewood for cooking per annum. Thus, the communes use approximately 9,616 m^3-12,020 m^3 of firewood per year.

Resin

Resin is only collected in the wet season at O'Talas in Kaoh Snaeng village when there is enough water for boat access to transport the resin out of the forest. Generally, two people will go in a boat together and spend from three to seven days extracting 30-60 litres of resin on each trip. During this time, they will also fish and may snare small mammals for consumption. The resin tends to be for personal use rather than trade, although they may sell the resin to other villagers if there is demand, at the rate of 1000 Riel/litre.

Livestock fodder

Islands in STRS are important areas for buffalo grazing during both rainy and dry seasons. Buffalo owners often release their herds on islands after finishing rice cultivation. A total of 2,501 bovines are reared in the villages around STRS.

2.7.2 Regulating services

Flood reduction

The wetland receives annual floodwaters with rapid flows from the Upper Mekong River. The water level in the main flood areas can be more than 10 metres higher than the dry season water level. The floodwaters inundated much of the surrounding floodplain forests, grasslands, and agricultural land. In addition, the high-water levels in the main Mekong channel may lead to the backing up of water flows in the tributaries adding to flooding in the surrounding areas. This all contributes to regulating flooding downstream and protecting land and infrastructure.

Climate regulation and carbon storage

STRS can reduce the negative climate impacts on aquatic flora and fauna, reducing the increase of maximum daily temperature. The site remains cooler than its surrounding areas and contributes to preventing riverbank erosion through the presence of several braided channels, seasonal wetlands and the unique flooded forest.

The undisturbed flooded forest and the forest present on numerous islands and riverbanks in

the wetland are crucial not only for wildlife, fish and aquatic animal habitats, but they also act as natural water storage for the area, mitigating floods and droughts throughout the year.

The wetland hosts terrestrial forests, riparian forests and flooded forests, which act as a significant carbon sink in the region. According to recent studies, the average carbon storage in the flooded forest is approximately 502.6Mg/ha. Also within the site, the gallery forest stores 220.2Mg/ha, shrublands store 104.6Mg/ha, grasslands store 106.9Mg/ha and burned shrublands and emergent woody shrubs store 70.9Mg/ha.

2.7.3 Cultural services

Tourism

Ecotourism is a fast-growing opportunity for livelihood generation in natural areas in Southeast Asia and around the world. STRS has a high potential for ecotourism development, however, it must be planned and implemented to ensure that it does not have any negative impact on the natural environment and culture of local people, particularly indigenous groups.

The Ramsar site is rich in flooded forests, rocky rapids, biodiversity, and greenery in the dry season, and it connects the Sophamit waterfall area to Lao PDR. The deep pools in the site can support dry-season fishing, and tourists can also engage in visiting historical sites such as stupas and other landmarks or going on excursions to villages, islands and flooded forests for wildlife viewing.

The Non-Timber Forest Products Exchange Programme (NTFP-EP) has supported two community-based ecotourism initiatives in STRS, including the O'Svay Community-Based Ecotourism (CBET), and Kaoh Snaeng CBET.

O'Svay CBET was established in 2005 and aims to highlight the unique aspects of the site, including the dolphins, bird watching, flooded forest, and island landscapes. In 2018 and 2019, approximately 800 people and 600 people visited the site each year, respectively. The annual income of the O'Svay CBET was USD 5,000. This provided a relatively small amount of income to the community when compared to Xplore-Asia, a private tour agent that books homestays in O'Svay for tourists. The income that locals received from working with Xplore-Asia totaled approximately USD 30,000 per year.

In addition, the site hosts the Anloung Phsaot CBET and the Mekong Bird Resort, a private service provider offering tour services such as boating, picnics, swimming, kayak rental and bird watching along Mekong River and Kaoh Han. The Mekong Bird Resort tours in O'Svay and Kaoh Snaeng resulted in incomes of up to USD 130,000 per year.

The total income from tourism in the site already supports over USD 150,000 in income, however the O'Svay CBET receives only USD 2,000 and no funding is given to the STRS management authority. There is high potential to strengthen this to ensure that benefits are shared more equally and that they support the ongoing sustainable management of the site.

Figure 13 Tourists visiting the Ramsar Site

Cultural values

STRS is recognized for providing numerous benefits to local communities, particularly the Prov and Kreung communities who have lived in the area for many generations and traditionally use the site for ceremonies. The tower of Preah Ko temple/Pram Bei Lveang temple in Thala Borivat district is a place of worship for local communities. Additional benefits come from the value of the traditional food and medicine derived from the mountains and flooded forests. The communities also rely on the site as an area for harvesting bamboo.

Visiting the site can also allow international tourists to understand the cultural and long-standing traditional values of the people and Indigenous groups in STRS. The site hosts various areas of significant archaeological or historical importance. At O'Svay, there is a statue of King Preah Sihanouk, considered an important historical site, located near the border of Cambodia and Lao PDR. In 1960, the king sent Khmer people to live in O'Svay village to protect the border of the country. In addition, there is a dragon's cave near the limestone hills, which provides an aesthetic landscape for visitors and is an important site for monks and religious figures in the area.

Educational value

STRS is an important area for both the formal and informal education sectors. The site can support increased awareness of wetlands and their values at the national level, but can also provide insight at the international level, as a wetland of international importance. In particular, the site is valuable for understanding the importance of environmental flows and biodiversity,

as the wetland covers a stretch of the Lower Mekong River in the Indo-Burma Hotspot, with a high density of diverse fish, pristine flooded forest, riverine islands and several deep pools that act as refuges for aquatic animals and fish during the dry season.

Several groups, including governmental agencies and non-governmental organizations, have developed monitoring and research programs in the site. For example, MOWRAM has set up an automatic sensor station at Kaoh Han Island to monitor the water level and speed of the river currents, and MoE has constructed an automatic water quality monitoring system and information center on the Mekong River to check the water quality and transfer data to DoE and MoE. Fish catch and biodiversity monitoring programs have also been established to monitor population trends of Irrawaddy Dolphins, waterbirds and flooded forest extent

Employment opportunities

STRS has great potential to provide employment opportunities for people living in and around the wetland. These opportunities include jobs as biodiversity researchers, fishers, and jobs in the tourism sector, such as ecotourism guides and porters, boat operators, resort staff, and jobs in infrastructure construction while the tourism sector is growing. In the future, potential jobs may expand for rangers, drivers and other positions.

3 EVALUATION

3.1 Ecological character

The ecological character of STRS comprises the ecological components, ecosystem processes and ecosystem services described in Section 2. The objective of the STRS Management Plan is to maintain the sustainability of the ecosystem, biodiversity, cultural heritage, nature, economy and environment, which are the foundation of public welfare and contribute to the sustainable development of the Lower Mekong Basin. Critical to this is the need to maintain the ecological character by targeting the essential and priority elements that comprise the ecological components, ecosystem processes and services.

