

GPSC Biodiversity Management Plan (BMP)



Global Power Synergy Public
Company Limited

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ACRONYMS AND ABBREVIATIONS

Name	Description
AZE	Alliance for Zero Extinction
BBOP	Business and Biodiversity Offset Program
BMP	Biodiversity Management Plan
CBD	Convention on Biological Diversity
CSA	Corporate Sustainability Assessment
CSR	Corporate Social Responsibility
GIS	Geographic Information System
IBA	Important Bird and Biodiversity Area
IBAT	Integrated Biodiversity Assessment Tool
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
NGO	Non-Governmental Organization
NNL	No Net Loss
NPI	Net Positive Impact
PA	Protected Area
PS6	Performance Standard 6
WHC	World Heritage Convention

1. INTRODUCTION

1.1. OVERVIEW

As a responsible oil & gas company, Global Power Synergy Public Company Limited (GPSC) Group acknowledges the paramount importance of biodiversity, as defined by the Convention on Biological Diversity (CBD)¹: "The variability among living organisms from all sources including inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems." Our understanding of biodiversity encompasses the richness of life forms and the essential ecological and evolutionary processes that sustain life, maintain our planet's chemical balance, moderate climate, renew soil, and conserve species diversity.

To ensure alignment with global biodiversity conservation standards and national requirements, GPSC reviewed the adequate regulatory frameworks governing biodiversity protection at both international and national levels. This review establishes the foundation for assessing GPSC's operational footprint against areas of high biodiversity value.

As part of this study, GPSC screened all operational sites to identify those located within or near ecologically sensitive zones, such as Key Biodiversity Areas (KBAs), Protected Areas (PAs), Ramsar sites, World Heritage Sites, and other critical habitats recognized under global conventions and national laws. This screening enables GPSC to understand potential biodiversity sensitivities and comply with the relevant international and domestic regulatory frameworks.

The sections **Adequate Regulation** summarize the international and national regulations related to biodiversity conservation and describe how they are applied in assessing GPSC's sites.

In light of this, GPSC Group is conducting a comprehensive Biodiversity Management Plan (BMP), as outlined in the process steps in **Figure 1.1**. The objective is to mitigate the negative impacts of operations on biodiversity while applying the mitigation hierarchy in accordance with international best practices and acknowledging biodiversity's pivotal role in human well-being. Concurrently, we commit to inventorying and managing biodiversity risks, aiming to embed biodiversity preservation into our operational strategies. Through this endeavour, we aim to contribute to global conservation efforts and advocate for industry-wide ecological responsibility.

¹ <https://www.cbd.int/convention/articles?a=cbd-02>

FIGURE 1.1 OVERVIEW PROCESS STEPS FOR BIODIVERSITY MANAGEMENT PLAN (BMP)



1.2. STUDY AREA

This study covers a total of 23 GPSC operational sites located across two countries – Thailand and the Lao People’s Democratic Republic (Lao PDR). In accordance with the scope of work under Phase 1: *Biodiversity Baseline and Offset Consideration*, GPSC conducted site screening for all 23 sites to identify those situated within or near areas of high biodiversity value, including Protected Areas (PA), Key Biodiversity Areas (KBA), Alliance for Zero Extinction (AZE) sites, Ramsar Sites, and World Heritage Sites (WHC).

Of the 23 operational sites, 19 are located within established industrial estates. These estates were fully developed, cleared, and prepared by estate developers before land allocation to GPSC. Following the “Polluter Pays” Principle, which places the responsibility for land clearance and associated biodiversity impacts on the party that undertakes or benefits from such activities, the biodiversity impact of these pre-cleared areas is attributed to the industrial estate developers, not GPSC. Consequently, these 19 sites are excluded from the land-use change and No Net Loss (NNL) analysis presented in the following section.

The remaining four (4) sites, CHPP (Solar), Huay Ho (Powerhouse and tailrace channel), IRPCCP Phase 1 & 2, and Rayong Waste to Energy, are located outside industrial estates and are therefore subject to NNL calculations to assess potential residual impacts on biodiversity (**Table 1.1**).

TABLE 1.1 SUMMARY OF GPSC’S 23 OPERATIONAL SITES AND INCLUSION IN NNL ASSESSMENT

Site ID	Site Name	Industry	Province	Country	Located in Industrial Estate/Not GPSC’s Area	Included in NNL Calculation
1	CHPP	Combined Heat and Power with District Cooling Power Plant	Bangkok	Thailand	Yes	No
2	CHPP (Solar)	Renewable Energy - Solar	Chanthaburi	Thailand	No	Yes
3	CUP1	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No
4	CUP2	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No
5	CUP3	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No
6	CUP4	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No

Site ID	Site Name	Industry	Province	Country	Located in Industrial Estate/Not GPSC's Area	Included in NNL Calculation
7	GHECO-One	Thermal	Rayong	Thailand	Yes	No
8	GIPP	Thermal Power – Natural Gas	Chonburi	Thailand	Yes	No
9	Glow Energy CFB 3	Thermal Power – Coal	Rayong	Thailand	Yes	No
10	Glow Energy Phase 1	Supporting Asset	Rayong	Thailand	Yes	No
11	Glow Energy Phase 2	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No
12	Glow Energy Phase 4	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No
13	Glow Energy Phase 5	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No
14	Glow Energy Solar Plant	Renewable Energy - Solar	Rayong	Thailand	Yes	No
15	Glow SPP 11 Project 1	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No
16	Glow SPP 11 Project 2	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No
17	Glow SPP 11 Project 3	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No
18	Glow SPP 2 Replacement	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No
19	Glow SPP 3 (CFB2 & CFB1)	Electric Energy Production - Geothermal or Combustion (Biomass, Coal, Gas, Nuclear, Oil)	Rayong	Thailand	Yes	No
20	Huay Ho (Powerhouse and tailrace channel)	Electric Energy Production - Hydropower		Lao PDR	No	Yes
21	IRPCCP Phase 1 & 2	Thermal Power – Natural Gas	Rayong	Thailand	No	Yes
22	Rayong Expansion (CUP-3)	Thermal Power – Natural Gas	Rayong	Thailand	Yes	No
23	Rayong Waste to Energy	Electric Energy Production - Geothermal or Combustion (Biomass)	Rayong	Thailand	No	Yes

2. ADEQUATE REGULATION

2.1. INTERNATIONAL REGULATION

Thailand has ratified various international laws and conventions in conservation and biodiversity, as described below.

2.1.1 KEY BIODIVERSITY AREA (KBA)

Key Biodiversity Areas (KBAs) are internationally important areas of biodiversity. Conservation activities should apply through government and/or non-government organizations. Criteria for identifying KBAs include the presence of globally threatened species, restricted-ranged species, and/or congregatory species. KBAs are usually situated over existing national protected areas (PA), Alliance for Zero Extinction sites (AZEs), Important Bird Areas (IBAs), etc.

According to International Finance Corporation (IFC) Performance Standard 6 (PS6), development projects situated within the boundaries of international conservation areas require biodiversity management plans and communication with stakeholders.²

2.1.2 PROTECTED AREA (PA)

According to the International Union for Conservation of Nature (IUCN), a protected area is “An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.”³

The Protected Area was divided into 23 management categories (**Table 2.1**).

TABLE 2.1 PROTECTED AREA MANAGEMENT CATEGORIES (IUCN CLASSIFICATION)

IUCN Management Categories	Definition
Category Ia: Strict nature reserve/wilderness protection area managed mainly for science or wilderness protection	An area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.
Category Ib: Wilderness area: protected area managed mainly for wilderness protection	Large area of unmodified or slightly modified land and/or sea, retaining its natural characteristics and influence, without permanent or significant habitation, which is protected and managed to preserve its natural condition.
Category II: National Park: protected area managed mainly for ecosystem protection and recreation	Natural area of land and/or sea designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
Category III: Natural monument: protected area managed mainly for conservation of specific natural features	Area containing specific natural or natural/cultural feature(s) of outstanding or unique value because of their inherent rarity, representativeness or aesthetic qualities or cultural significance.
Category IV: Habitat/Species Management Area: protected area managed mainly for conservation through management intervention	Area of land and/or sea subject to active intervention for management purposes to ensure the maintenance of habitats to meet the requirements of specific species.

² GN91. IFC Guidance Note (2019) of PS6 (2012).

³ IUCN (2007) Defining Protected Areas. International Union for Conservation of Nature. Retrieved April 10, 2024, from <https://portals.iucn.org/library/sites/library/files/documents/2008-106.pdf>.

IUCN Management Categories	Definition
Category V: Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation or recreation	Area of land, with coast or sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance, and evolution of such an area.
Category VI: Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural resources	Area containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while also providing a sustainable flow of natural products and services to meet community needs.

2.1.3 ALLIANCE FOR ZERO EXTINCTION (AZE)

The Alliance for Zero Extinction (AZE) is a joint initiative of biodiversity conservation organizations worldwide working to prevent extinctions by promoting identification and ensuring the safeguard and effective conservation of key sites that are the last remaining refuges of one or more Endangered or Critically Endangered species.

The objective and framework were developed in accordance with the Kunming-Montreal Global Biodiversity Framework, Goal A, and Target 4.⁴

2.1.4 RAMSAR CONVENTION

The Ramsar Convention, commonly known as the Convention on Wetlands, is an international convention that promotes the conservation and sustainable use of wetland areas. The goal of the Convention is to conserve and wisely use all wetlands via local and national actions and international collaboration, as a contribution to attaining global sustainable development. Wetlands are defined broadly under the Convention. All lakes and rivers, underground aquifers, swamps and marshes, wet grasslands, peat lands, oases, estuaries, deltas and tidal flats, mangroves and other coastal regions, coral reefs, and all man-made sites like fishponds, rice paddies, reservoirs, and salt pans are included.

