Strategic Environmental Assessment (SEA) Manual for Natural World Heritage Planning

The Office of the National Economic and Social Development Council

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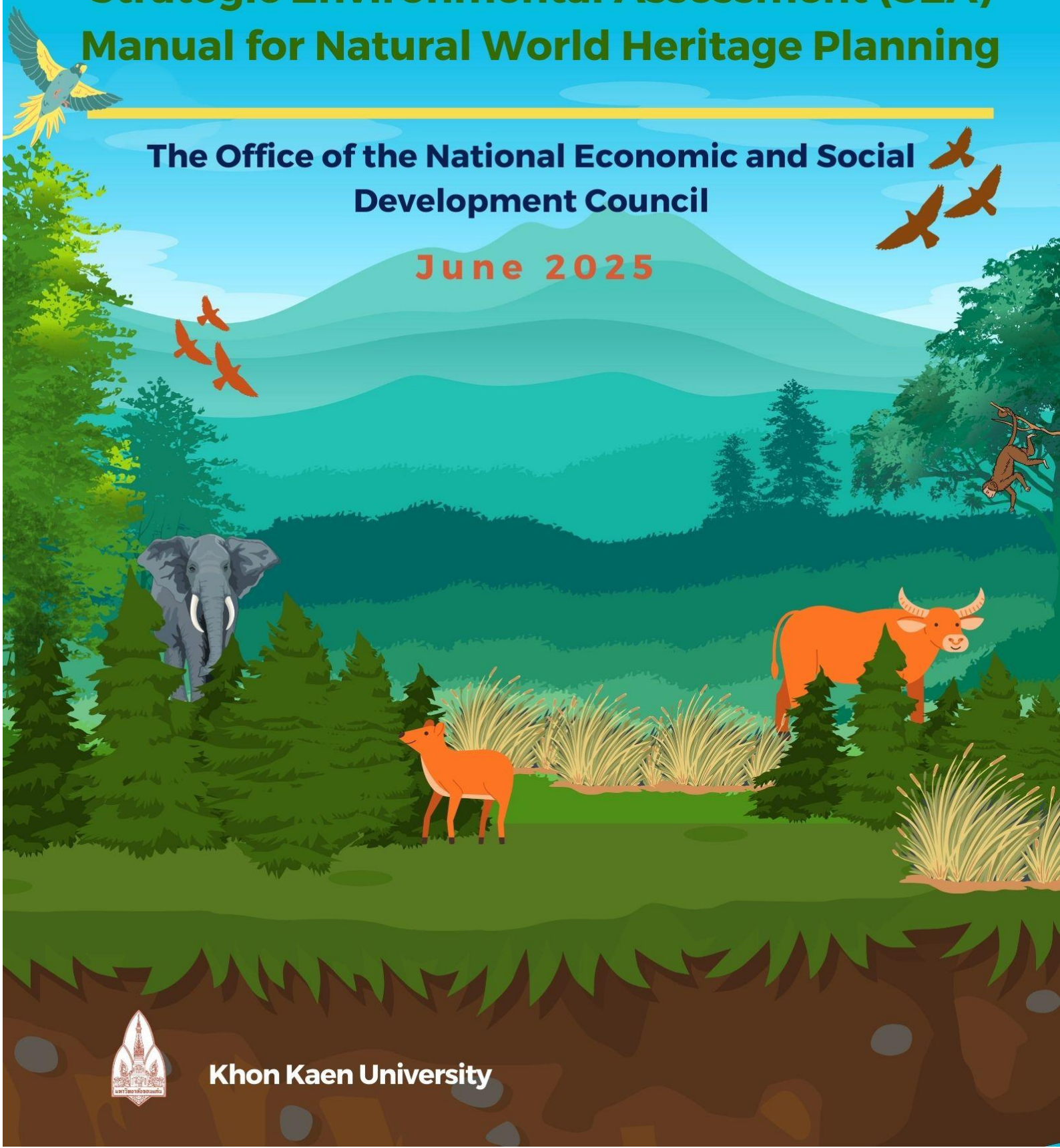

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Preface

The Strategic Environmental Assessment (SEA) Manual for Natural World Heritage Planning was developed to support government agencies and related organizations in conducting SEA specifically for Natural World Heritage Sites. The SEA Guideline (NESDC, 2021) outlines foundational principles, processes, and procedural steps for conducting SEAs. However, SEA implementation for Natural World Heritage still involves certain specificities. The SEA organizers need to thoroughly understand the meaning and characteristics of Natural World Heritage Sites, the threats posed by any developments that may affect them, and the details of the SEA process, including the steps that require particular attention. These considerations are essential for achieving meaningful SEA outcomes, which should be effectively integrated into the planning and implementation of relevant development initiatives. These efforts aim to ensure that SEA results, which must be used in conjunction with such development, are used to maintain the registered Natural World Heritage Sites in Thailand in their current condition and status.

The Office of the National Economic and Social Development Council (NESDC) sincerely hopes that this SEA Manual, designed using the strategy-based SEA approach, which is both contextually appropriate for Thailand and consistent with internationally recognized practices, will complement the existing strategic environmental assessment guidelines and clarify SEA preparation for Thailand's Natural World Heritage Sites. This will benefit relevant agencies by reducing the time required for reviewing international guidelines and case studies. Additionally, the structured procedures in Chapter three of this Manual can serve as a valuable reference for designing Terms of Reference (TOR) and supervising the SEA process efficiently and effectively.