3.2 Evaluation of ecological components

The critical ecological components comprise the species of conservation concern that the STRS supports during their life cycle. These species are summarised in Table 10. In addition to the species of conservation concern, it is important to protect, restore and manage the habitats that support these species and to maintain this unique ecosystem. The site supports a mosaic of habitats, each of which is important in supporting the key species as well as driving ecosystem processes and delivering ecosystem services. The critical habitats are summarised in Table 11.

Table 10 Key threatened species

English/Khmer name	**Binomial name**
Critically Endangered	
Giant Mekong catfish	*Pangasianodon gigas*

Pangasid-catfish	*Pangasius sanitwongsei*
Giant carp	*Catlocarpio siamensis*
Siamese crocodile	*Crocodylus siamensis*
White-rumped vulture	*Gyps bengalensis*
Long- billed vulture	*Gyps indicus*
Red-headed vulture	*Sarcogyps calvus*
White-shouldered ibis	*Pseudibis davisoni*
Endangered	
Yellow tail brook barb	*Poropuntius deauratus*
Green peafowl	*Pavo muticus*
White-winged duck	*Cairina scutulata*
Masked finfoot	*Heliopais personatus*
Greater adjutant	*Leptoptilos dubius*
Spotted greenshank	*Tringa guttifer*
Eld's deer	*Rucervus eldii*
Irrawaddy dolphin	*Orcaella brevirostris*
Giant freshwater stingray	*Urogymnus polylepis*
Vulnerable	
Elephant ear gourami	*Osphronemus exodon*
Trei Papea	*Hypsibarbus lagleri*
Trei Kanchoss kdoang	*Mystus bocourti*
Southeast Asian softshelled turtle	*Amyda cartilaginea*
Small scaled mud carp	*Cirrhinus microlepis*
Mekong herring	*Tenualosa thibaudeaui*
Lesser adjutant	*Leptoptilos javanicus*
Smooth-coated otter	*Lutrogale perspicillata*

Table 11 Key habitats

Key habitats
Permanently flooded forests
Seasonally flooded forest
Seasonally inundated bushlands
Permanently flooded marsh vegetation
Seasonally inundated marsh vegetation
Seasonally inundated mixed grassland
Seasonally inundated sand bars
Seasonally inundated beaches
Seasonally inundated channels
Permanent channels
Permanent deep pools
Seasonally inundated channel banks
Intermittently inundated channel banks
Seasonally flooded recession paddy rice
Intermittently flooded rain-fed paddy rice

3.2.1 Evaluation of Ecosystem Processes

Hydrology

The key driving ecosystem process is the monomodal flood pulse hydrology which drives the distribution of habitats and the life cycle of species. Maintaining the seasonal flooding is critical to the maintenance of the ecological character of the site.

Sediment and water quality dynamics

In combination with the flood pulse-driven system, the commensurate sediment dynamics are vital for maintaining the landforms within the site, such as sand bars, and the nutrients in the flood waters help to support the overall productivity of the systems.

Ecological connectivity

The STRS occupies a critical location on an extended eco-geomorphological system which extends considerable distances to the north and the south. The site plays a vital role in providing ecological connectivity for migratory animals, particularly fish and birds. On a more local level, the flood pulse that seasonally inundates floodplain habitats provides additional lateral ecological connectivity between the main river and adjacent areas.

3.2.2 Evaluation of Ecosystem Services

The site provides a range of ecosystem services that are critical to the well-being of both local communities living in and around the STRS, but also delivers benefits to human societies at considerable distance from the site boundaries. The provision of food, including fish and rice, and water, the flood risk management, and cultural-tourism values are all key elements of the ecological character of the site.

3.3 Challenges and Threats

The ecological character of the STRS is under a variety of direct and indirect threats. Some of these threats are chronic and long-standing. Other threats may induce acute pressures on the site that risk irreparably altering the ecological character of the site.

3.3.1 Direct threats

Habitat change, land use change

The analysis of land use change between 2016 and 2022 has highlighted the impact of encroaching agriculture. This is resulting in the conversion of forest and shrubland but may also be generating barren areas of redundant agricultural land.

Illegal fishing and over-harvesting

Based on the Baseline Survey of Fishing Households in Kratie and Stung Treng Provinces (FiA 2018), the total sample size used for the analysis was 1181 households included 762 community fishing households and 419 non-community fishing households. Among all CFi households, the top three threats to the fisheries are electrofishing, illegal fishing gears such as gillnets, and population growth/increase in fishing (Table 12).

Invasive species

Invasive species, particularly *Mimosa pigra*, currently pose a relatively limited threat to the Ramsar site. This is mostly because it is poorly adapted to the annual flood cycle, and experiences large-scale die-offs during the annual monsoons, limiting its growth and dominance of the site. Invasive golden apple snails (*Pomacea canaliculata*) are collected as a food source for both people and fish aquaculture, and are kept under control through these approaches, but still lead to damage in rice paddies.

Pollution

There is increased pollution from solid waste and wastewater runoff from agriculture, industry and households that is impacting water quality at the site. Limited infrastructure exists for garbage collection and waste management, including sewage systems, and there is a need to enhance this and develop treatment basins within STRS, to ensure suitable water quality for freshwater extraction and aquatic biodiversity.

Human disturbance

Recent population increases have led to the conversion of natural habitats to areas for agriculture and settlements. There has been a loss of both shrubland and forests within the site, which have been encroached upon due to limited enforcement of the site's boundaries.

Infrastructure development – upstream dams

Figure 14 shows the variation in water levels in Stung Treng since 2007. 2007 is considered as a "normal" year, as no large storage dams on the Lancang (upper Mekong) in China had been built and the existing much smaller dams on the Lancang were managed as run of river with little impact on downstream flow.

The 2007 hydrograph shows the Mekong's classic monomodal flood pulse in Stung Treng, with a smooth transition from the lowest flow in early April to maximum flow in early September. In 2016, however, two of largest dams on the Lancang, the Nuozhadu and Xiaowan with a combined storage of 38 km^3, equivalent to 34% of total Lancang/Mekong reservoir storage, were completed, changing Mekong's hydrology. The use of the Lancang dams to maximize dry season power sales to Guangzhou has resulted in increased water retention and lower downstream flows in the wet season, and increased flows in the dry season. The flood season is shorter: the period when the river level in Stung Treng exceeds 36 m has shrunk from early July to late October (3.5 months) to late July to early October (2.5 months). It is also marked by extreme and unnatural variations in flow: in 2019, for example, the water level rose from 35 m to 41 m in one month. Meanwhile, during the dry season, minimum water levels have increased from 32 m to 33 m.

The Lancang dams are not the only cause of these changes. The rapid expansion of paddy and associated irrigation infrastructure since 2010 has also restricted flooding across the Mekong floodplain. These anthropogenic hydrological changes, combined with more frequent prolonged droughts, have already had profound impacts on the ecological processes that drive the fisheries productivity of the site. Lauri et al. (2012) suggest that climate change will increase the uncertainty of the estimated reservoir operation impacts and that even the

direction of the flow-related changes induced by climate change remain unclear. Consequently, both dam planners and dam operators will need to pay closer attention to the cumulative impacts of climate change and reservoir operation on STRS to minimise significant impacts on the site.