2.1.5 WORLD HERITAGE CONVENTION

The World Heritage Convention (WHC) aimed to protect the world's cultural and natural heritage. The WHC's definition of "natural heritage" may be compatible with biodiversity protection, which should include:

- "Natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view;
- Geological and physiographical formations and precisely delineated areas that constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation; and
- Natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation, or natural beauty."

The World Heritage Convention states that each State Party should be dedicated to the preservation of its distinct heritage sites. Heritage sites placed within the jurisdiction of a State Party shall be the responsibility of the State. The state is dedicated to protecting and conserving

⁴ <https://www.cbd.int/doc/c/e6d3/cd1d/daf663719a03902a9b116c34/cop-15-l-25-en.pdf>

its heritage sites, using all available resources and, when appropriate, international assistance and collaboration.

2.2. NATIONAL REGULATION

The significant laws and regulations in Thailand regarding terrestrial and marine biodiversity are shown in **Table 2.2**.

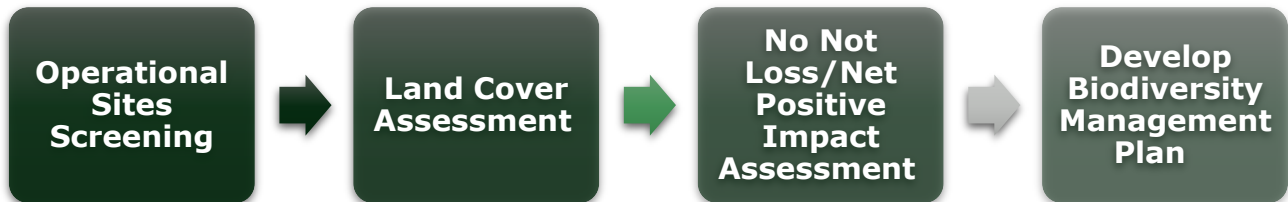
TABLE 2.2 THAILAND REGULATIONS REGARDING BIODIVERSITY

No	Regulation	Substance
1	Marine and Coastal Resources Management Promotion Act B.E. 2558 (2015)	The law has an objective to establish criteria for the management, maintenance, conservation, restoration of marine and coastal resources and prevention of coastal erosion, including allowing local people and communities to participate in the planting, maintenance, conservation and restoration of marine and coastal resources in a sustainable manner.
2	Wild Animal Conservation and Protection Act, B.E.2562 (2019)	The law is related to the conservation and protection of wildlife and was established to comply with international agreements for the cooperation in conserving and protecting local wildlife, which is an important global resource. It specifies the reserved wildlife according to the appendix of this law and designates protected wildlife according to the appendix of the ministerial regulations issued under this law. It also sets penalties for anyone who commits offenses or violates the law.
3	Wild Animal Reservation and Protection Act, B.E.2535 (1992)	The Act was Thailand's foundational law for wildlife conservation. It classified species into preserved and protected categories, prohibiting unauthorized hunting, possession, trade, and export of these animals. The 7 types of protected wildlife are designated according to the appendix of this regulation. These 7 types are 1) Mammal 2) Bird 3) Reptile 4) Amphibian 5) Invertebrate 6) Fish 7) Other Invertebrate.
4	Ministry of Natural Resources and Environment, B.E.2546 (2003) to No.4, B.E.2561 (2018) Protected Wildlife Reproduction Designation	This ministerial regulation was declared to preserve the protected wildlife, the protected wildlife that can be reproduced are designated according to the appendix of this regulation.
5	Royal Ordinance on Fisheries B.E.2558 (2015) and No.2 B.E.2560 (2017)	This Royal Ordinance is the law that aims to preserve aquatic animal resources and preserve the environment in an appropriate state along the approaches, criteria and standards recognized internationally. Overfishing is prevented and eliminated to ensure that the level of fishing does not undermine the sustainability of fisheries resources. The releasing of any toxic that can affect aquatic animals into the fisheries resources is not allowed.
6	National Park Act, B.E.2562 (2019)	The Act is related to the sustainable efficacy of the conservation, preservation, protection and maintenance of national parks, forest parks, botanic gardens and arboreta as well as the management of natural resources, the ecosystem and biological diversity in such areas.
7	National Reserved Forests Act, B.E.2559 (2016)	The Act is related to the protection and reservation of forest, and to reserve any forest to be national reserved forest, wholly or partly.
8	Forest Act B.E. 2484 (1941) and amendments (No. 8) B.E. 2562 (2019)	The Royal Gazette published the Forestry Act (No. 8) B.E. 2562, revoking Section 7, unlocking the planting of protected trees and allowing the use of protected trees on owned land.
9	National Biodiversity Action Plan B.E. 2566-2570 (2023-2027)	The Action Plan is also known as Thailand's National Biodiversity Strategy and Action Plan (NBSAP) to fulfill the country's obligations under the Convention on Biological Diversity (CBD,

No	Regulation	Substance
		consists of 3 strategies and 12 targets. Strategy 1 focuses on enhancing conservation efforts by increasing the protection of important habitats and species through improving management practices, expanding protected areas, and developing measures to protect threatened species. Strategy 2 promotes sustainable use of biodiversity resources in a way that is fair and beneficial to local communities, including the sustainable management of agricultural, forestry, tourism, and fisheries areas to ensure balanced use and not destroy nature. Strategy 3 integrates the importance of biodiversity into national and sectoral policies, planning processes, and development projects, by integrating biodiversity into policies and plans in all sectors of development.

3. NO NET LOSS / NET POSITIVE IMPACT ASSESSMENT

The Biodiversity Management Plan (BMP) with No Net Loss (NNL) / Net Positive Impact (NPI) Assessment follows a four-step systematic approach used in environmental management to assess and manage biodiversity within a particular area. The Biodiversity Management Plan with NNL/NPI Assessment involves four (4) main steps:



Operational site screening categorizes sites based on their proximity to internationally recognized biodiversity areas. This screening process categorizes the risk level of each site based on its proximity to critical biodiversity features, such as Protected Areas (PAs), Key Biodiversity Areas (KBAs), Alliance for Zero Extinction (AZE) sites, Ramsar Sites, and World Heritage Areas, while the land cover assessment compares pre-construction and current land cover types to evaluate habitat loss. The NNL/NPI assessment calculates biodiversity risks and targets, aiming to achieve no net loss or net positive impact, and the development of a biodiversity management plan follows the IFC Performance Standard 6, incorporating guidelines for offsetting adverse impacts on biodiversity.

Utilizing a systematic approach, the plan integrates various technical guidelines to ensure compliance with global standards and considers factors such as socio-economic aspects and stakeholder interests. By implementing this approach, the plan aims to manage and conserve biodiversity effectively while promoting sustainable development within specific regions or ecosystems.

The application of the mitigation hierarchy is required to demonstrate whether no net loss (NNL) or net positive impact (NPI) has been achieved by the project. Residual impacts on natural habitats are required to achieve No Net Loss of biodiversity values.

In relation to achieving no net loss for natural habitats, the following definition applies (IFC PS6 2012):

"No net loss is defined as the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the project's impacts, undertake on-site restoration, and finally offset significant residual impacts, if any, on an appropriate geographic scale (e.g., local, landscape-level, national, regional)."

Biodiversity offsets are designed to compensate for the residual biodiversity losses due to the Project. They are defined as (Business and Biodiversity Offset Program (BBOP), 2012):

"Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss of biodiversity on the ground with respect to species composition, habitat structure and ecosystem function and people's use and cultural values associated with biodiversity."

3.1 OPERATIONAL SITE SCREENING

3.1.1 APPROACH

The distance of the operational sites to internationally recognized areas and/or important biodiversity areas was analyzed using GIS tools. Data on internationally recognized areas and/or important biodiversity areas was derived from the Integrated Biodiversity Assessment Tool (IBAT).

A risk rating was subsequently allocated to each site that overlaps with or is in proximity to internationally recognized areas and/or important biodiversity areas. The risk rating is based on the sites' relative distance to these areas. This follows the general principle of proximity-based biodiversity risk screening consistent with guidance from BBOP and IFC PS6.

Sites that overlap are rated as very high risk; closer than 2 km are rated as a high risk; those between 2 km and within 5 km a medium risk; and those greater than 5 km are recorded as a low risk.

The risk criteria for assessing the risk rating for sites are shown in **Table 3.1**.

TABLE 3.1 RISK RATING CRITERIA

Proximity to biodiversity recognised area	Definition
Insufficient data to assess the location of the site in relation to internationally recognized areas and/or important biodiversity areas	Insufficient Data
Internationally recognized areas and/or important biodiversity areas are greater than 5 km from the site .	Low
Internationally recognized areas and/or important biodiversity areas are greater than 2 km or less than 5 km of the site .	Moderate
Internationally recognized areas and/or important biodiversity areas are immediately adjacent to or within 2 km of the site .	High
Site is located within the internationally recognized areas and/or important biodiversity areas.	Very High

3.1.2 FINDING

GIS analysis was conducted for 23 operational sites. Of these, one site is located within an Internationally Recognized Areas and/or Important Biodiversity Areas.

The assessment found that:

- Most GPSC sites (19 out of 23) are classified as Low biodiversity risk, as they are located far from any international biodiversity designation and are predominantly situated within developed industrial estates.
- Two sites—GIPP and Huay Ho—fall within the Moderate risk category because they are located within close proximity (4–5 km) to KBAs or protected landscapes.
- Only one site, CHPP, is categorized as Very High risk, due to its direct overlap with the Lower Central Basin KBA, indicating higher ecological sensitivity within the surrounding area.

The risk level for each site is listed in **Table 3.2**. Maps of the location of GPSC sites, in relation with Internationally Recognized Areas and/or Important Biodiversity Areas are shown in **Figure 3.1 - Figure 3.5**.