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Acronyms

CBD	= Convention on Biological Diversity
CCME	= Canadian Council of Ministers of the Environment
EEA	= European Environmental Agency
IUCN	= International Union for Conservation of Nature
NCEA	= Netherlands Commission for Environmental Assessment
NWH	= Natural World Heritage
NWHMP	= Natural World Heritage Management Plan
ODPM	= Office of the Deputy Prime Minister
OECD	= The Organisation for Economic Co-operation and Development
OUV	= Outstanding Universal Value
PAC	= Parks of Canada
SEA	= Strategic Environmental Assessment
SEMP	= Strategic Environmental Management Plan
UNESCO	= United Nations Educational, Scientific and Cultural Organisation

Glossary

Attributes	Indicators that relate to or express the OUV of a World Heritage site. These can be tangible or intangible and include features such as distinctive landscapes, aesthetic values, suitable and sufficient natural habitats for species, natural ecological processes, the existence and reproduction of rare species, and ecosystem integrity. (UNESCO, 2011)
Natural World Heritage Management Plan (NWHMP)	A management plan for Natural World Heritage Sites that applies SEA findings to guide planning and achieve a balance and sustainability of natural resources and the environment. NWHMP can accommodate the impacts of the important proposed actions within the Natural World Heritage site (Modified from IUCN 2013).
Outstanding Universal Value (OUV)	Refers to the natural or cultural significance of a property which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. OUV is defined by three pillars: (1) compliance with criteria for inscription, (2) integrity and authenticity, and (3) protection and management (UNESCO/ICCROM/ICOMOS/IUCN, 2022)
Proposed Actions	Refers to planned policies, programs, or projects (set of projects) — either newly proposed or revised and expanded from existing development plans. (DEAT, 2004)
Strategic Environmental Assessment (SEA)	A systematic process designed to support decision-making in planning by considering economic, social, and environmental factors in a balanced manner. It emphasises stakeholder participation and promotes sustainable development. (NESDC, 2021)
Strategic Environmental Management Plan (SEMP)	This is an action plan to manage the impacts, including cumulative impacts from existing and proposed actions, arising from activities on Natural World Heritage Sites. The SEMP utilises the SEA findings, generated for the preferred alternative development and Measures for sustainability, to develop or improve plans and projects around the Natural World Heritage Sites, as well as to develop monitoring and evaluation plans (Geological Survey of Namibia, 2017; CEGIS/Integra, 2021e). Most threats arise from activities outside the Natural World Heritage site, including industry, transportation, water resources, agriculture, and tourism. However, some activities may also be external and have repercussions, such as transportation and tourism. Therefore, the relevant planning agency is responsible for implementing the plans proposed in the SEMP.

Chapter 1

Introduction

This chapter begins by explaining the rationale and necessity for developing the Strategic Environmental Assessment (SEA) Manual for planning relevant to Natural World Heritage (NWH). It then provides foundational knowledge about NWH, particularly the definition and types of World Heritage, its registration as a Natural World Heritage Site, the roles and responsibilities of the State Party hosting Natural World Heritage Sites, the scope of the Manual's application, and the Manual's target users. This chapter also delivers an understanding of SEA and Natural World Heritage relevant plans, including the scope of use and its target users. An overview of the structure of this Manual is provided along with guidance for use. This is to ensure that the Manual users recognise the importance and understand the basic principles of SEA for the development of relevant plans for the Natural World Heritage. Accordingly, the steps and methods of SEA processing for the Natural World Heritage relevant plans are elaborated in the following chapters.

1.1 Rationale

Thailand has actively promoted the integration of the Strategic Environmental Assessment (SEA) process as a planning framework. To implement SEA-based plans, the Office of the National Economic and Social Development Council (NESDC) developed and published the Strategic Environmental Assessment Guideline (NESDC, 2021) as a reference for government agencies and related entities to incorporate SEA into their planning activities.

In fiscal year 2022, NESDC initiated the development of the SEA Manual for Natural World Heritage Planning as part of its broader SEA implementation strategy. This initiative aims to support agencies responsible for conducting SEA for Natural World Heritage Sites, with the primary objective of safeguarding the Outstanding Universal Value (OUV), integrity, and long-term resilience of the property in accordance with the obligations under the World Heritage Convention.

If developments affecting designated World Heritage Sites are undertaken without appropriate SEA preparation, there is a risk that such sites may be placed on the List of World Heritage in Danger or, in extreme cases, lose their World Heritage status.

Development of the SEA Manual for Natural World Heritage Planning has two objectives: (1) to provide guidelines for Natural World Heritage planning agencies in conducting strategic environmental assessment in line with national and international best practices effectively and

efficiently towards sustainable development; and (2) to serve as a document to develop knowledge and support the relevant agencies in applying SEA to Natural World Heritage planning appropriately and efficiently.

This Manual provides additional details on the Strategic Environmental Assessment Guidelines (NESDC, 2021), which serve as an essential foundation. Users should first understand the principles, concepts, and processes/steps for conducting the strategic environmental assessment from the Strategic Environmental Assessment Guidelines (NESDC, 2021). Since Thailand has not yet produced a manual for the Natural World Heritage, the development of this manual required reviewing and analyzing the following documents.

1.1.1 Guidelines of impact-based SEA

It is presented by the following references:

1) IUCN World Heritage Advice Note Environmental Assessment & World Heritage (IUCN, 2013).

2) Guideline and Toolkit for Impact Assessments in a World Heritage Context (UNESCO/ICCROM/ICOMOS/IUCN, 2022).

1.1.2 Guidelines of strategy-based SEA rooted in the EU Directive

It is presented by the following references.

1) Practical Guidance on Applying European Directive 2001/42/EC “On the Assessment of the Effects of Certain Plans and Programmes on the Environment” (ODPM et al., 2005).