At the scale of the STRS, the main impacts are likely to be:

Higher dry season flow reduces the period during which the flooded forest is dry. Since this forest type has evolved in response to the flood pulse, this could impact forest health, especially if the flooded forest cannot migrate to higher ground because of roads, dikes, or other barriers.

1. Higher and more irregular dry season flow floods the sandbanks where the Critically Endangered Asian giant softshell turtle lays its eggs. This could be mitigated by expanding the head starting program in Kratie, which moves eggs from the sandbanks to protected enclosures to prevent predation.
2. Sudden changes in flow throughout the year, which have been well documented in Chiang Saen in Thailand, flood homes and riverbank gardens. It is not known if these kinds of short, severe, and unannounced disturbances have been experienced further downstream in Stung Treng.

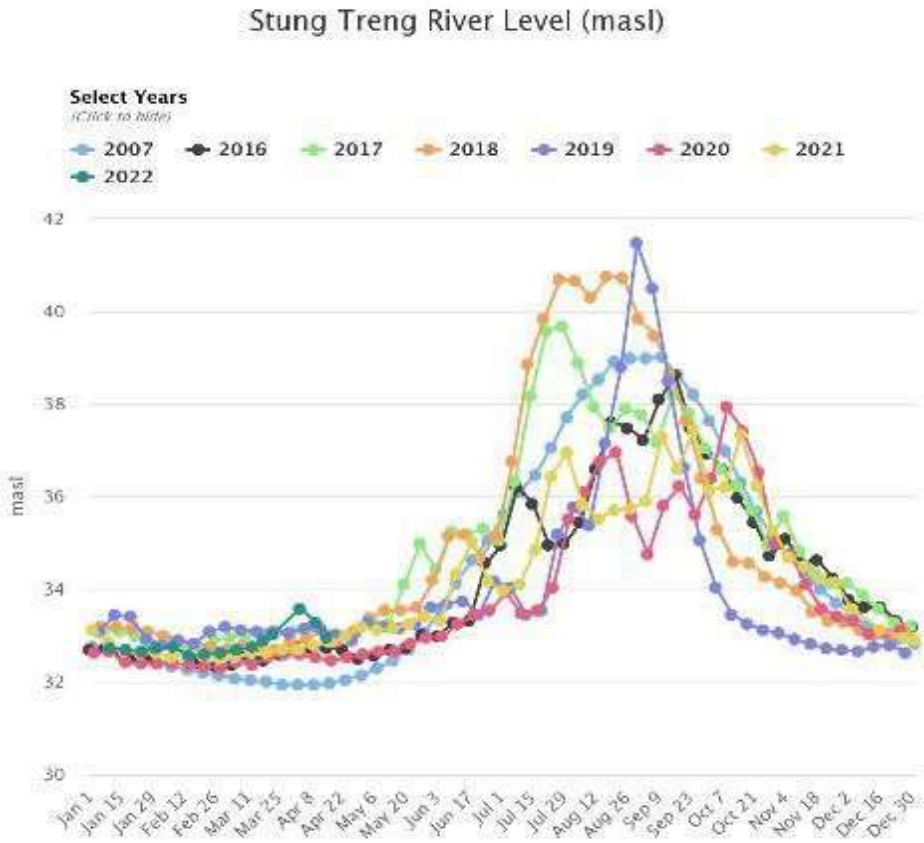

Figure 14 Water level variation at Stung Treng 2007-2022 (Stimson 2022)

Infrastructure development – Stung Treng dam

A feasibility study for the Stung Treng dam is currently underway. Figure 15 shows the three potential locations for the dam: downstream, midstream, and upstream. The downstream location is just outside of STRS, the other two are within the formal boundary of the site. Maps of the proposed reservoirs have not been made public, but given the very low-lying terrain, it

is reasonable to assume that all of these options would submerge and irrevocably change the ecological character of a site of global importance.

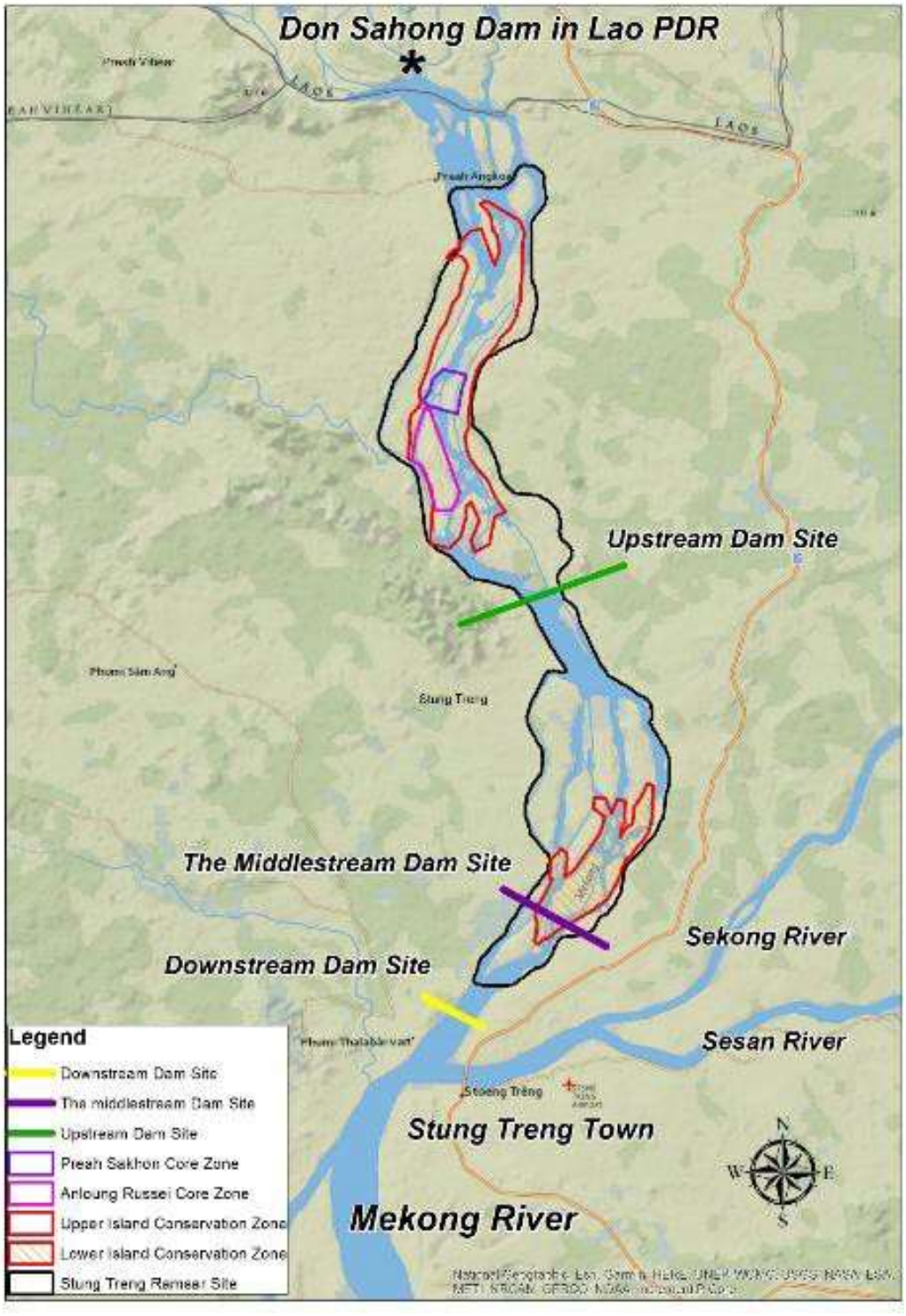

Figure 15 Proposed dams near STRS

At the UN Climate Change Conference in November 2021, the Minister of Environment, H.E. Say Samal, delivered Cambodia's national statement, which included the following: *"We are increasing share of clean energy, not developing any new coal power plants and not constructing any new hydropower dam along the Mekong River."*