TABLE 3.2 SUMMARY RISK LEVEL OF EACH SITES

No.	Site Name	Nearest KBA (KM)	Nearest PA (KM)	Nearest AZE (KM)	Nearest RAMSAR (KM)	Nearest WHC (KM)	Risk Level
1	CHPP	Lower Central Basin (0)	None	None	None	None	Very High
2	CHPP (solar)	None	None	None	None	None	Low
3	CUP1	None	None	None	None	None	Low
4	CUP2	None	None	None	None	None	Low
5	CUP3	None	None	None	None	None	Low
6	CUP4	None	None	None	None	None	Low
7	GHECO-One	None	None	None	None	None	Low
8	GIPP	None	Khao Khiew - Khao Chomphu (4.863)	None	None	None	Moderate
9	Glow Energy CFB 3	None	None	None	None	None	Low
10	Glow Energy Phase 1	None	None	None	None	None	Low
11	Glow Energy Phase 2	None	None	None	None	None	Low
12	Glow Energy Phase 4	None	None	None	None	None	Low
13	Glow Energy Phase 5	None	None	None	None	None	Low
14	Glow Energy Solar Plant	None	None	None	None	None	Low

No.	Site Name	Nearest KBA (KM)	Nearest PA (KM)	Nearest AZE (KM)	Nearest RAMSAR (KM)	Nearest WHC (KM)	Risk Level
15	Glow SPP 11 Project 1	None	None	None	None	None	Low
16	Glow SPP 11 Project 2	None	None	None	None	None	Low
17	Glow SPP 11 Project 3	None	None	None	None	None	Low
18	Glow SPP 2	None	None	None	None	None	Low
19	Glow SPP 3 (CFB2 & CFB1)	None	None	None	None	None	Low
20	Huay Ho	Phou Kathong (4.408)	None	None	None	None	Moderate
21	IRPCCP Phase 1 & 2	None	None	None	None	None	Low
22	Rayong Expansion (CUP-3)	None	None	None	None	None	Low
23	Rayong Waste to Energy	None	None	None	None	None	Low