2) Applying Strategic Environmental Assessment: Good Practice Guidance for Development Co-Operation: DAC Guidelines and Reference Series (OECD, 2006).

3) Regional Strategic Environmental Assessment in Canada: Principles and Guidance (CCME, 2009).

4) National Guidelines for Strategic Environmental Assessment in Kenya. An Outline of the Concept, Principles, Basic Steps and Expected Outputs and Outcomes of the SEA Process (NEMA, 2011).

1.1.3 International case studies of strategy-based SEA

1) Strategic Environmental Assessment of South West Region of Bangladesh for Conserving the Outstanding Universal Value of the Sundarbans**.** There are 5 references, including 1) Prospectus SEA (CEGIS/ Integra, 2021a), 2) Final Screening Report (CEGIS/ Integra, 2021b), 3) Final Scoping Report (CEGIS/ Integra, 2021c), 4) Final SEA Report (CEGIS/ Integra, 2021d), and 5) Final SEMP Report (CEGIS/ Integra, 2021e).

2) Strategic Environmental Assessment of Wood Buffalo National Park, Canada. There are two references, including 1) Wood Buffalo National Park World Heritage Site Action Plan (PAC, 2019) and 2) Final SEA Report (IEC, 2018).

3) Strategic Environmental Assessment of Tana River Delta Land Use of Kenya. There are two references, including 1) Tana River Delta Land Use Plan (Odhengo et al., 2014a), and 2) Tana River Delta Strategic Environmental Assessment (Odhengo et al., 2014b).

1.2 Understanding of Natural World Heritage

1.2.1 Definition and types of World Heritage

World Heritage refers to cultural or natural assets of Outstanding Universal Value (OUV) that are passed on from one generation to the next. **A World Heritage Site** is a location that has been internationally recognized under the World Heritage Convention and officially inscribed on the World Heritage List by the United Nations Educational, Scientific and Cultural Organisation (UNESCO).

World Heritage is divided into two categories: (1) **Cultural World Heritage**, which includes works of architecture, sculpture, painting, and archaeological sites of outstanding universal value from the historical, aesthetic, scientific, and anthropological perspectives; and (2) **Natural World Heritage**, which includes physical and biological features or groups of natural features of outstanding universal value from the scientific, conservation, and natural beauty perspectives.

1.2.2 Inscription as a Natural World Heritage Site

World Heritage inscription defines the site as officially recognized as having Outstanding Universal Value (OUV), meaning it has a value of great importance beyond the borders of nation-states and is universal to humanity, both in the present and in the future. Therefore, it is necessary to protect the Outstanding Universal Value of the World Heritage site, based on three characteristics or elements: (1) compliance with the criteria for inscription as a World Heritage site; (2) Integrity and authenticity; and (3) protection and management.

To be inscribed as a Natural World Heritage Site, a nominated property shall meet one or more of the criteria specifically designated for natural heritage, as outlined by the Department of National Parks, Wildlife and Plant Conservation (2020). These include:

Criterion (vii)–sites that contain superlative natural phenomena or areas of exceptional natural beauty that cannot be compared to any other location.

Criterion (viii)–a remarkable example reflecting the evolution of the earth over time, including evidence of life or significant geological processes that have shaped the land or significant landforms.

Criterion (ix)–outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, freshwater, coastal, and marine ecosystems, and plant and animal communities; and

Criterion (x)–sites containing the most significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

Thailand is a member state of the Convention for the Protection of the World Cultural and Natural Heritage. It has been registered as a World Heritage Site by UNESCO (the World Heritage Convention) since 1972. With three Natural World Heritage Sites within the country, Thailand has the responsibility to protect and conserve these sites for future generations, in accordance with the principles of the World Heritage Convention. The three Natural World Heritage Sites registered in Thailand are:

1) **Thungyai–Huai Kha Khaeng Wildlife Sanctuaries**, covering areas in Uthai Thani, Kanchanaburi, and Tak provinces, inscribed in 1991 under criteria (viii), (ix), and (x);

2) **Dong Phayayen–Khao Yai Forest Complex**, spanning Saraburi, Nakhon Nayok, Nakhon Ratchasima, Prachinburi, Sa Kaeo, and Buriram provinces, inscribed in 2005 under criterion (x); and

3) **Kaeng Krachan Forest Complex**, covering Ratchaburi, Phetchaburi, and Prachuap Khiri Khan provinces, inscribed in 2021 under criterion (x).

1.2.3 Roles and responsibilities of the state party hosting the Natural World Heritage Site

Any Member State that considers it necessary, whether for economic or social reasons, to undertake any development that may pose threats by the proposed actions and may alter the Outstanding Universal Value (OUV) of the Natural World Heritage shall notify the National Focal Point, under its obligations under the Convention for the Safeguarding of the World Cultural and Natural Heritage and the World Heritage Centre, as the secretariat of the World Heritage Committee. In addition, the World Heritage Committee shall resolve to require the Member State in which the Natural World Heritage Site is situated to take measures to protect and safeguard the Natural World Heritage, including recommending that a Strategic Environmental Assessment (SEA) be conducted before any development for the protection and management of the site to maintain its World Heritage status. If a Member State fails to do so,

the World Heritage Committee may consider placing the site on the List of World Heritage in Danger and ultimately withdraw its World Heritage status.