The construction of the Stung Treng dam would contradict this commitment. It would also

require MOE to submit an Article 3.2 report to the Ramsar Secretariat to notify the Convention that a human-induced negative change in the ecological character of a Ramsar site was likely to occur.

3.3.2 Indirect threats

Climate change

Climate change projections imply a significant and steady increase in temperatures at Stung Treng Ramsar Site. This increase was already described by some authors in the early 21st century (Try & Chambers, 2006) and corroborated by data recorded at the Stung Treng Province weather station, with historical maximum temperatures above 41ºC in some months. The consequences of such an increase in temperature could pose a severe threat to the lifecycle of many of the species inhabiting the site, as well as to the livelihoods of the human population.

Sediment supply

Changes in the flood-pulse system, due to upstream dams will impact the availability and replenishment of sediments within STRS. These changes can impact the presence and size of sand bars, which are essential nesting grounds for turtles and birds, and can also impact the nutrient availability in the water at the site, which supports the productivity of the systems.

3.3.3 Community level threats to STRS

In March 2022, community-level and provincial consultations identified the following threats to STRS:

- Overuse of illegal fishing gears such as electric fishing, fine-mesh fishing nets and fishing during the closed season.
- Illegal fishing during the closed season for sale to neighboring countries.
- A need for environmental clean-up, including garbage collection and waste management, sewer systems and treatment basins in the STRS, which may affect fish species and their habitats that inhabit the deep pools. There is a need for Stung Treng Administration to collaborate with neighboring provinces to reduce waste at the site.
- Trapping and hunting of wild animals was determined to be the greatest threat to biodiversity in the site. Of particular concern is trapping, the use of dogs to chase wild animals and the use of firearms to hunt wild animals, including wild boars, turtles, lizards, wild chickens, pangolins, and other species.
- Construction of upstream large scale hydrological dams is depleting water levels and changing the hydrology and ecology of the wetland and river.
- Climate change is also evidenced through rising temperatures, changes in rainfall patterns and increased storm strength. These impacts are already affecting the hydrological and ecological processes in STRS. The quality of ecosystems in STRS has significantly declined due to extreme low water levels, leading to algal blooms in some areas in STRS. In dry season, shallow areas are becoming hotter due to increased temperatures under climate change.
- The flooded forest is growing more slowly due to increased amounts of sand covering the flooded forest and algal growth in the water in the dry season.
- Chemical and pesticide runoff from the dry season agricultural areas/agro-industrial crop cultivation upstream is reported degrading water quality and increasing nutrient loads, impacting aquatic organisms.
- Local population is increasing, as people move nearer to the site for fishing access.

This is leading to increased frequency of illegal fishing activities. Further, this migration has impacted the site more widely through increased waste and plastic disposal and increased demands on fisheries resources. There is also increased for land for housing, agricultural land and other needs. There has not yet been a comprehensive study of local land use and data for the area.

- Increased prevalence of *Mimosa pigra*, which increases chances of forest fires during the dry season.
- The loss of flooded forest due to fires is a main concern. Fires are increasing due to human activities coupled with extreme climate event during the dry season. Flooded forest fires have led to reductions in fish catches due to loss of breeding habitats.

Threats and drivers of change for STRS were developed based on the responses from the stakeholder consultations and R-METT assessment conducted throughout 2022. Table 12 summarizes the threats and drivers of change within STRS.

4 STRS MANAGEMENT CHALLENGES

Unsurprisingly, given the extent of direct and indirect threats to the ecological character of the STRS, the site is also facing several key management challenges that further compromise the wise use of the site. These are summarized below.

4.1 Staffing and coordination

The number of rangers is insufficient compared to the area that they are responsible for managing. There is also limited capacity and experience among officers at the site, which leads to regulations that do not provide effective site protection. Site managers are beginning to increase their capacity on legal enforcement, technical skills, and leadership through close cooperation with municipal and district administrations. The office chief and rangers at STRS have not yet completed skills courses on protected area management best practices. There is a need to improve information sharing and skills in effective site management such as financial management, human resource development, working with local communities, and transboundary cooperation on sustainable water resources management.

4.2 Community involvement in conservation

Community members surrounding the site have limited awareness of the laws and regulations governing STRS, leading to conflicts in resource use. There is a need to strengthen and build on the work done with communities to establish community protected areas, community fisheries and community forestry initiatives, to enhance co-management of the site, where possible, and promote its wise use. There is a further need to improve local livelihoods to reduce impacts on the site and increase conservation of natural resources. Improving local supply chains so that community members can receive better compensation for their products, would increase their livelihoods and decrease the demand for natural resources. Improving animal husbandry would likely decrease wild animal trapping and hunting.

4.3 Lack of infrastructure

Ranger stations and sub-stations are not developed throughout the site, and there is a lack of demarcation to indicate the site's boundaries and management areas. To increase potential

ecotourism activities, there is a need to build visitor centers, and trails, and develop signage for both national and international visitors to the site.

4.4 Monitoring and Evaluation

In general, the Provincial Department of Environment and Rangers has achieved a lot in managing, conserving, and promoting the sustainable use of natural resources under the leadership of the Provincial Governor of the Board of Governors, in collaboration with relevant units, local communities, development partners and in cooperation with neighboring countries. So far, there has been no monitoring and evaluation of successes or lessons learned from best experiences to share with teams working on protected areas and protected areas biodiversity corridors after the projects have been completed.

4.5 Budget and Management

The Royal Government of Cambodia has provided funding for the training of rangers at the Thmat Pong Active Military Training School, as well as patrol equipment, uniforms, and funding for daily law enforcement patrols. Despite this, adequate budget is still a limiting factor in the effective management of the site. There is a need to provide further training to rangers, which enables them to effectively and fairly manage the site, while also providing support further up the management chain, should offences occur.

The Ministry of Environment has created a logo for STRS (Figure 16), which has increased visibility of the site and helped the surrounding communities to understand its unique value and importance. There is also an opportunity to use the logo and better communication to strengthen eco-tourism and associated co-benefits for various sectors, which can support the development of long-term sustainable financing for STRS.