FIGURE 3.1 NEAREST KEY BIODIVERSITY AREA (KBA) TO GPSC'S OPERATIONAL SITES

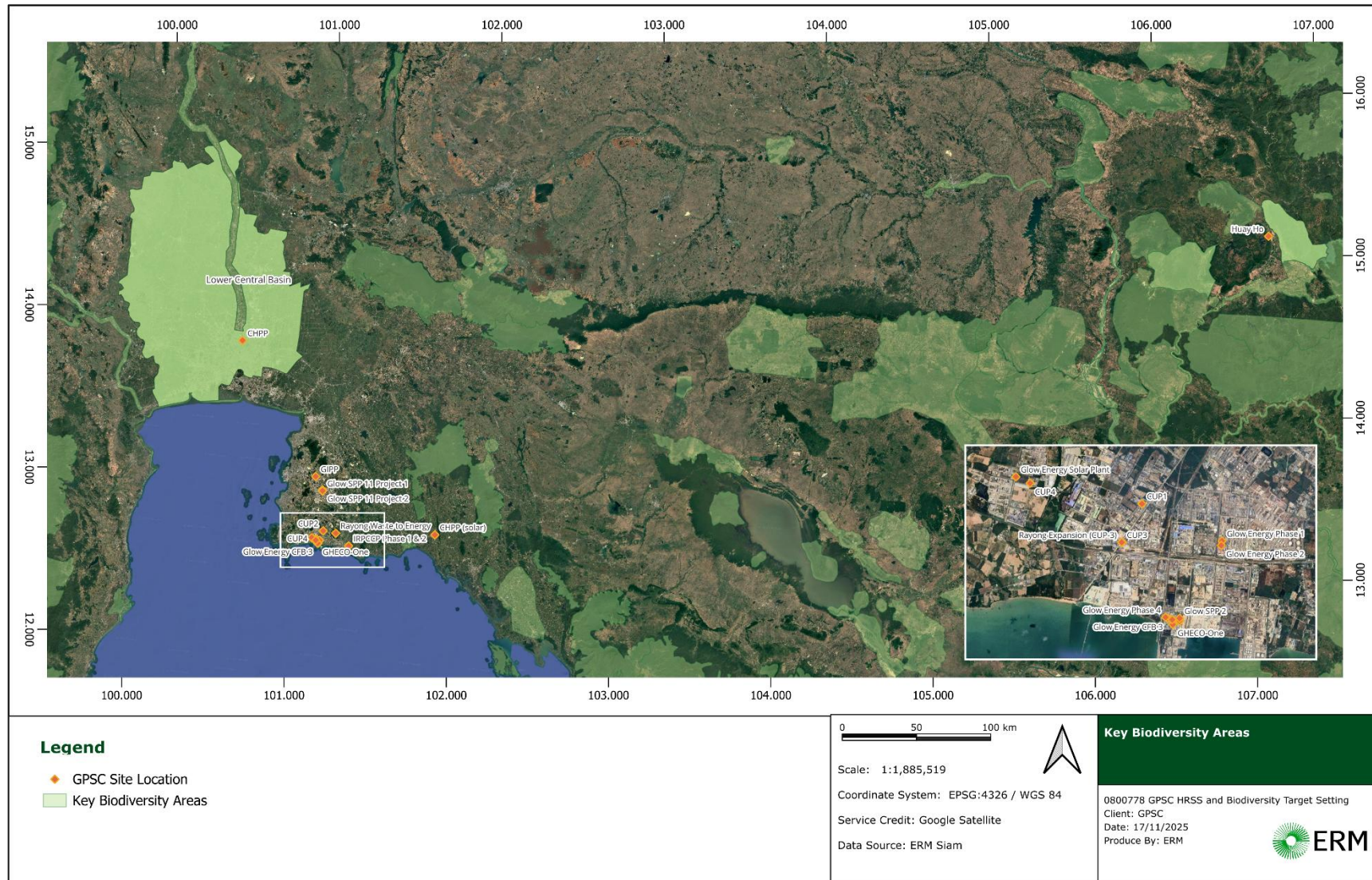


FIGURE 3.2 NEAREST PROTECTED AREA (PA) TO GPSC'S OPERATIONAL SITES

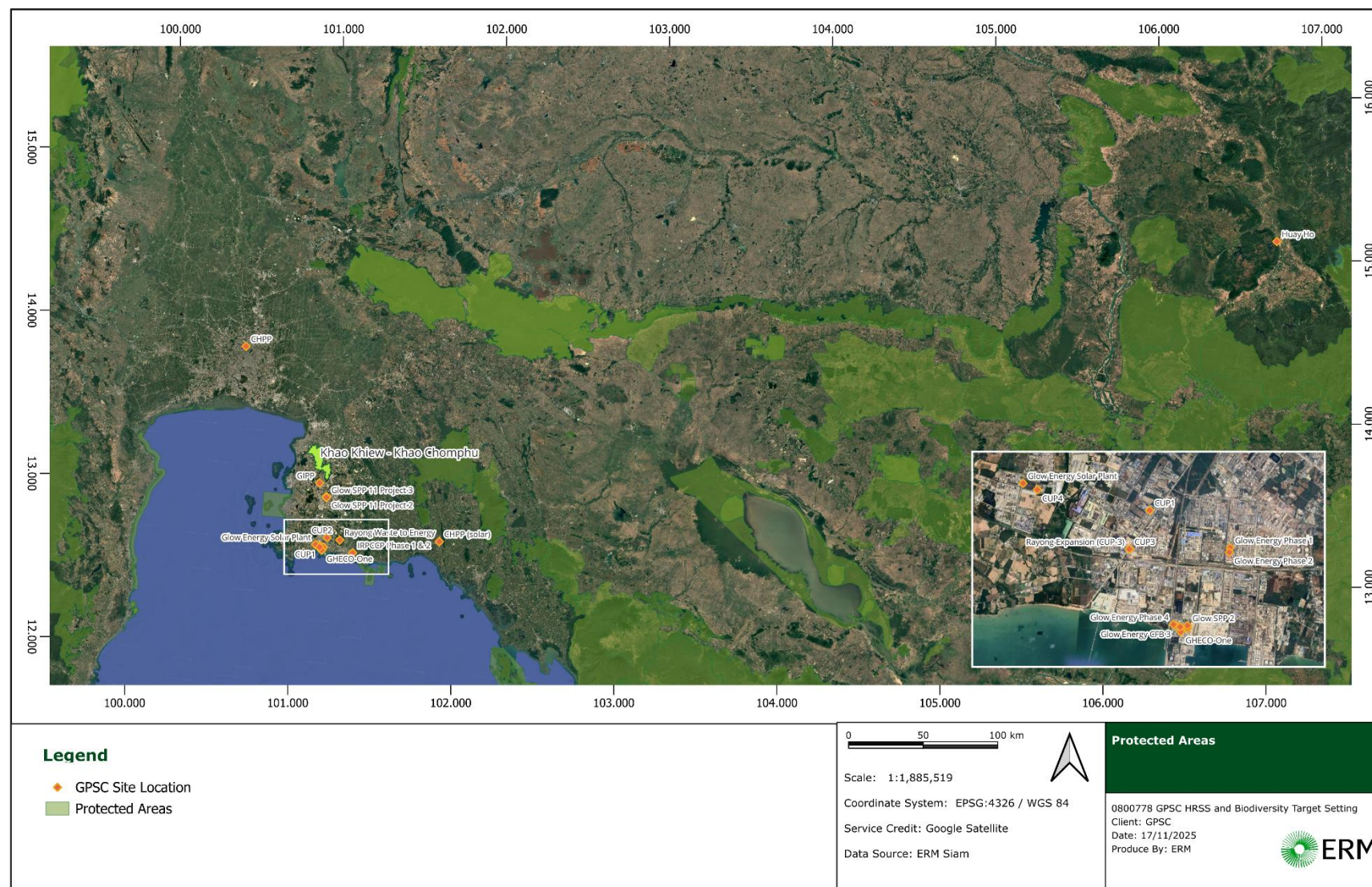


FIGURE 3.3 NEAREST ALLIANCE FOR ZERO EXTINCTION (AZE) TO GPSC'S OPERATIONAL SITES

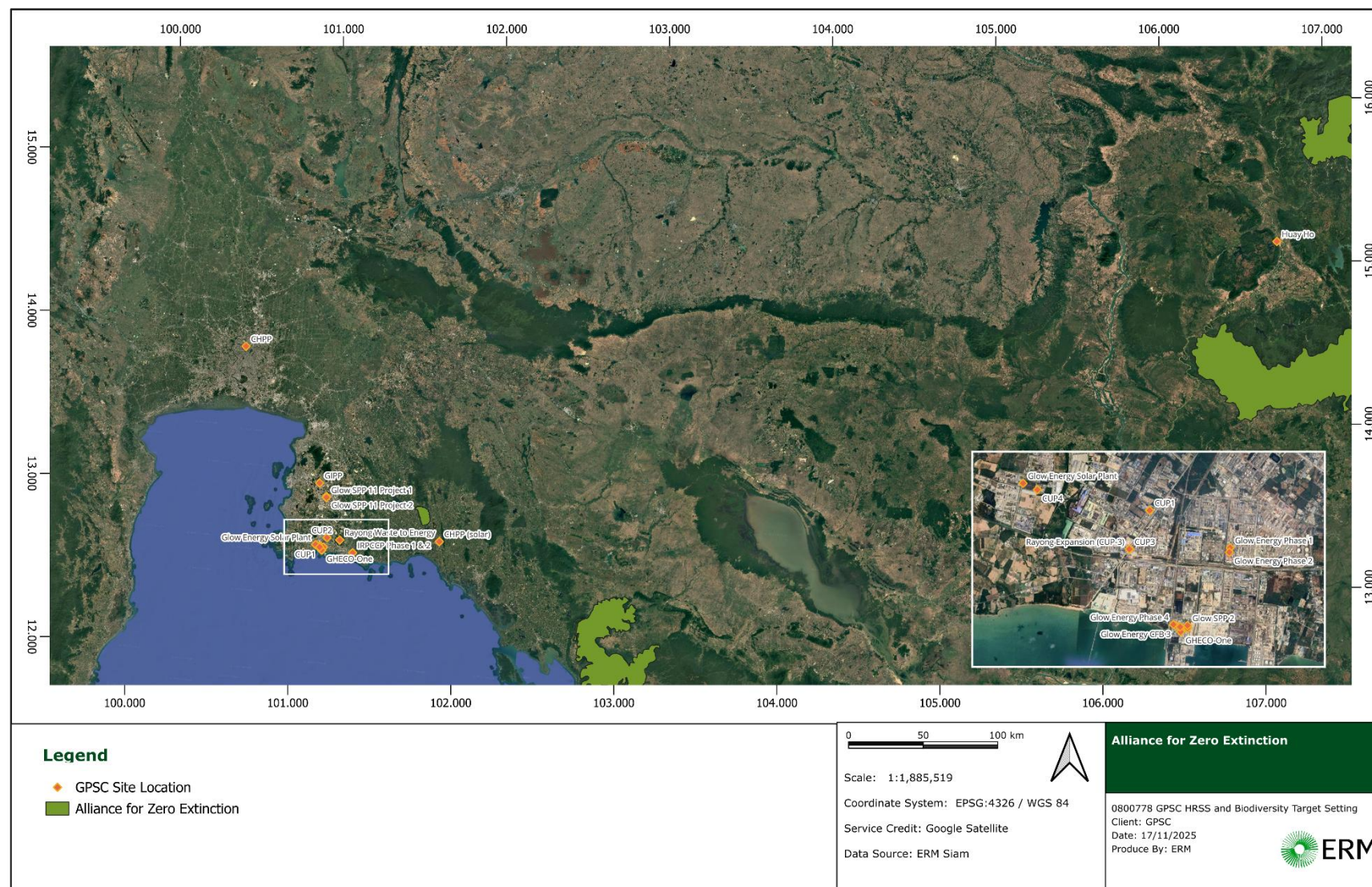


FIGURE 3.4 NEAREST RAMSAR SITE TO GPSC'S OPERATIONAL SITES

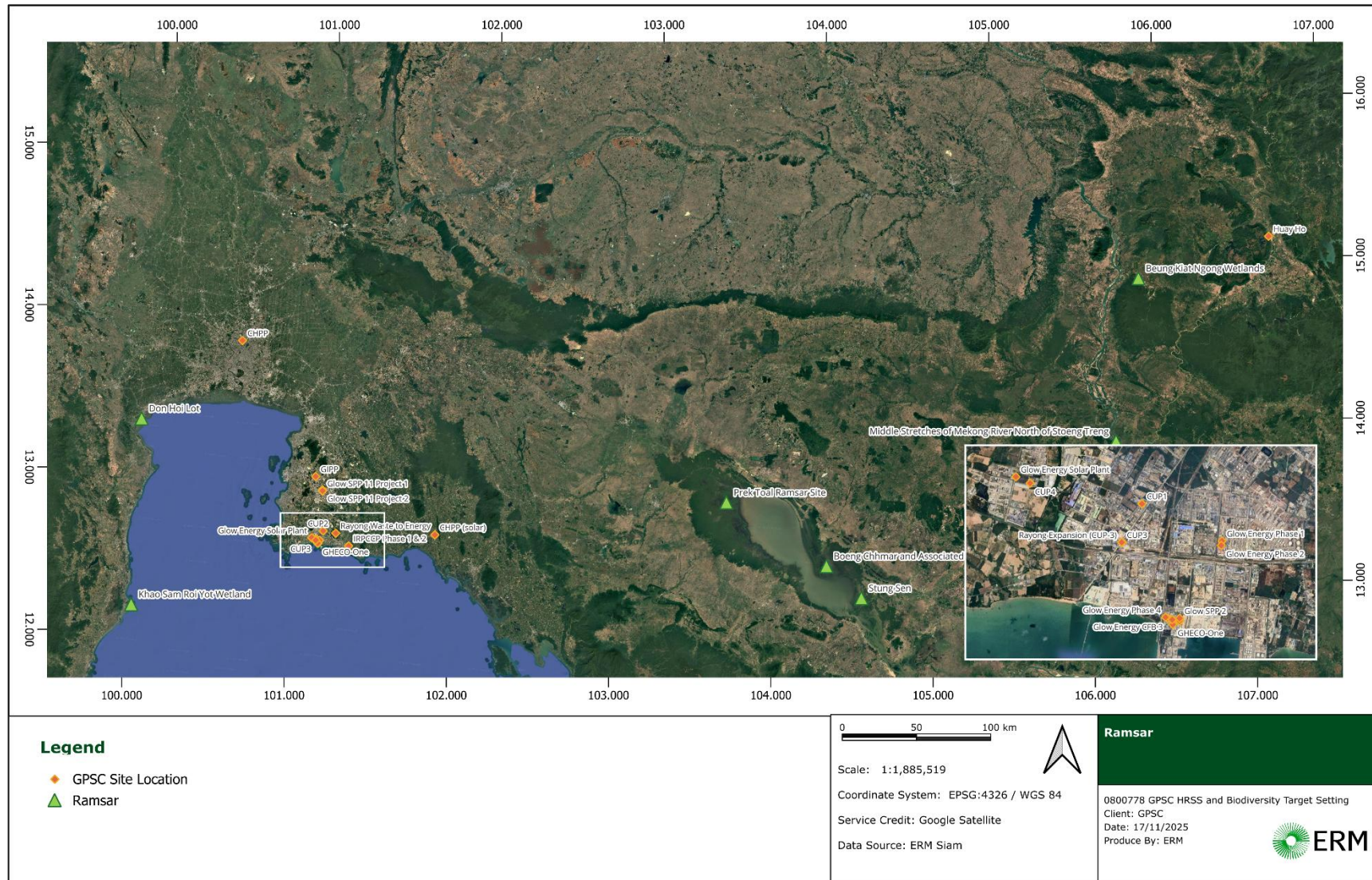
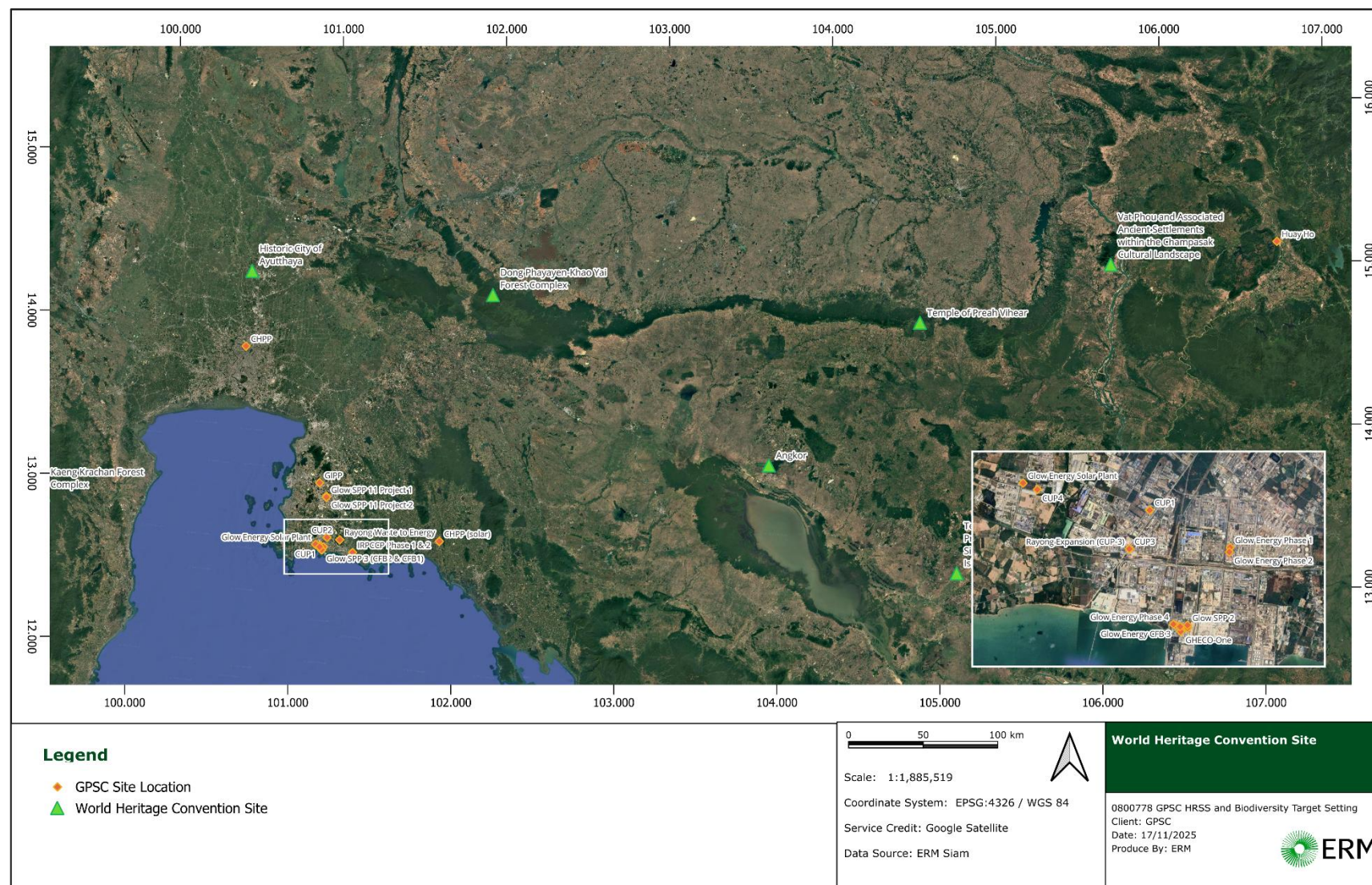