1.3 Understanding plans relevant to Natural World Heritage

1.3.1 The purpose of SEA for World Heritage-relevant plans is to ensure that any proposed development plans that could pose threats will not alter the Outstanding Universal Value and characteristics of the Natural World Heritage. This aims to maintain the status of the Natural World Heritage Site in accordance with the sustainable criteria. This approach applies the precautionary principle and limits of acceptable change to the various threats. It prioritizes considering the impacts of proposed plans, particularly cumulative impacts, and developing and assessing alternatives to identify preferred alternatives for the proposed plan. These include measures to avoid, prevent, compensate for, and mitigate the impacts of the proposed plan. It also enhances conservation effectiveness on the OUV and the characteristics of the Natural World Heritage Site. It also prioritizes participatory mechanisms for stakeholders, including the public, private, civil society, and the private sector (UNESCO/ICCROM/ICOMOS/IUCN, 2022).

1.3.2 Proposed actions may pose a threat to the Natural World Heritage. They may involve a set of actions, such as various water resource development projects, or several actions, such as reservoirs, road construction, and tourism projects. These proposed actions may be implemented within or outside of the Natural World Heritage Sites. These proposed actions may have significant direct, indirect and cumulative impacts on the OUV and attributes of the Natural World Heritage, as presented in **Figure 1-1**.

Figure 1-1: Proposed actions

1.3.3 Plans relevant to Natural World Heritage. SEA results will serve as a framework for preparing or improving plans relevant to Natural World Heritage Sites, ensuring careful consideration and sustainable development. The pertinent essential plans include:

1) **The Strategic Environmental Management Plan (SEMP)** is an action plan designed to manage the cumulative impacts of threats, both from existing and proposed future actions, that may affect Natural World Heritage Sites. It is developed based on the SEA findings, particularly those related to the development of preferred alternatives and sustainability measures. The SEMP incorporates adjustments to ongoing and future programs and projects around the heritage site, including a follow-up program by monitoring and evaluation (Geological Survey of Namibia, 2017; CEGIS/Integra, 2021e). Most threats originate outside the heritage site boundaries, including industry, transportation, water resources, agriculture, and tourism. However, some activities may also extend beyond the site, such as tourism and transportation. Therefore, the agency responsible for those activities shall also be accountable for implementing the SEMP, including the programs, the preferred alternative, measures for sustainability, operative activities, responsible agencies, budget and period.

2) **The Natural World Heritage Management Plan (NWHMP)** is a management plan for a Natural World Heritage site that applies the SEA findings to planning to achieve the balance and sustainability of natural resources and the environment. The management plan can accommodate the impacts resulting from the important proposed actions in the Natural World Heritage site (modified from IUCN, 2013), covering preferred alternative plans, sustainability measures, activities to be carried out, responsible agencies, budgets, and time periods.

1.3.4 The SEA Report and relevant plans, including SEMPs and NWHMPs, having integrated the SEA findings, shall be submitted to the appropriate agencies for consideration before any proposed plans are implemented. Once the Cabinet approves the presentation of the results of the SEA and plans relevant to Natural World Heritage Sites developed through the SEA process, the Office of Natural Resources and Environmental Policy and Planning, the secretariat of the National Committee for the World Heritage Convention, will submit the information to the World Heritage Centre for inclusion in the agenda for consideration at the regular World Heritage Committee meeting within the specified timeframe. The World Heritage Committee, with the IUCN as its advisory body, provides guidance on preparing the SEA and on plans relevant to Natural World Heritage Sites, as shown in **Figure 1-2.**

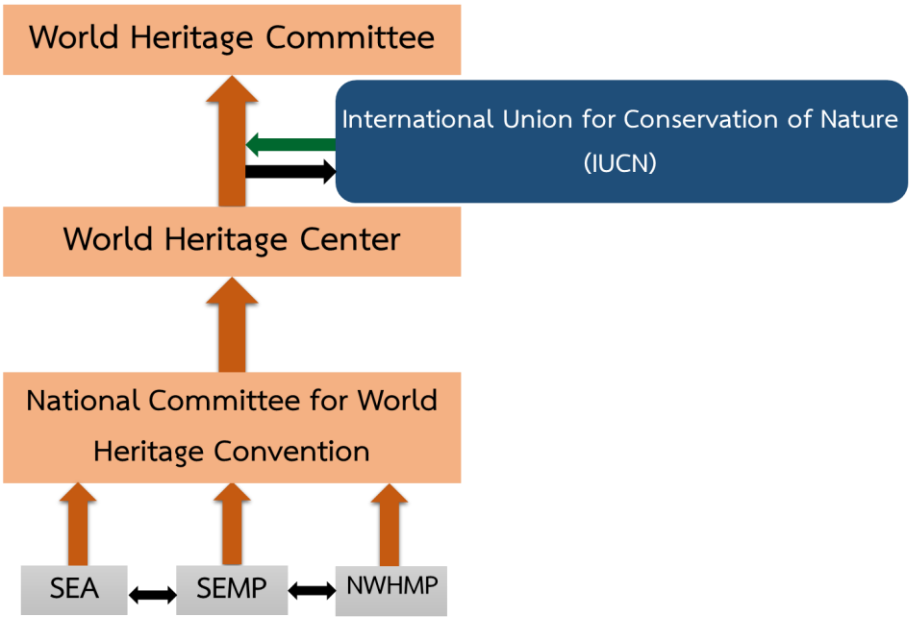

Figure 1-2: Steps of the SEA Report and plans relevant to the Natural World Heritage

1.4 Scope of use

This Manual is used for

1.4.1 Supporting the preparation of Terms of Reference (TOR), conducting SEA for plans relevant to the Natural World Heritage;

1.4.2 Guiding the application of SEA for plans relevant to Natural World Heritage-, particularly those under the categories of Forest Resource and Biodiversity Conservation Plans, in alignment with the Draft Regulation of Prime Minister on Strategic Environmental Assessment B.E. ...., as well as for the cases where threats may pose significant impacts on the Outstanding Universal Value (OUV) of Natural World Heritage Sites; and

1.4.3 Serving as reference material for training and capacity-building of human resources of the agencies involved in the SEA process for planning relevant to the Natural World Heritage.