Figure 16 STRS Logo

Table 12 Threats to STRS

Direct and indirect threat/driver of change	Impact on site ecological character
Illegal fishing	Kong (2022) reported a dramatic decline of large-bodied fish. Among the 11 endangered species present at the site, 4 species: *Lycothrissa crocodilus, Catlocarpio siamensis, Wallago micropogon and Incisilabeo behri* decreased remarkably.
Trapping and hunting of wild animals (snares/traps)	The annual STRS report (2021) highlighted several cases of hunting with net traps and rifles. The target species are green pigeons, spotted doves, waterhens, parrots, and wild pigs.
Operation of upstream large-scale hydrological dams depleting water levels and changing the hydrology and ecology of the wetland and river	Kong (2022) reported the change in the river hydrological system affects the reproductive period of fish which results in the decline in fish population. Don Sahong Dam is likely to affect the Mekong River fish population, river flows, biodiversity, health, and livelihoods. Dams disrupt flow patterns and increased storage behind hydropower dams also delays the onset of the flood pulse at the start of the wet season.
Climate change is leading to increased temperatures, changes in rainfall patterns, and increased storm strength.	MRC (2022) reported a rainfall reduction of more than 400mm in 2020 as compared to 2008-2017. It also indicated that 2019-2020 were the hot dry years.
Loss of flooded forests	Impacts on the extent of *Anogeissus rivularis* (DuemAnchheng) and *Homonoiariparia riparia Lour* (Ray Toek)
Chemical and pesticide runoff	Uncontrolled discharge of chemical substances from industrial factories from the upper riparian areas lead to increased incidents of algal blooms, which negatively impact water quality and can lead to fish kills. In addition, local fishers have noted increased difficulties in traveling to fishing areas due to dense concentrations of blue-green algae. The algae also slows water movement, providing habitat for mosquitoes, which can lead to increased mosquito-bourne illnesses.
Hydropower dams	Depending on the location, dams can lead to more prolonged flooding or droughts downstream, with impacts on water currents and associated habitats and lifecycles of aquatic animals. They can also impact sediment loads, affecting fish species, particularly those that rely on the deep pools during the dry season. The death of the last remaining Irrawaddy dolphin in STRS was reportedly linked to the operation of the dam, which blocked its movement.
Agriculture	Economic land concessions led to the loss of natural habitats at the site and increased runoff from chemical fertilizers and pesticides. Increased agriculture relies on pumping water from the river, which may impact the depth of deep pools, particularly during the dry season. There is a land

	concession in O'Svay commune that relies on pumping water from the river to irrigate banana, dragon fruit, pepper, and durian (R-METT, 2022).
Fire and agricultural land encroachment	Resulting in the loss of flooded forests which has emerged as a critical concern. These fires and agricultural land encroachment have become more frequent, primarily due to a combination of human activities and extreme climate events experienced during the dry season. According to local communities, the local people (mostly immigrants) encroached on the land for agricultural practices.
Population growth	Multiple, widespread impacts such as increased logging, wildlife hunting, pollution, water bird disturbance, overfishing, and riverbank erosion due to uncontrolled agricultural practices.
Mimosa pigra	Mimosa pigra is not widely distributed throughout the site, however, in the areas where it does occur, the invasive species can restrict the movement of fish for spawning and feeding.
River bank erosion	Local consultations indicated the hydrological flow change results in the river bank erosion affecting local settlements and croplands. Approximately 30% of Koh La Ngor Island has been eroded due to changes in the water currents.
Challenges	
Lack of rangers/ limited patrolling capacities	There are currently 11 rangers at the site, which is not enough to adequately cover the site. Per IUCN guidelines, the recommended number of rangers is 1/500 hectares. Applying this to the 14,600 hectares of the STRS yields 29 rangers.
Overlapping mandates between MoE and FiA over Ramsar Site	Two main agencies are working at the STRS level: MOE and FiA/MAFF. There is a lack of cohesion between the work conducted by both agencies and a lack of collaboration to optimize law enforcement.
Community awareness	Lack of local engagement and understanding of the importance of the site; increased incidence of illegal activities in deep pools and impacts on broodstock/overfishing
Lack of up-to-date biodiversity assessments	There is currently no updated species inventory for STRS, limiting the ability of decision-makers to effectively conserve the site.
Limited zonation and demarcation of conservation areas, particularly deep pools	Zonation is not clear within the site, which impacts the ability to enforce regulations, particularly in the deep pools.
Limited budget	Limited budget for the site leads to decreased patrolling, as there isn't sufficient budget for fuel for vehicles. This is particularly of important during the closed fishing season (1 May-30 September) for broodstock protection.
Weak transboundary cooperation	Weak transboundary cooperation between Cambodia and Lao PDR has been a significant challenge. While there is a transboundary cooperation agreement between Stung Treng province in Cambodia and Champasak province in Lao PDR, the effectiveness of this collaboration has been underwhelming. As a result, many issues have arisen, including the extinction of the Mekong Irrawaddy Dolphin at Cheu Teal Deep Pool. Furthermore, there have been more illegal fishing and overfishing activities, exacerbating the ecological and environmental concerns at the border and Ramsar sites.

5 MANAGEMENT OBJECTIVES

5.1 Objective setting

The site management objectives have been developed through a consultative and participatory approach with local stakeholders. The objectives are intended to ensure that the STRS delivers on the obligations under the Ramsar Convention and maintains the ecological character of the site.

5.1.1 Vision

STRS is an area of exceptional natural beauty and aesthetic importance and is an outstanding example of ongoing hydrological, ecological, and biological processes that sustain a vast diversity of habitats and species. The site is of international importance for nature conservation and represents one of the main biodiversity hotspots in the Indo-Burma region. Lying on one of the largest and most dynamic river systems in the world, the site supports a mosaic of habitats supporting a rich diversity of fish, mammal, bird, reptile amphibian, crustacean, and plant species, 25 of which are on the IUCN Red List of species of conservation concern. The site is also important to the local communities living in and around the site, providing water, and food and creating employment opportunities through agricultural, fishing, and tourism activities.

The vision for the site is to maintain the ecological character through the implementation of wise use principles to benefit wildlife and current and future generations of humanity.

5.1.2 Site zonation

For complex and large wetland sites, it can be helpful to divide the site for management planning purposes into several contiguous zones and to develop separate management objectives for each of these zones, under the umbrella of the overall management plan.

The historical site management planning processes have identified and categorized different management zones within STRS. The zonation proposed in this management plan builds on the historical understanding and supplements it with recent and updated information and research results. The rationale underpinning the zonation is that different spatial areas make different contributions to the ecological character of the site. Consequently, the management activities and actions, and their priority, within different zones will vary.

Within the context of Cambodia, the Law on Protected Areas (2008) provides that each protected area shall be divided into four management zones comprising (1) core zone, (2) conservation zone, (3) sustainable zone and (4) community zone. Zoning is based on the area management objectives, potential values of the natural resources of the area, socio-economic and cultural implications of the area, carrying capacity of the natural resources of the area and geographical location of the area. In the specific context of a Ramsar site, the zoning should reflect the ecological character of the site and provide a spatial structure to underpin wise use.