FIGURE 3.5 NEAREST WORLD HERITAGE CONVENTION SITE TO GPSC'S OPERATIONAL SITE



3.1.3 IMPLICATIONS AND RECOMMENDED ACTIONS FOR GPSC

These results indicate that while the majority of GPSC's portfolio operates in low-risk biodiversity contexts, a small number of sites will require closer attention as GPSC moves toward NNL/NPI target setting and long-term biodiversity management.

1) Very High-Risk Site: CHPP (Very High Risk – directly within a KBA)

- Conduct a site-specific biodiversity impact review focusing on operational impacts, water abstraction/discharge, habitat fragmentation, and species potentially associated with the Lower Central Basin KBA.
- Integrate biodiversity considerations into the plant's Environmental Management Plan (EMP).
- Implement enhancement measures (e.g., riparian buffer improvement, habitat restoration, invasive species control) to support KBA values.

2) Moderate-Risk Sites

1. GIPP: located 4.86 km from Khao Khiew–Khao Chomphu PA
2. Huay Ho: located 4.40 km from Phou Kathong KBA
 - Undertake focused biodiversity assessment (desktop review and rapid field verification) to confirm whether operations impact nearby biodiversity features and KBAs/PA values.
 - Strengthen biodiversity monitoring within the site's zone of influence, especially along transmission corridors, waterways, and riparian edges.
 - For Huay Ho specifically:
 - Apply IFC PS6 principles for operational impacts (e.g., hydrology, downstream ecology and sedimentation).
 - Implement voluntary restoration/enhancement aligned with the concession agreement, despite legacy land clearance not being GPSC's responsibility.

3) Low-Risk Sites (19 sites)

- Maintain standard environmental management practices under GPSC's ESMS.
- Monitor for any future expansion or land-use change that may alter risk status.

3.2 LAND COVER ASSESSMENT

3.2.1 APPROACH

Of the 23 operational sites assessed for this project, 19 are located within established industrial estates. These estates have been fully prepared, cleared, and developed by the estate developers prior to land allocation to GPSC. Following the "polluter pays" principle, which assigns responsibility for habitat clearance to the party that undertakes or benefits from the land preparation, the biodiversity impacts associated with these pre-cleared areas should be attributed to the industrial estate developers, rather than to GPSC. Therefore, these 19 sites are excluded from the land-use change analysis and do not contribute to GPSC's No Net Loss (NNL) calculations in the next chapter. The assessment presented below focuses only on the remaining sites where GPSC's activities may directly influence habitat conditions. As a result, only the remaining four (4) sites, those outside industrial estates and not located in GPSC's area, are

assessed in this chapter and further. Additionally, for the operational site Huay Ho HPP, the project boundary for this assessment has been refined based on clarifications provided by GPSC. Although the broader facility includes structures and supporting infrastructure developed in coordination with the Lao government, only a portion of the site is under the direct control and operational responsibility of GPSC. Specifically, GPSC confirmed that the assessment should focus solely on the powerhouse and the tailrace channel that connects the powerhouse to the Xekong River.

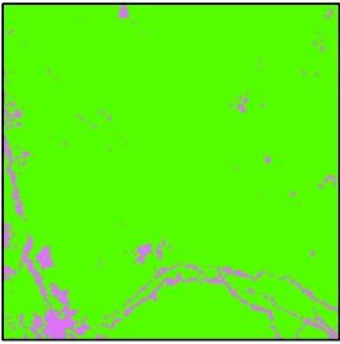
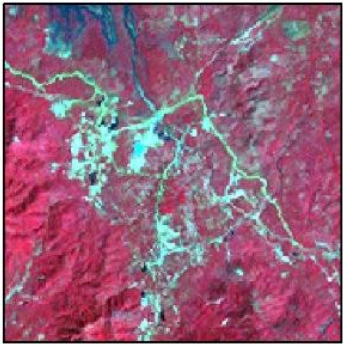
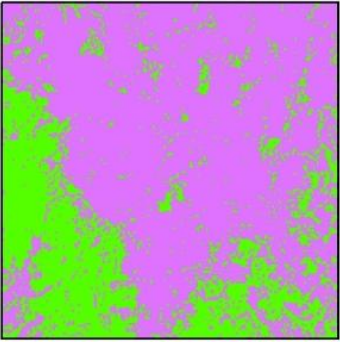
The land cover assessment was conducted using very-high-resolution satellite imagery from Pléiades Neo (Airbus) and Maxar. These platforms provide optical imagery with spatial resolutions ranging from 30 cm to 50 cm, enabling detailed interpretation of land cover features and significantly improving the accuracy of the analysis compared with medium-resolution datasets.

The imagery was chosen from the years 1985 to 2020, with two scenes of imagery covering the project's study area to identify the distribution of land cover types using historic satellite imagery (imagery taken before the development of the Project site and associated facilities). The results were used to delineate the areas of natural habitat and modified habitat.

This approach is consistent with the principles of the Kunming-Montreal Global Biodiversity Framework (GBF), which encourages the use of the earliest reliable data to assess biodiversity change relative to pre-disturbance conditions. It also aligns with the International Finance Corporation's Performance Standard 6 (IFC PS6) requirements to describe pre-project conditions using the best available information and to acknowledge any data limitations transparently. As such, 1985 has been selected as an appropriate baseline year for the purpose of this assessment.

The example image classification used by the natural habitat and modified habitat is shown in **Table 3.3** below.

TABLE 3.3 IMAGE CLASSIFICATION OF NATURAL AND MODIFIED HABITATS

	Infrared Image	Remote Sensing Result	Satellite Image
Natural Habitat			
Modified Habitat			

3.2.2 FINDING

GPSC conducted pre-construction natural and modified habitat classifications and analysis for GPSC's four operational sites. The assessment found that one sites (Huay Ho Hydro Power Plant) were constructed by clearing forest areas that can support biodiversity, resulting in the loss of natural habitats totaling approximately 0.92 hectares. However, the impact area that belongs to GPSC's responsibility was limited to the powerhouse and the connecting tailrace. In contrast, the other three sites (CHPP Solar, IRPCCP Phase 1&2 and Rayong Waste to Energy) were developed entirely within modified habitats, without impacting areas classified as natural habitat.

Habitat classes and areas directly impacted by GPSC operational sites are summarized in **Table 3.4**, which shows that, across all sites, a total of 0.92 hectares of natural habitat and 43.04 hectares of modified habitat were identified, covering a combined total area of 43.96 hectares. The site-specific distribution is further visualized in

Figure 3.6 - Figure 3.9.