1.5 Target users

1.5.1 **Key planning organizations** with mandates and responsibilities relevant to the development of plans pertinent to the Natural World Heritage Sites. These agencies are responsible for formulating TOR and supervising SEA processes for such plans. Examples include the Department of National Parks, Wildlife and Plant Conservation, and the Office of Natural Resources and Environmental Policy and Planning.

1.5.2 **Consultants** engaged in conducting SEA for plans relevant to Natural World Heritage, as well as in monitoring and evaluating the implementation of such plans.

1.5.3 Relevant development agencies in planning and implementing programs and projects within or adjacent to the Natural World Heritage Sites. These may include the Office of National Water Resources, the Royal Irrigation Department, the Office of Transport and Traffic Policy and Planning, the Department of Industrial Works, the Ministry of Tourism and Sports, and the Office of Natural Resource and Environmental Policy and Planning, etc.

1.5.4 Public, civil society, and interested stakeholders can utilize this Manual to enhance their knowledge and understanding, thereby enabling them to actively participate in the SEA process, whether during plan preparation or implementation. The Manual can also serve as a reference for those involved in grassroots or community-based planning efforts that aim to contribute to the long-term sustainability of the plans relevant to the Natural World Heritage.

1.6 Structure of the manual

The manual consists of the following chapters:

Chapter 1: Introduction. This chapter includes: the rationale and necessity for developing the Manual; key concepts related to Natural World Heritage; an understanding of plans relevant to Natural World Heritage; the scope of use of the Manual; the target user groups; the structure of the SEA Manual for Planning Relevant to Natural World Heritage; and guidance on how to use the Manual.

Chapter 2: Review of Relevant Documents. This chapter reviews international SEA guidelines for both impact-based SEA and strategy-based SEA, as well as case studies of Natural World Heritage Sites. The case studies included 1) Strategic Environmental Assessment of South West Region of Bangladesh for Conserving the Outstanding Universal Value of the Sundarbans; 2) Strategic Environmental Assessment of Wood Buffalo National Park World Heritage Sites; 3) Strategic Environmental Assessment and Land Use Plan for the Tana River Delta. These reviews lead to a step, procedure and tool for the development of SEA for planning relevant to Natural World Heritage, being appropriate to the context of Thailand.

Chapter 3: SEA Process for Planning Relevant to Natural World Heritage. This chapter details the procedural stages as follows: **Stage 1**: context setting and scoping, which includes (1) review of related policies, plans, and programs; (2) identification of key issues and development of thematic baseline data; (3) delineation of the study area; (4) identification of the plans subject to SEA; (5) formulation of a vision for the plan; (6) stakeholder analysis and development of a communication and engagement plan; and (7) preparation of the Scoping Report; **Stage 2**: development and assessment of alternatives; **Stage 3**: formulation of measures for sustainability; **Stage 4**: drafting of the SEA Report; and **Stage 5**: follow-up through Monitoring and Evaluation.

1.7 Guidance for using the manual

To ensure that users have the information and content needed to conduct SEA comprehensively and effectively in planning relevant to the Natural World Heritage, the guidance for manual use is as follows:

1.7.1 Users with limited knowledge or experience in SEA are recommended to first develop a foundational understanding of SEA by reviewing the Strategic Environmental Assessment Guideline (NESDC, 2021). This will help build the necessary background to apply the SEA Manual for Natural World Heritage Planning appropriately and effectively.

1.7.2 Users intending to adopt this manual as a practical guide for implementing SEA for planning relevant to the Natural World Heritage. Users should study and understand the interrelation of activities and outputs at each step of the SEA process, along with the distinct integration of SEA results into the plans relevant to Natural World Heritage. This will enable them to achieve the goals of using the SEA Manual for Natural World Heritage planning. Furthermore, they can study the content, details, and additional information from the documents referenced in this Manual, particularly those listed in Section 1.1.

1.7.3 This Manual was developed with limitations on the application of SEA for planning relevant to the Natural World Heritage. In the future, as more lessons are learned from the application of SEA for the preparation of SEMPs and NWHMPs for Natural World Heritage in Thailand and abroad, and as more international SEA guidelines are developed and revised, the planning agencies and agencies involved in the preparation of plans relevant to Natural World Heritage may consider revising their own plans or the SEA Manual for planning relevant to Natural World Heritage as necessary. This will ensure that the aforementioned plans and the manual are appropriate, aligned with changing international standards, and more relevant to the Thai context.

Chapter 2

Literature Review

This chapter presents a review and analysis of SEA guidelines and case studies in the context of important World Heritage Sites. The review covers both process frameworks and procedural steps to study key issues in SEA preparation for plans relevant to Thailand's Natural World Heritage Sites, appropriately and in accordance with international standards.

2.1 Guidelines for SEA in the context of World Heritage Sites

A review of key international SEA guidelines considered twosets of international documents: 1) Guidelines for SEA for World Heritage Sites based on impact-based SEA, and 2) Guidelines for SEA for World Heritage Sites based on strategy-based SEA rooted in the EU Directives, which can be summarized as follows:

2.1.1 Guidelines for preparing SEAs for World Heritage Sites by impact-based SEA

Guidelines are available in the World Heritage Resources Manual Series, which provides guidance and tools for impact assessment on World Heritage Sites.