Table 13 Description of the STRS management zones

Management zone	Definition	Zones
Core zone	Areas of high value for the conservation of rare, endangered, and threatened species and fragile ecosystems	COR1. Anlong Rusie deep pools
		COR2. Preah Sakhorn deep pools
Conservation zone	A management area is adjacent to a core zone of value for natural resource conservation, ecosystems, and natural landscapes.	CON1. Upper Islands
		CON2. Lower Islands
Sustainable zone	Areas with high economic value, serving the national economic development, the management and conservation of direct protected areas, and the contribution to improve the livelihoods of local and indigenous communities.	SUS1. Koh Khorndin fishing area
		SUS2. Koh Langor fishing area
		SUS3. Koh Sneng fishing area
		SUS4. Veun Sean fishing area
Community zone	Areas serving the socio-economic development of communities and indigenous peoples who are already active, including housing, farms and plantations.	COM1. Koh Chheutal Leu community fishing area
		COM2. Koh Chheutal Krom community fishing area

5.1.3 Management objectives

The management plan has been developed based on feedback from various stakeholders, including communities, officials, authorities, and NGOs. Within the STRS, three major threats have been identified:

1) Illegal fishing and poaching

2) Agricultural land encroachment and habitat loss

3) Hydrological changes

The table below outlines the proposed management actions and activities, categorized into three main objectives to address the threat and protect the ecological character of the site:

Objective 1: To halt illegal fishing and poaching

Objective 2: To address agricultural encroachment and habitat loss

Objective 3: To mitigate the impact of hydrological changes and improve species and habitat protection

Table 14 Management Action (2026-2030) and Budget Estimated (3,770,000 USD):

Management actions	Proposed activities	Indicators/ Targets	Budget Estimated (USD)	Monitoring
	Objective 1: To halt illegal fishing and poaching			
Enhance the effectiveness of law enforcement	1.1 Review compliance with the May-September (5-month) closed fishing season to understand how to increase community support including the provision of alternative livelihoods	% of fishers adhering to the closed fishing season	40,000	Annual
	1.2 Map illegal fishing patterns over time and across the STRS, by monitoring and analyzing the trends of illegal fishing activities over time and across various locations to identify patterns and changes in unlawful fishing practices.	Number of Illegal fishing incidents SMART report	35,000	Monthly and quarterly
	1.3 Develop Law Enforcement (LE) Strategy and Minimum LE Standards: - LE Strategy: Includes plans, tactics, and approaches for deterrence but also livelihood support to vulnerable households to enhance compliance - Minimum LE Standards: The fundamental criteria and expectations set for law enforcement personnel to ensure effective and ethical performance in carrying out their duties.	-One LE strategy -One Minimum LE standards	60,000	Annual
	1.4 According to the LE strategy, enforce Environmental & Natural Resource Code and fisheries law. Steps may include: - Increase the number of rangers, facilities, and equipment needed to halt illegal fishing and poaching. (Per IUCN guidelines, the recommended number of rangers is 1/500	-Five PDoE staff -At least 20 rangers -Number of equipment -Four ranger stations	600,000	Monthly monitoring of the effect of patrolling and LE

	hectares. Applying this to the 14,600 hectares of the STRS yields 29 rangers). - Support law enforcement, including training rangers on SMART, patrol tactics, field craft law enforcement, crime scene investigation, etc., provisioning necessary equipment for patrolling, and rangers conducting rigorous patrolling on the site. (350,000 USD) - Support four existing broodstock zones to protect the breeding fish during the closed fishing season from May to September, including installing the maps of broodstock zone management sites to improve the awareness of community fishers, and patrolling by rangers and CFi communities. (250,000 USD)	-One major training, with annual refresher -Number of patrol days -% of decreased illegal fishing activities based on SMART reports -8 maps of broodstock zones -4 broodstock zone support -4 times a year of co-management events		
	1.5 Introduce alternative livelihood initiatives to the vulnerable families living inside and adjacent to the conservation areas. - Conduct livelihoods and value chain assessments to understand potential wetland products and explore alternative livelihood options. (50,000 USD) - Support sustainable farming related to environmentally friendly or climate-smart agricultural development, including building technical knowledge to increase wetland agricultural products, business and marketing, and value chain development. (180,000 USD) - Collaborate with local banks to explore and facilitate access to financial resources and incentives for farmers engaged in environmentally friendly agriculture. (40,000 USD)	-# of farmers who adopted sustainable farming practices -Increased in wetland agricultural products	270,000	Annual

Transboundary coordination and collaboration	1.6 Strengthen transboundary collaboration between Champa Sak and Stung Treng Provinces: - Renew the 2010 agreement between Cambodia's Fisheries Administration and Lao PDR's Department of Livestock and Fisheries, with a specific focus on wetlands and fisheries management. (15,000 USD) - Develop a joint annual work plan for transboundary collaboration between Champa Sak and Stung Treng Provinces (40,000 USD) - Organize regular transboundary meetings with the two provincial authorities (50,000 USD)	MoU for transboundary cooperation agreement	105,000	One-time
Integrate improved CBNRM and sustainable financing	1.7 Empower local communities in wetland resource conservation and management by using the CBNRM approach. - Provide technical support and capacity development to improve CFis operations, toward community-led wetland and fishery conservation (150,000 USD) - Strengthening CFis such as institutional development, legalization, revising, and implementing management plans). (120,000 USD)	17 CFis have improved their operations	270,000	Quarterly
	1.8 Support sustainable financing initiatives for natural resource management: - Develop sustainable financing guidelines for natural resource management under the mandate of MoE (50,000 USD) - Replicate the community mini-trust fund (MTF) as a community sustainable finance scheme, with the CFis and CPAs. (150,000 USD) - Promote the inclusion of women in conservation work and community leadership roles by	-MoE sustainable financing guideline -# of CFis adapted MTF -# of women in the leadership role of in the CFis, and involved in fisheries protection	240,000	Annual

	providing opportunities, capacity development, and education to communities. (40,000 USD)			
Community-based eco-tourism (CBET) management	1.9 Develop and strengthen existing Community-Based Ecotourism: - Conduct CBET viability assessment with a focus on flooded forests and threatened species viewing and other unique values of STRS. (40,000 USD) Based on the results, the following activities could follow: - Create visitor guidelines to promote responsible tourism practices and educate tourists about the significance of wetland conservation. (20,000 USD) - Strengthen existing CBETs, including increasing the technical capacity, services, marketing, and institutional management (150,000 USD) - Develop ET infrastructure such as visitor centers, trails, and roads by using commune development funds. (250,000 USD)	-ET strategy for STRS -All CBETs in STRS improved their operations	460,000	Quarterly
	Objective 2: To address agricultural land encroachment and habitat loss			
Political dialogue to manage immigration	2.1 Manage immigration, migration, and population growth: - Assess the level of immigration and population growth within and close to the STRS, and its impact on its conservation values. (20,000 USD) - Based on an analysis of population growth and immigration, establish political dialogue with the commune councils and district, and provincial governors to manage immigration in ways that reduce pressure on the STRS (40,000 USD)	-Studied report -# of dialogues -Migration management plan	60,000	One-time