TABLE 3.4 LAND COVER CLASSIFICATION

Site	Habitat Type (hectares)		Land use Type	Total Area (hectares)
	Natural Habitat	Modified Habitat		
Huay Ho HPP	0.92	0	Forest	0.92
CHPP Solar	0	11.35	Agriculture – Rubber, Palm oil	11.35
IRPCCP Phase 1&2	0	28.87	Bareland, Built-Up and Shrubland	28.87
Rayong Waste to Energy	0	2.82	Agriculture – Rubber	2.82
Total				43.96

FIGURE 3.6 HABITAT TYPE OF HUAY HO HPP

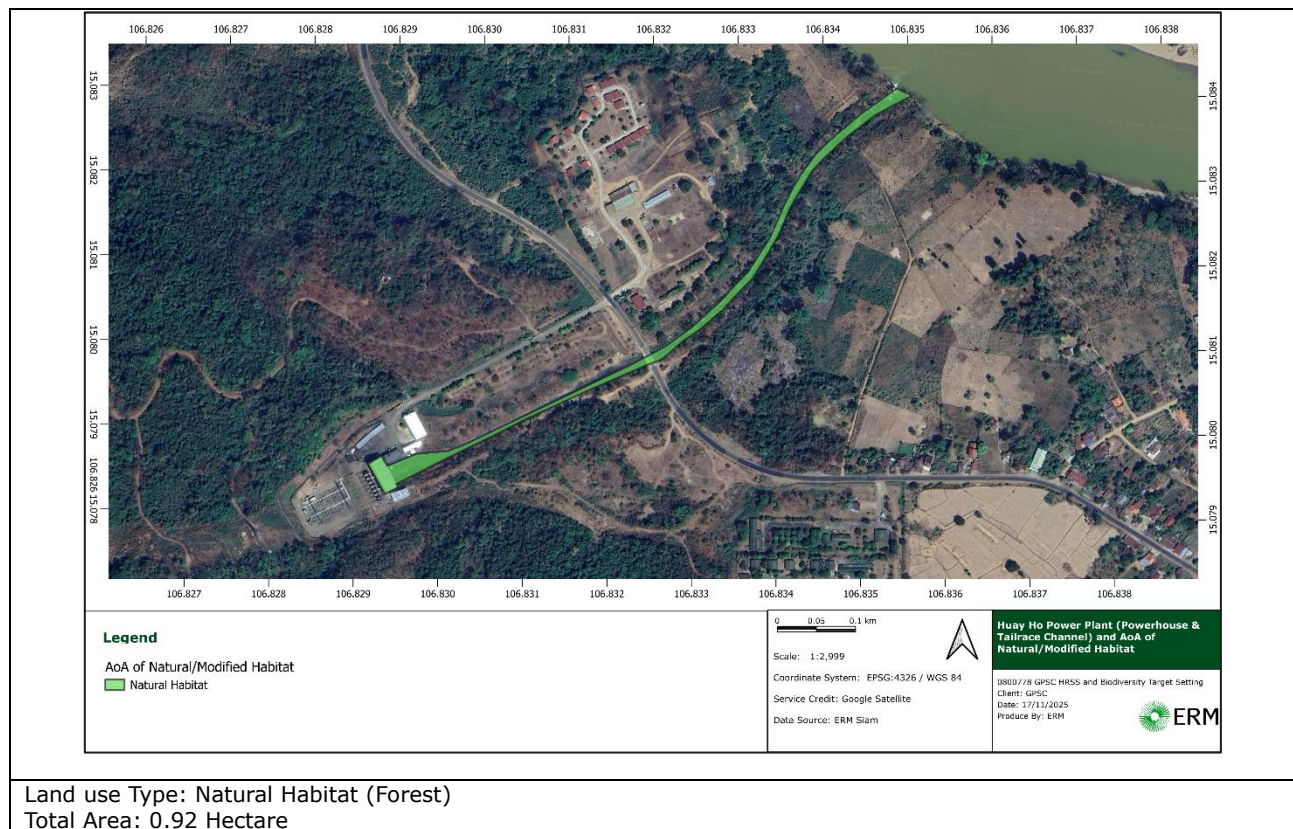


FIGURE 3.7 HABITAT TYPE OF CHPP SOLAR

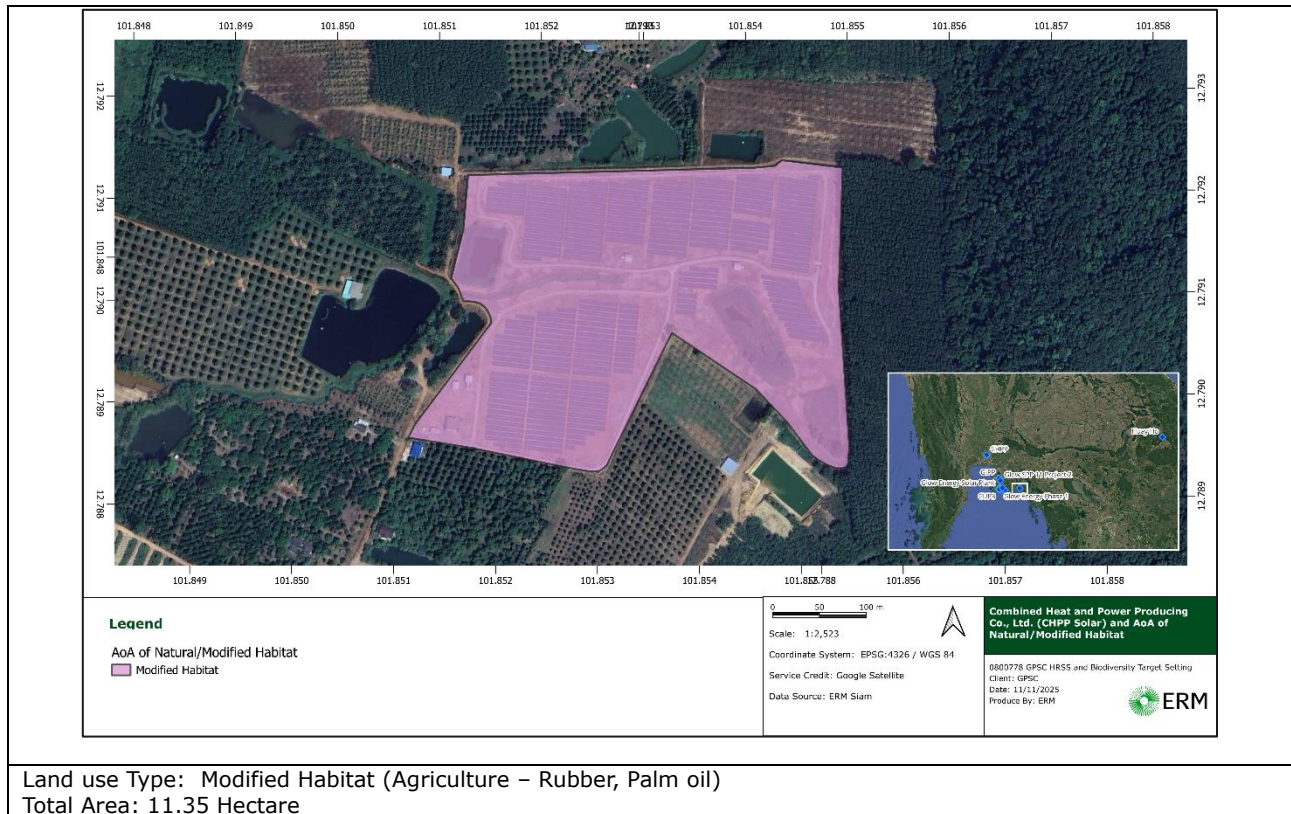


FIGURE 3.8 HABITAT TYPE OF IRPCCP PHASE 1&2

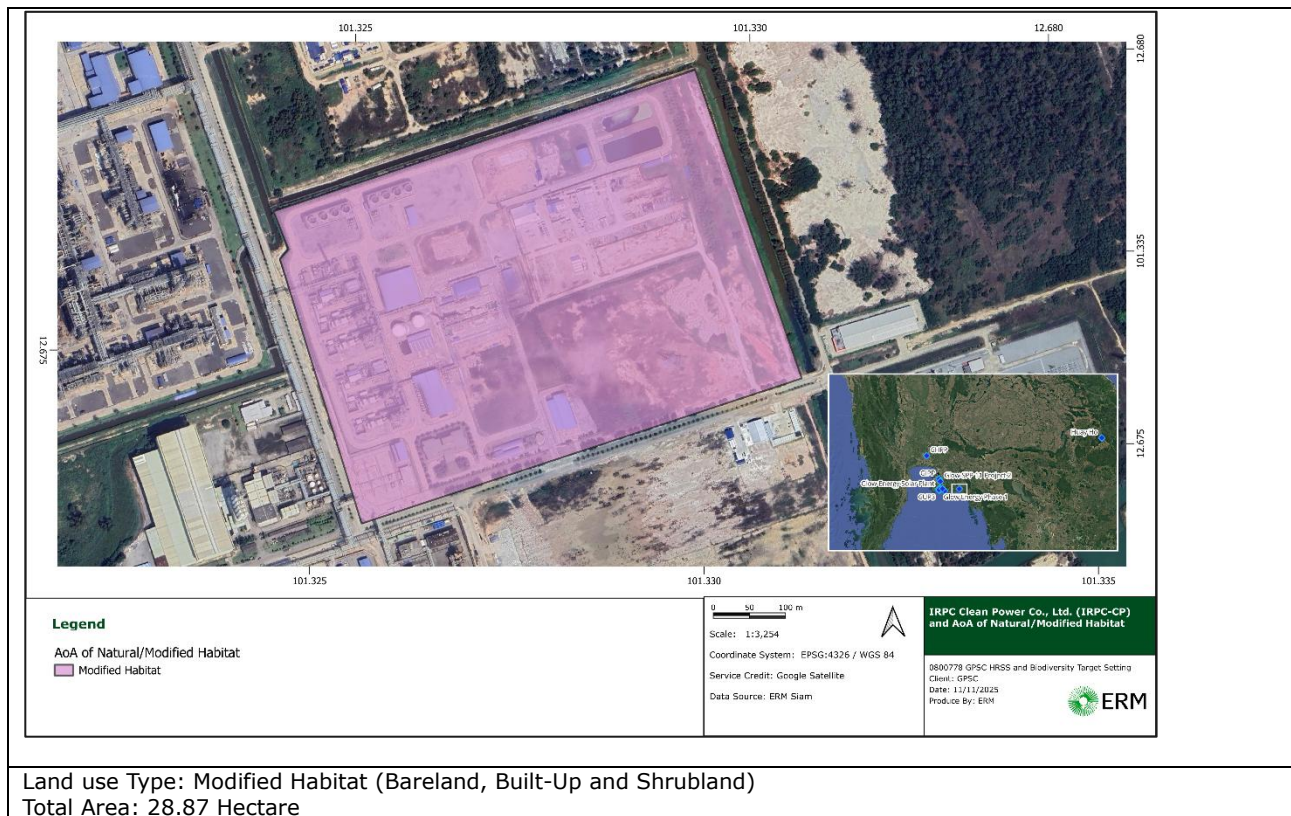
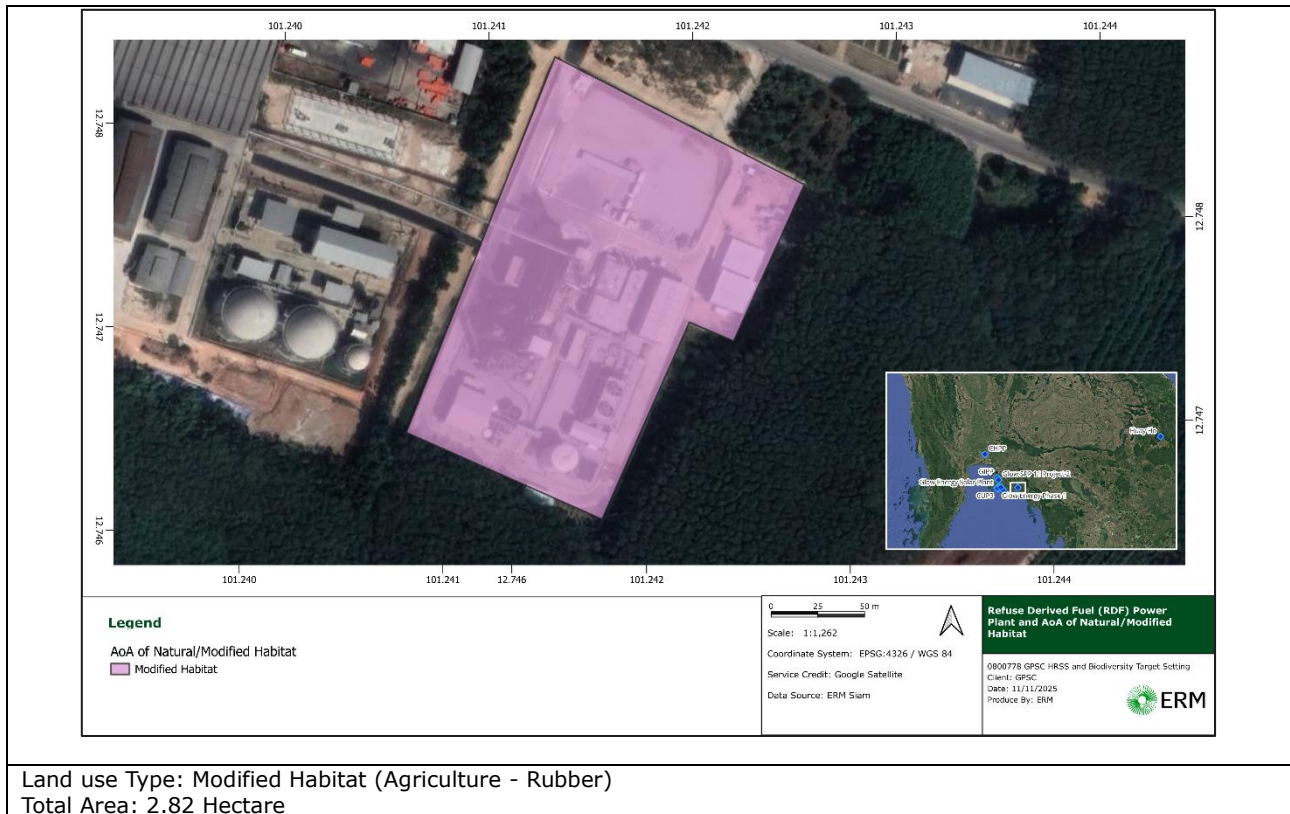


FIGURE 3.9 HABITAT TYPE OF RAYONG WASTE TO ENERGY



3.3 NNL / NPI CALCULATION METHODOLOGIES

NNL / NPI Assessment Methodologies GPSC's used was 'Impact site habitat hectare calculations.' The residual impact habitat hectare calculations are used to quantify the residual value of the impacted habitats. Habitat condition scores were assigned for each habitat type on the operational site. These scores are used to set a baseline condition of the impact site against a habitat condition benchmark (set at a value of 1).

The Habitat Hectare model relies on scores to define 'vegetation quality', being the degree to which the current vegetation differs from a 'benchmark' representing characteristics of a mature and apparently long-undisturbed stand of the same vegetation community. Essentially, this method attempts to assess how 'natural' a site is by comparing it to the same vegetation type in the absence of major ecosystem changes that have occurred.⁵

The following formula has been used to calculate the habitat hectares of the residual values of the impacted habitats:

$$\text{Habitat Hectares} = \frac{[\text{Area of Habitat Type (A)} \times \text{Habitat Condition Score (B)}]}{\text{Benchmark Score}}$$

Refer to **Table 3.5** outlines the habitat class condition scores applied. These scores have been derived based on the definitions contained in IFC PS6 for "natural" and "modified" habitats and the definition of "degradation" level of modified habitats (IFC, 2012). The scores have been derived to reflect the relative difference between a condition category and the benchmark, which in effect is a proxy for the 'restorability' of that habitat.

TABLE 3.5 HABITAT CONDITION SCORE

Condition	Definition	Score
Benchmark	Benchmark habitats in a mature condition with only native origin vegetation, a diversity of species of a mature or senescent state; and no sign of human disturbance (such as the presence of waste, vegetation removal).	1
Natural	Natural condition is defined as habitat largely of native origin, and/or where human activity has not essentially modified the primary ecological functions and species composition. Some disturbance is likely present such as vegetation removal, waste and minor introduction of invasive species.	0.75
Modified level 1	Modified condition habitats (level 1) are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition.	0.5
Modified level 2 (Degraded)	Modified condition habitat (level 2) defined as significant conversion or degradation of the habitat such as the elimination or severe diminution of the integrity of a habitat caused by a major and/or long-term change in land or water use; or (ii) a modification that substantially minimizes the habitat's ability to maintain viable populations of its native species.	0.25

⁵ Parkes, D., Newell, G., & Cheal, D. (2003). Assessing the quality of native vegetation: the 'habitat hectares' approach. Ecological management & restoration, 4, S29-S38.

3.3.1 FINDING OF NNL/NPI CALCULATION