Since the adoption of the World Heritage Convention in 1972, the World Heritage Sites have been continually developing. It is essential to guide States Parties in implementing the Convention. Several expert meetings and periodic reporting sessions have identified the need for capacity building, particularly in areas where State Parties and site managers require additional support. This has led to the development of a dedicated set of manuals on World Heritage resources. Over the past decade, the Advisory Bodies of the World Heritage Committee (ICCROM, ICOMOS, IUCN) have developed specific guidance documents to assist States Parties in implementing best practice. Guidelines for the conservation of World Heritage have continued to evolve, including the Guidance on Impact Assessment for Cultural World Heritage Properties (ICOMOS, 2011) and the World Heritage Advice Note on Environmental Assessment (IUCN, 2013).

In 2022, as part of the 50th anniversary of the adoption of the World Heritage Convention, UNESCO, ICCROM, ICOMOS, and IUCN developed the Comprehensive Guidance and Toolkit for Impact Assessments in the World Heritage Context. This initiative responds to the growing challenges faced by over 1,100 heritage sites worldwide that have been inscribed on the World Heritage Sites recognized for their exceptional value to humanity and whose conservation

is a shared global responsibility. However, many of these invaluable properties are increasingly under pressure from various development projects within or around their boundaries. The assessment of the potential impacts of such projects is therefore critical, not only to prevent harm to World Heritage Sites but also to identify more sustainable alternatives before decisions to implement are made.

The World Heritage Manual Series aims to provide guidance on implementing the Convention for State Parties, heritage protection authorities, local governments, site managers, and local communities associated with World Heritage properties, as well as other stakeholders involved in the identification and conservation processes. These Manuals have been developed as user-friendly tools to support capacity-building and raise awareness of the World Heritage Convention. Their primary objective is to provide knowledge and assistance to ensure that the World Heritage List remains representative and credible, comprising properties that are well protected and effectively managed. The Manual Series is intended to guide users through the necessary steps for conducting impact assessments for projects of all types and scales across all categories of World Heritage properties, whether cultural, natural, or mixed, using a standard and adaptable framework. Moreover, these Manuals are designed to serve both as standalone resources for self-directed learning and as materials for practical, workshop-based training to support effective application.

Herein, it highlights the Guidance and Toolkit for Impact Assessment in a World Heritage Context. This Guidance serves as a cross-sectoral and multidisciplinary resource to define protection and mitigate potential impacts on World Heritage Sites. It also supports the pursuit of high quality and appropriateness in development. State Parties to the World Heritage Convention, site managers, decision-makers, planners, and developers can use this Manual to help fulfil their shared commitment to safeguarding and transmitting the world's most precious heritage to future generations.

SEA preparation employing the Guidance and Toolkit for Impact Assessments in a World Heritage Context consists of 11 main steps as follows: 1) screening, 2) scoping, 3) baseline assessment/ baseline data, 4) proposed actions and alternatives, 5) identification of impacts and prediction 6) assessment of impact, 7) mitigation of negative impact and enhancement of positive impact, 8) reporting, 9) reviewing the report, 10) decision making, and 11) monitoring and evaluation. In addition, consideration is given explicitly to the planning owner, such as the Department of National Parks, Wildlife, and Plant Conservation, as presented in **Table 2-1.**

Table 2-1: Guidance and toolkit for impact assessments in the World Heritage context

Key considerations of plan owners for SEA preparation	
1. Understanding SEA: Its application, impact, or strategy-based SEA, and assessment procedure	1) The objectives of the SEA and the Terms of Reference (TOR) shall be clearly defined, along with the basis of the SEA. 2) The SEA assessment method shall be appropriate to the nature of the study issues, particularly SEA applied to planning relevant to the Natural World Heritage. 3) The best outcome of SEA is the capability to influence the development of national plans, laws, institutions, and organizations in a suitable timeframe. This can increase political openness to the application of the SEA process, enabling significant changes in development across governance and institutional arrangements. However, such transformation takes time, meaning that governments and development partners shall remain committed to initiating and sustaining SEA outcomes over an appropriate period. 4) The implementation of SEA does not strictly require it to be triggered solely by environmental concerns. While ecological sustainability plays a central role in SEA, some SEA initiatives may be driven by other factors beyond the ecological domain.
2. SEA leader and team members composition	1) The SEA team and its leader play a critical role in the success of the SEA process. The team must include subject-matter experts whose expertise aligns with the assessment's scope. The team leader, in particular, must possess a comprehensive understanding of the interconnections between economic, social, and environmental dimensions. 2) The SEA team and the team leader must also have a clear understanding of planning processes and the use of SEA as a mechanism to support planning for Natural World Heritage.
3. SEA steering committee	The SEA Steering Committee comprises senior executives and academic experts whose knowledge spans the relevant themes and issues under study in SEA. Members shall have a thorough understanding of the SEA process and its procedural steps to effectively oversee the assessment. The Committee is responsible for reviewing the SEA Report and facilitating its integration into planning or its application in the formulation of new plans.

Source: UNESCO/ICCROM/ICOMOS/IUCN (2022)

2.1.2 Guidelines for preparing SEAs for World Heritage Sites by strategy-based SEA

This manual has reviewed international SEA guidelines based on strategy-based SEA, rooted in the EU Directive, compiled with the context of the Natural World Heritage, as follows:

- Practical Guidance on Applying European Directive 2001/42/EC “On the Assessment of the Effects of Certain Plans and Programmes on the Environment” (ODPM et al., 2005).

- Applying Strategic Environmental Assessment: Good Practice Guidance for Development Co-Operation: DAC Guidelines and Reference Series (OECD, 2006).

- Regional Strategic Environmental Assessment in Canada: Principles and Guidance (CCME, 2009).