Creation of a Provincial Working Group for STRS Management, zoning, and demarcation	2.2 Support Provincial Stakeholder Coordination for STRS Management: - Establish a Provincial Stung Treng Ramsar Site Working Group. The working group will supervise the STRS zoning and site management to address the challenges (10,000 USD) - Organize regular meetings to discuss site management among relevant stakeholders, including provincial departments, district and commune authorities, and NGOs (50,000 USD) - Develop a zoning plan, and demarcate STRS zones (buffer, core, and sustainable use) using floating signboards, concrete poles, and billboards (120,000 USD)	-Approved zones and land use plan -Physical demarcation of zones -Reduced settlement and land encroachment	180,000	One-time
	Objective 3: To mitigate the impact of hydrological changes and enhance species and habitat protection			
Ecological change assessment and documentation	3.1 Based on the results of Mekong Dam Monitor (MDM) and other hydrological monitoring programs, - Assess the ecological impact of hydrological changes on the ecological dynamics of the STRS, including changes in habitats (shallowing deep pools), fish biodiversity, and water quality. And evaluate the long-term and potential cascading impacts of these changes on the ecosystem of the site. (120,000 USD) - Research on current biodiversity status and develop a comprehensive habitat restoration strategy for degraded habitats, and remove invasive plant species, mainly Mimosa pigra (120,000 USD)	-Studied report: Demonstrating habitats, fish biodiversity, and water quality change -Restoration strategy -# of hectares restored	440,000	One-time and Annual

	- Implement habitat restoration and remove invasive species (e.g., Mimosa pigra) (200,000 USD)			
	3.2 Monitoring the ecological change of the STRS: - Develop a long-term monitoring program to track and analyze hydrological changes in the site. This entails designing and implementing robust monitoring protocols to collect and analyze hydrological data, enabling the detection of trends, patterns, and potential risks associated with these changes. (100,000 USD) - Collaborate with academic and research institutes to conduct relevant studies on the site 80,000 USD) - Engage the communities to conduct the Community Action Research (CAR) (60,000 USD)	-Monitoring plan developed -Frequency and consistency of data collection and analysis, and documented -# of research partnerships established	240,000	Quarterly
Protecting priority species, including Giant freshwater stingrays, Giant barb, River tern, Lesser adjutant, and other species	3.3 Engage local communities for nest protection to protect threatened water birds and monitor the habitats where they nest. - Implement a community-based conservation incentives program (egg collection, nest, and nest site protection). (150,000 USD) - Involve CFi groups to participate in river tern protection, and the CFi management plan should include this action. (50,000 USD)	-# of nests protected -# of local people protected the nests	200,000	Monthly
	3.4 Communication Education Participation and Awareness (CEPA) Activities	% of behavior change in local communities # of annual FVC	200,000	Annual

	- Organize World Wetlands Day in STRS to promote youth awareness of wetlands (30,000 USD) - Install signboards about the Ramsar Site and its features at entry points (25,000 USD) - Develop an educational unit on wetlands for schoolchildren (35,000 USD) - Develop and implement a communication strategy to promote the importance of the site at the local, national, and transboundary levels and raise awareness of risks to the site's integrity (70,000 USD) - Support Fish Voice Campaign (FVC) led by Community Youth to promote awareness of the fish species including endangered, critically endangered, and vulnerable fish species. (40,000 USD)			
Biosphere Reserve (BR) and World Heritage Site (WHS) Nomination	3.5 Nominate STRS and adjoining areas of significant ecological importance for designation as a Biosphere Reserve (BR) and inclusion in Cambodia's World Heritage Site (WHS) Tentative List. - Communicate research findings and recommendations to policymakers nationally and regionally through scientific publications, policy papers, and other appropriate channels to promote informed decision-making and support conservation and management efforts of the site (30,000 USD) - Capacity development on BR concepts to relevant stakeholders including communities. (40,000 USD) - Nominate the Upper Mekong as a UNESCO Biosphere Reserve as a stepping stone in	-STRS is formally designated as a BR -STRS is included in Cambodia's WHS Tentative List -Government budget increased	290,000	Annual

	improving site management practices as well as the integrity of a TL site in preparing the site for WH nomination and increasing government funding (120,000 USD) - Add the Upper Mekong to Cambodia's WHS Tentative List. The nomination should include Sambo and Prek Prasab Wildlife Sanctuaries, Mekong Dolphin Management Zone (which is managed by MAFF), Mekong Fisheries Biodiversity Conservation and Management Area, and Stung Treng Ramsar (100,000 USD) - Increase government funding for conservation of the site			
IUCN Green List	3.6 Enroll RS in the IUCN Green List to promote effective management and conservation	Green List applied	80,000	One-time

ANNEX 1: REFERENCES

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ANNEX 2: DEEP POOLS IN THE COMMUNITY FISHERY AND PROPOSED AREAS FOR CONSERVATION ZONES IN STRS

Deep pools in the Community Fishery in Samaki Commune of Stung Treng Province

1. Phum K Community or Community Fishery (Thmor Bang)

Name	Width and Length (Meters)	Total (Square Meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
O'Samhong Deep Pool	50 x 70	3.500	42	30	
Samrong Deep Pool	50 x 200	1.000	62	40	
Ta Khim Deep Pool	50 x 200	1.000	42	30	
Trey Kes Deep Pool	70 x 100	7.000	52	40	
Thmor Bang Deep Pool	50 x 50	2.500	62	50	

2. Phum Khamphan Community (Thmor Ta Kuk)

Name	Width and Length (Meters)	Total (Square Meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Ta Yorn Deep Pool	50 x 63	3.150	30	25	
Yeay Sok Deep Pool	100 x 100	1.000	43	38	
Ta Ku Leu Deep Pool	100 x 150	15.000	58	53	

3. Thmey Village

Name	Width and Length (Meters)	Total (Square Meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Vernduk Deep Pool	70 x 100	7.000	70	60	
Verntatho Deep Pool	70 x 70	4.900	50	40	
Kantuy Kohtreng Deep Pool	30 x 30	900	80	70	
Ta Lon Deep Pool	50 x 100	5.000	50	40	
Vernsan Deep Pool	80 x 200	16.000	50	40	
Ta Lam Deep Pool	150 x 200	30.000	30	20	

Kantuy Kohkang Deep Pool	100 x 100	10.000	70	60	

4. Koh Korn Din Village (Koh Kang Deep Pool)

Name	Width and Length (Meters)	Total (Square Meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Ta Ku Krom Deep Pool	70 x 150	10.500	45	35	
Koh Kang Deep Pool	70 x 200	14.000	45	35	
Koh Yeay Chim Deep Pool	70 x 150	10.500	50	40	
Pou Deep Pool	70 x 100	7.000	35	25	