The total area assessed across the four (4) operational sites, using the habitat hectare method, is 43.96 hectares. Based on the application of habitat condition scores to each habitat type, the calculated area requiring offset to achieve No Net Loss (NNL) of biodiversity values is 11.43 hectares, as summarized in **Table 3.6**.

Given the inherent uncertainties associated with the success of forest restoration activities and the ecological outcomes, robust monitoring and evaluation of offset restoration projects are essential to determine the effectiveness of the offsetting process. Adaptive management approaches are recommended to ensure continuous improvement and to maximize the project's chances of successfully achieving NNL.

TABLE 3.6 CALCULATION OF HABITAT HECTARE IMPACT AREAS

Sites	Habitat Type	Area of Habitat Type (ha) (A)	Habitat Condition Score (B)	Habitat Hectares Impact Area (ha)
Huay Ho HPP	Natural	0.92	0.75	0.69
CHPP Solar	Modified level 1	11.35	0.25	2.83
IRPCCP Phase 1&2	Modified level 1	28.87	0.25	7.21
Rayong Waste to Energy	Modified level 1	2.82	0.25	0.7
Total		-	-	11.43

Note: The total habitat hectare impact area requiring offset (11.43 hectares) is equivalent to 71.43 Rai.

4. BIODIVERSITY MANAGEMENT PLAN FOR NNL/NPI

The Biodiversity Management Plan (BMP) outlines the essential actions required to manage biodiversity risks and strengthen conservation outcomes for the four (4) standalone GPSC operation sites: *CHPP (Solar)*, *Huay Ho (Powerhouse and tailrace channel)*, *IRPCCP Phase 1 & 2*, and *Rayong Waste to Energy*. These sites are located outside industrial estates and therefore retain direct relevance to GPSC's biodiversity footprint. The management actions follow the mitigation hierarchy and include both direct and indirect interventions to enhance biodiversity resilience.

The GIS-based screening of all 23 operational sites found that biodiversity risk across the portfolio is generally low; however, four sites warrant further attention due to their standalone location and relevance to operational biodiversity considerations. The overall screening results indicate that:

- 19 sites are classified as Low biodiversity risk, located far from internationally recognized conservation areas and situated within fully developed industrial estates.
- Two sites—GIPP and Huay Ho—are categorized as Moderate risk, as they lie within close proximity (4–5 km) to Key Biodiversity Areas or protected landscapes.
- One site, CHPP, is classified as Very High risk due to its direct overlap with the Lower Central Basin KBA.
- Three standalone sites—CHPP (Solar), IRPCCP Phase 1 & 2, and Rayong Waste to Energy—are located away from high biodiversity areas but remain ecologically relevant due to being outside industrial estates.

Land-cover assessment further indicates that three of the four BMP sites are situated in modified habitat (developed or settlement areas), where no deforestation occurred for site establishment. One site, Huay Ho, shows historical signs of vegetation clearance, reflecting legacy impacts associated with project development before GPSC's operational control.

Based on the combined results of GIS sensitivity screening, habitat condition, and site context, six (6) sites, *GIPP*, *CHPP*, *CHPP (Solar)*, *Huay Ho (Powerhouse and tailrace channel)*, *IRPCCP Phase 1 & 2*, and *Rayong Waste to Energy*, are selected for the application of the Biodiversity Management Plan (BMP). These sites represent the locations where biodiversity-related management actions are most appropriate and aligned with GPSC's long-term commitment to responsible biodiversity stewardship.

As a result, significant replanting is necessary to compensate for the loss of natural habitat. Meanwhile, measures to support other biodiversity-supportive habitats related to company activities are classified as recommended actions to support NNL achievement.