- National Guidelines for Strategic Environmental Assessment in Kenya. An Outline of the Concept, Principles, Basic Steps and Expected Outputs and Outcomes of the SEA Process (NEMA, 2011).

The SEA guidelines of ODPM et al. (2005), OECD (2006), CCME (2009), and NEMA (2011) have similar main steps, including setting the context or scoping, development and assessment of alternatives, report preparation, submitting and making a decision, monitoring and evaluation, as presented in **Table 2-2**.

Table 2-2: SEA Guidelines from ODPM, OECD, CCME, and NEMA

ODPM	OECD	CCME	NEMA
Setting the context and objectives, developing baseline data, and **scoping**	**Setting the context** - Screening - Defining objectives - Identifying stakeholders	- **Scoping** - **Developing TOR for consultant engagement**	**Setting the context** - Screening - Setting the context for processing SEA and other missions
Development and refinement of alternatives, and impact assessment	**SEA implementation** - Scoping (including stakeholder consultations) - Baseline data collection - Identification of alternatives	- **Identification of strategic alternatives** - Assessment of cumulative Impacts for each alternative - Identification of the preferred alternative	**SEA implementation** - Detailed study of SEA - Preparing draft SEA Report
	- Identification of measures to enhance positive impacts and mitigate negative impacts - Quality assurance	- Proposed mitigation measures for the preferred alternative	
Report preparation	**Reporting**	**Report submission**	**Report submission** to inform data-influenced decision-making

ODPM	OECD	CCME	NEMA
Consultation on draft plans or programs and **environmental reporting**	- **Proposing and decision-making** - Recommendations (including stakeholder consultations)	**Decision-making**	**Reviewing by** - Administrator - Stakeholders - Public - Committee **Determining, preparing, and submitting the final SEA** - Decision-making at policy - Decision making at the plan and program levels
Monitoring and evaluation - Significant environmental impacts induced by the implementation of the plan or program	**Monitoring and evaluation** - Monitoring the decision of PPP implementation - Monitoring the progress of PPP implementation - Evaluating the outcomes of SEA and PPP	**Development of the monitoring and evaluation Program**	**Development and evaluation**

Source: ODPM et al. (2005), OECD (2006), CCME (2009) and NEMA (2011)

In conclusion, the review of international SEA guidelines is as follows:

1) Comparison of impact-based SEA (UNESCO /ICCROM/ICOSMOC/IUCN, 2022) **and strategy- based SEA rooted in the EU Directive.** In impact-based SEA, the first step is screening, followed by scoping, whereas in strategy-based SEA (EU Directive), the first step is setting the context. However, the context-setting in the strategy-based SEA (EU Directive) differs somewhat as follows. Screening according to OECD (2006) and NEMA (2011) is described in the setting of context. In contrast, ODPM et al. (2005) and CCME (2009) exclude screening but include scoping.

2) The positioning of sustainability measures differs from the SEA procedural steps. In the impact-based SEA, sustainability measures are a separate step from alternative development and assessment. While sustainability measures in the strategy-based SEA are included in the development and assessment of alternatives, the strategy still proposes a preferred alternative.

This comparison highlights that, while impact-based SEA provides rigorous tools for project-level impact identification, strategy-based SEA is better suited to guiding long-term planning decisions relevant to Natural World Heritage, particularly when cumulative and transboundary impacts are significant.

2.2 Case studies of SEA prepared for the Natural World Heritage

Reviewing SEA prepared for Natural World Heritage based on strategy-based SEA was made for two case studies, including 1) SEA of South West Region of Bangladesh for Conserving the Outstanding Universal Value of the Sundarbans (CEGIS/ Integra, 2021a-e), and 2) SEA of Wood Buffalo National Park, Canada (PAC, 2019, and IEC, 2018). In addition, SEA was conducted for land-use planning in the Tana River Delta, Kenya, which is not a Natural World Heritage site but is a critical wetland included in the biodiversity plan (Odhengo et al., 2014a-b).

2.2.1 Strategic Environmental Assessment of South West Region of Bangladesh for conserving the Outstanding Universal Value of the Sundarbans

The Strategic Environmental Assessment (SEA) conducted for the South West Region of Bangladesh aims to enhance the conservation of the Sundarbans' OUV. This SEA was initiated in response to threats posed by existing and planned development projects in the South West Region of Bangladesh, a region envisioned as a developed nation by 2041. In this context, the World Heritage Committee requested that the Government of Bangladesh undertake an SEA to assess the potential impacts of future development plans over the next 20 years (2021-2041). It aims to ensure that Bangladesh can pursue sustainable development while safeguarding the OUV of the Sundarbans. Details and steps of SEA for this case study are summarized as follows:

1) Inscription as the Natural World Heritage Site. The Sundarbans mangrove forest, located in the South West Region of Bangladesh within the Ganges Delta, is the largest natural mangrove forest in the world. It covers an area of approximately 10,000 square kilometers (6,250,000 rai); 60% of which lies within Bangladesh, with the remainder in India. This site is of local, regional, and global significance due to its rich biodiversity, ecological uniqueness, and abundance. It provides habitat for many rare and endangered species, including the Bengal tiger, aquatic mammals, birds, and reptiles. The Sundarbans were inscribed on the UNESCO World Heritage List in 1997 under two natural criteria:

Criterion (ix) – The Sundarbans represents ongoing ecological processes and serves as an outstanding example of delta formation, tidal influence, monsoon activity, flooding, sedimentation, and colonization by mangrove species. It is the most extensive deltaic mangrove system in the world, formed by sediment deposits from three major rivers—the Ganges, Brahmaputra, and Meghna, which interact with tidal forces in the Bay of Bengal to shape a unique ecosystem.