<u>Deep Pools in the Community Fishery in O'Svay Commune of Thala Borivat District</u>

5. O'Svay Village

Name	Width and Length (Meters)	Total (Square Meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Seyma Deep Pool	70 x 250		36	25	
Ta Heng Deep Pool	50 x 30		30	20	
Rice Mill Deep Pool	40 x 60		20	12	
Takay Deep Pool	10 x 80		20	12	√
Deum Svay Deep Pool	60 x 300		25	15	√

6. Koh Heb Village

Name	Width and Length (Meters)	Total (Square Meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Toeuk Vil Deep Pool	50 x 50	2.500	50	40	
O'Chrey Deep Pool	100 x 300	30.000	30	20	√
Svay Deep Pool	150 x 200	30.000	30	20	

7. Koh Pnov Village

Name			Depth	

	Width and Length (Meters)	Total (Square Meters)	Rainy Season (Meters)	Dry Season (Meters)	Proposed Conservation Zone?
Ta Chhun Deep Pool	20 x 200	4.000	12	5	√
Ta Den Deep Pool	30 x 50	1.500	23	15	√

8. Vern Sean Village

Name	Width and Length (Meters)	Total (Square Meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Krak Thom Deep Pool	100 x 250	15.000	30	15	
Krak Toch Deep Pool	35 x 85	2.975	20	5	
East Vern Phung Deep Pool	100 x 170	17.000	30	15	√
West Vern Phung Deep Pool	13 x 28	364	28	13	√
Vern Sean Deep Pool	55 x 100	5.500	35	20	√
Sreh Yeay Nou Deep Pool	45 x 100	4.500	20	5	
Trey Pruol Deep Pool	40 x 120	4.800	18	3	
Kbal Koh Krolay Deep Pool	30 x 70	2.100	20	5	
Koh Thyung Deep Pool	45 x 130	5.850	19	4	
Bung Veng Deep Pool	30 x 175	5.250	18	3	
Ta Prum Pakkandal Deep Pool	45 x 120	5.400	18	3	
Koh Tunsay Deep Pool	25 x 75	1.875	18	3	

9. O'Run Village

Name	Width and Length (Meters)	Total (Square Meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Ach Kropeu Deep Pool	80 x 250	2.000	50	40	√

Sampev Thom Deep Pool (Big Three Row Deep Pool)	100 x 150	1.500	35	25	√
Sampev Toch Deep Pool (Small Three Row Deep Pool)	80 x 300	24.000	30	15	√
Vern Crey Deep Pool (Anlong Crey)	10 x 80	800	20	12	
Vern Sot Deep Pool (Anlong Sot)	80 x 300	24.000	18	8	√
Trey Kray Deep Pool (Babong Batang Deep Pool)	90 x 90	8.100	18	20	√
Vern Phong Deep Pool (Anlong Phong)	50 x 50	2.500	20	12	
Sun Lai Deep Pool (Anlong Khley)	50 x 100	50.000	20	10	

Community Fishery in Koh Sneng Commune of Thala Borivat District

10. Koh Sneng Village

Name	Width and Length (Meters)	Total (Square meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Ta Ly Deep Pool	100 x 300	3.000	33	23	√
Ampil/Vern Kham Deep Pool	50 x 100	5.000	20	10	
Ta Thav Deep Pool	150 x 300	45.000	35	25	√
Thmor Damrey Deep Pool	150 x 200	30.000	31	21	√
Koh Kandor Deep Pool	50 x 200	10.000	30	20	√
Koh Sambuor Deep Pool	100 x 250	25.000	19	09	√

11. Koh Srolao Village

Name	Width and Length (Meters)	Total (Square meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Thmor Thom Deep Pool	100 x 200	20.000	52	40	√
O'Chrey Deep Pool	150 x 200	30.000	35	25	√
ToToeung Deep Pool	50 x 200	10.000	40	30	

Chheuteal Deep Pool	50 x 150	75.000	40	30	
Kun Huot Deep Pool	50 x 100	5.000	40	30	
Ta Theung Deep Pool	60 x 100	6.000	40	30	

12. Koh Kei Village

Name	Width and Length (Meters)	Total (Square meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Koh Kei Deep Pool	250 x 1.500	375.000	25	15	√
Norng Duen Deep Pool	300 x 300	90.000	25	15	√
Sreh Phnum Deep Pool	80 x 120	9.600	15	05	
Chrey Deep Pool	150 x 250	37.500	10	7	√

13. Choim Thom Village (Koh Kantheay)

Name	Width and Length (Meters)	Total (Square meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Kamborphot Deep Pool	30 x 30	900	60	50	
Kambor Deep Pool	100 x 150	15.000	40	30	
Koh Kantheay Deep Pool	150 x 300	45.000	25	15	√

Community Fishery in Preah Rumkel Commune of Thala Borivat District

14. Krala Peas Village

Name	Width and Length (Meters)	Total (Square meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Kork Deep Pool	100 x 200	20.000	8	4	√
Lok Deep Pool	60 x 70	4.200	10	6	
Ta Prey Deep Pool	50 x 100	5.000	8	4	
Sleng Deep Pool	70 x 80	5.600	7	3	
O'Dong Deep Pool	50 x 80	3.200	7	3	

Ta Pok Deep Pool	40 x 50	2.000	6	2	
O'Talas Deep Pool	60 x 80	48.000	9	5	
Ang Deep Pool	150 x 300	45.000	11	7	
Russey Deep Pool	60 x 200	12.000	14	10	

15. Koh Chheuteal Toch Village

Name	Width and Length (Meters)	Total (Square meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meter)	Dry Season (Meter)	
Koh Tunsay Deep Pool	70X 150	10.500	33	25	
Khvek Deep Pool	70 X 70	4.900	14	6	
Kromuon Deep Pool	30 X 50	1.500	15	7	
Romeas Deep Pool	30 X 300	9.000	15	7	
Koh Kanthao Deep Pool	100 X 200	20.000	38	30	

16. Koh Chheuteal Thom Village

Name	Width and Length (Meters)	Total (Square meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Thmor Deep Pool	50 x 150	7.500	23	13	
Skat Sva Deep Pool	50 x 130	6.500	18	8	
Sdao Phaem Deep Pool	50 x 100	5.000	18	8	
Kol Bak Deep Pool	50 x 50	2.500	18	8	
Ta Oun Deep Pool	50 x 50	2.500	18	8	

17. Koh La-Ngor Village

Name	Width and Length (Meters)	Total (Square meters)	Depth		Proposed Conservation Zone?
			Rainy Season (Meters)	Dry Season (Meters)	
Run Bei Poin Deep Pool	80 X 90	7.200	21	17	
Kantuy Koh La-Ngor Deep Pool	45 X 60	2.700	17	13	
Vern Samrong Deep Pool	30 X 100	300	12	8	
Kbal Koh La-Ngor Deep Pool	100 X 300	3.000	43	35	
Koh Kan Thao Deep Pool	100 X 200	20.000	38	30	

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