According to IFC PS6 Paragraph 10, the design of a biodiversity offset must adhere to the "like-for-like or better" principle. The principle of "like-for-like or better" requires that biodiversity offsets be designed to conserve the same biodiversity values affected by the project or company's activities. The natural habitat was lost because the site construction is an overgrown area. This type of habitat is an acceptable biodiversity biodiversity-supportive habitat. To comply with the "like-for-like or better" principle, a ***mixed deciduous forest, or dry evergreen forest***, should be enough to compensate for the loss.

The following section highlights the main actions required as part of the BMP. The action type, as identified within the mitigation hierarchy, is shown in **Table 4.1**. The scope of this BMP also

includes the adjacent area of the site location (5 km). In addition to the direct mitigation measures, the BMP also includes a number of indirect measures that can be classified as enhancements. These indirect measures create additional biodiversity value on the ground. While these actions might not directly create value, they have the potential to indirectly yield positive effects on the area, e.g., financial support to local NGOs, and/or research.

The action types were determined according to potential impact on six (6) operational sites to related biodiversity features surrounding the sites. The mitigation measures can be grouped into baseline survey, biodiversity conservation, stakeholder engagement and information sharing.

TABLE 4.1 DETAILED OF THE BIODIVERSITY MANAGEMENT PLAN FOR GPSC'S 23 OPERATION SITES

No.	Proposed Actions	Mitigation Hierarchy						Duration	Target and Indicator	Responsible	Partnerships and Stakeholders
		Avoidance	Minimization	Restoration	Offset	Transformation	Additional Action				
Direct Biodiversity Conservation ^{1/}											
1	Conduct biodiversity monitoring on offset locations to obtain baseline information.						/	Annually	Target: To validate monitoring of species diversity (including invasive species) and ecosystem status Indicator: Updated database and information on biodiversity in the adjacent area of the sites. Methods: To obtain biodiversity data of offset locations, series of surveys for birds, mammals, reptiles, amphibians and insects need to be considered.	GPSC’s Sustainability and Climate Change Management Team/ Corporate Communication and Public affairs Team /Operation Health and Environmental Management Team	Third-party specialists (e.g. Professors from universities and/or related government agencies, consultancy companies, etc.)
2	Organize a reforestation program on offset locations.				/			10 years to achieve NNL target. However, the results from existing programs can be reviewed against NNL goal.	Target: To improve the ecosystem that is comparable to the impacted ecosystem. Indicator: Biodiversity improvement of the offset locations. Method: As the program has already been implemented, the reforestation approaches should be certain.	GPSC’s Sustainability and Climate Change Management Team/ Corporate Communication and Public affairs Team /Operation Health and Environmental Management Team	Third-party specialist (Professors from universities and/or related government agencies, etc.)
3	Implement adaptive management measures if biodiversity monitoring						/	If no significant positive	Target: To improve efficiency of offset program.	GPSC’s Sustainability and Climate Change Management Team/	Third-party specialist (Professors from universities and/or

No.	Proposed Actions	Mitigation Hierarchy						Duration	Target and Indicator	Responsible	Partnerships and Stakeholders
		Avoidance	Minimization	Restoration	Offset	Transformation	Additional Action				
	documents impact any species and/or show no significant positive change in the overall habitat of offset locations.							impacts were noticed from monitoring program on offset locations	Indicator: Significant positive change in the biodiversity components of offset locations. Method: -	Corporate Communication and Public affairs Team /Operation Health and Environmental Management Team	related government agencies, etc.)
Indirect Biodiversity Conservation											
4	Limit the duration of artificial lighting during nighttime hours.		/					Throughout the project lifetime	Target: To reduce the light pollution during nighttime. Indicator: The duration of lighting during nighttime. Methods: To minimize light pollution, a schedule will be implemented to restrict the timeframe for nighttime activities.	GPSC's operational sites	-
5	Replace outdoor lights with shielded fixtures to reduce light pollution.		/					Throughout the project lifetime	Target: To reduce the number of nocturnal species drawn to the Operational site by the Project's light pollution. Indicator: All outdoor light should be changed to shielded light fixtures. Method: -	GPSC's operational sites	-
6	GPSC staff should avoid feeding free-roaming cats and dogs, as providing food encourages them to remain in the project area and increases the risk of wildlife predation		/					Throughout the project lifetime	Target: To reduce the number of feral cats and dogs around the site. Indicator: Number of feral cats and dogs roaming around the site. Method: -	GPSC's operational sites	-

No.	Proposed Actions	Mitigation Hierarchy						Duration	Target and Indicator	Responsible	Partnerships and Stakeholders
		Avoidance	Minimization	Restoration	Offset	Transformation	Additional Action				
	by these non-native predators.										
7	Encourage GPSC staff to use reusable food and beverage containers.		/			/		Throughout the project lifetime	Target: To reduce the single use plastic waste. Indicator: The number of single use plastic containers Methods: Tracking the household waste monthly.	GPSC's Sustainability and Climate Change Management Team/ Operation Health and Environmental Management Team	-
8	Consider improving the logistics system to reduce air pollution, such as by transitioning to EV vehicles.					/		Throughout the project lifetime	Target: Reducing carbon emission from logistic related activities. Indicator: Decrease of corporate air pollution from logistic aspect. Method: -	GPSC's Corporate Services Team	Tech automotive companies
Stakeholder Engagement and Information Sharing											
9	Routinely meet with stakeholders to share updated information related to the environment, especially biodiversity and habitats. The objective is to strengthen the stakeholder relationship and monitor the funded program.						/	Align with GPSC's CRS/orate Communication programs	Target: To ensure continuous communication with stakeholders and encourage knowledge sharing. Indicator: Minutes of meetings from stakeholder consultations. Method: -	GPSC's Corporate Communication and Public affairs Team	-

Remark: 1/ Regarding the Polluter Pay principal, the Direct Biodiversity Conservation (mitigation number 1-3) will exclude site GIPP and CHPP.

5. BIODIVERSITY MONITORING AND EVALUATION PLAN

Annual biodiversity monitoring and evaluation, together with local project engagement, are expected, and adaptive management should be modified accordingly. Through system monitoring, adaptive management is an iterative process of responsible decision-making that aims to reduce uncertainty of an offset outcome.

5.1 BIODIVERSITY MONITORING

The habitat and existing species should be surveyed to monitor their presence and population trends. The survey should focus on (but not be limited to) high-importance habitats like vegetation patches, wetlands, orchards, and paddy fields in the adjacent area. The presence of potentially invasive species should be monitored project-wise, and mitigation/remediation actions should be implemented if diffusion of these species is detected.

Long-term biodiversity monitoring should be undertaken in order to allow for direct comparison of the data and to identify changes in species distribution and abundance.

TABLE 5.1 MONITORING PLAN

Monitoring Aspect	Location	Frequency	Stakeholder
Biodiversity Baseline Survey	Offset location	Annually, during key seasons for biodiversity activity (e.g., breeding seasons)	Biodiversity specialists
Recheck the program efficiency from the offset funding program (financial efficiency, area coverage, etc.)	Offset location	Annually	Sustainability teams and NGOs, working communities, and relevant local government organization
Light pollution monitoring	Operational sites	Semi-annual	-
Household plastic waste	Operational sites	Monthly	-
Free roaming dogs and cats	Operational sites	Quarterly	-
Air pollution monitoring (from transportation)	Operational sites	Quarterly	Tech automotive companies
Stakeholder engagement	-	Quarterly or as GPSC's CSR Plan	Relevant working groups depend on the program
Adaptive management	-	Consider all implemented programs annually for identifying gaps to improve (detail in section 0)	Relevant working groups depend on the program

5.2 EVALUATION PLAN

Following the completion of each biodiversity monitoring survey on offset locations, results should be evaluated by an external ecological consultant in conjunction with a third-party specialist and GPSC. Any Critically Endangered, Endangered, Protected and/or Endemic species not previously identified in the biodiversity supportive habitat adjacent to the Operational site should be assessed in accordance with IFC PS6 criteria and included as additional priority species within this BMP. The mitigation measures and actions included in the BMP should also be reviewed against the results of priority species, and relevant changes should be made where deemed necessary.

Topic	Recommended Action
Species Assessment	- Site-specific species assessment should be conducted to identify the state of biodiversity and any Critically Endangered, Endangered, Protected, and/or Endemic species that have not been previously identified on the operational site in accordance with the criteria outlined in the IUCN Red List of Threatened Species. - Priority species identified through these assessments are incorporated into the BMP to ensure adequate protection and conservation measures are implemented. - In case of high conservation status species (Critically Endangered, Endangered, Protected, and/or Endemic species) are identified, a study to identify distribution groups and population status should be conducted to prevent disturbance. Monitoring data should be updated with recorded populations of each species.
Review of Mitigation Measures	- The mitigation measures and actions outlined in the BMP are reviewed against the results of priority species assessments. - Relevant changes to mitigation strategies are proposed and implemented where necessary to address the conservation needs of priority species and ensure compliance with regulatory requirements and best practices.
Stakeholder Engagement	Stakeholders, including local communities, NGOs, and relevant governmental agencies, are engaged throughout the evaluation process to ensure transparency, inclusivity, and alignment of conservation efforts with local needs and priorities.
Funding Monitoring (offset area)	GPSC has the right and responsibility to evaluate the result from the funded working group or organization through the annual report.
Re-visit the Biodiversity Management Plan (BMP)	GPSC will review and revise the Biodiversity Management Plan (BMP) at least every five (5) years, or earlier if major biodiversity changes or significant operational expansions occur.

By conducting thorough evaluations and incorporating the findings into the BMP, GPSC demonstrates its commitment to adaptive management and continuous improvement in biodiversity conservation practices. This iterative approach allows for the integration of new information and emerging conservation priorities into management strategies.

Additionally, the adaptive management plan should be implemented if there are no substantial changes in the surrounding ecology and livelihood in such areas. This adaptive management plan will include consultations with local stakeholders (e.g., community members, local Non-Governmental Organization (NGOs), local government agencies) and national experts to identify restriction factors and adapt the management plan accordingly.