Criterion (x) – The Sundarbans supports exceptional biodiversity in both terrestrial and marine environments and provides critical habitat for a dense population of endangered Royal Bengal Tigers, which is higher than in any other region in the world.

2) Pressures on the Sundarbans mangrove forest

In recent years, there has been increasing concern about the impacts of ongoing and planned development projects in the South West Region (SWR) of Bangladesh. The country aspires to achieve developed nation status by 2041, and the SWR is considered a key region in supporting this goal, given its significant development potential. However, Bangladesh is also committed to sustainable development, which shall not impact the OUV of the Sundarbans.

For this reason, the World Heritage Committee recommended that the Government of Bangladesh conduct an SEA to assess the long-term impacts of development activities planned over the next 20 years (2021–2041) at both the landscape and regional levels. The aim is to ensure that Bangladesh can pursue its development pathway while maintaining the integrity of the Sundarbans' OUV.

3) SEA implementation

SEA process for the Sundarbans case was guided by the good SEA practice, as outlined in the SEA Guidance of the Development Assistance Committee of the Organisation for Economic Cooperation and Development (OECD, 2006) and the IUCN (2013) principles, which are similar to the procedural steps defined in UNESCO/ICCROM/ICOMOC/IUCN (2022). The SEA was conducted through 8 key stages: (1) screening, (2) scoping, (3) initial and deeper assessment of alternatives, (4) preparation of the draft SEA Report and draft Strategic Environmental Management Plan (SEMP), (5) review of the draft SEA and SEMP, (6) workshops of national-level multi-stakeholder and consultation, (7) finalization and submission of the SEA and SEMP reports, and (8) monitoring and evaluation of the PPP. Notably, the process did not include the setting of the context step, which is designated in strategy-based SEA rooted in the EU Directive.

Stage 1: screening. This stage involved identifying policies, plans, and programs (PPPs) with significant potential to impact the environment and socio-economic factors. Government agencies were asked to complete a structured questionnaire to provide data for 89 development plans. These were then screened for key environmental and socio-economic concerns. Based on an impact rating system that measured both positive and negative impacts at moderate to high levels, only one plan was excluded, resulting in 88 PPPs that required an SEA.

Stage 2: scoping. This stage included the following sub-steps: (1) collecting and preparing the thematic baseline data, (2) designating the objective of environment and socio-economic for the key issue, (3) analyzing stakeholders as well as consulting at the nation, regional and local levels, (4) reviewing laws and regulations, (5) reviewing PPPs and defining

environmental and socio-economic objectives, (6) developing scenario and development status, (7) drafting Scoping Report, (8) requesting comments of stakeholder for Scoping Report preparation, and (9) finalizing the Scoping Report.

Stage 3: primary assessment. This stage included two sub-main steps: 1) **initial assessment,** which was the development of future scenarios by assessing three alternative scenarios, including high economic growth, medium economic growth, and low economic growth. The preferred alternative was high economic growth, which included 9 sectoral plans: industry, transportation, ports, power and energy, urban development, water resources, forestry, fisheries, and agriculture. These sectors complied with the government's policy to achieve high-income status by 2041. 2) **Deeper assessment** focused on assessing the impacts of high economic growth scenarios across the 9 key sectors mentioned. The preferred alternative for 9 sectors would be developed to prepare the Strategic Environmental Management Plan (SEMP) to drive the Natural World Heritage Plan further.

Stage 4: drafting the SEA Report and the Strategic Environmental Management Plan (SEMP). **Stage 5:** reviewing the draft SEA and SEMP. **Stage 6:** organizing two rounds of workshops for multi-stakeholders. **Stage 7:** finalizing and submitting SEA and SEMP reports to decision-making for implementation. **Stage 8:** monitoring and evaluation of PPP implementation.

Guidelines on the conservation of World Heritage, having continued to evolve, as for the Guidance on Impact Assessment for Cultural World Heritage Properties (ICOMOS, 2011) and the World Heritage Advice Note on Environmental Assessment (IUCN, 2013).

2.2.2 SEA for Wood Buffalo National Park, Canada

SEA for Wood Buffalo National Park (WBNP) in Canada was undertaken in response to the anticipated threats posed by project developments, including hydroelectric, oil sands extraction, urban expansion, and mining activities. These developments posed potential risks to the OUV of the Park, particularly the Peace-Athabasca Delta (PAD), a critical ecological feature within the World Heritage property.

The World Heritage Committee formally requested that the Government of Canada conduct an SEA to assess the cumulative and long-term impacts of these developments on the Site's World Heritage values. The main elements and procedural steps of the SEA are summarized as follows:

1) Inscription of Wood Buffalo National Park, Canada, as the Natural World Heritage Site

Wood Buffalo National Park (WBNP) is Canada’s largest national park, encompassing a diverse landscape of forests, wetlands, and grasslands over an area of 4 . 5

million hectares (approximately 28.13 million rai). The Park was established in 1922 to protect the remaining wild wood bison population. The park is now home to the world's largest self-regulating herd of wood bison. It also provides critical breeding habitat for the only remaining wild flock of endangered whooping cranes.

In addition, the Park includes PAD, a biodiversity-rich inland delta, vast salt plains unique to Canada, and the finest example of gypsum karst topography in North America. These exceptional natural phenomena form the basis for its inscription as Canada's 8th World Heritage Site by UNESCO in 1983 under the World Heritage Convention.

The Park was listed for its OUV according to the following three Natural World Heritage criteria:

Criterion (vii) –The park contains globally significant concentrations of migratory wildlife and rare natural phenomena, including the large deltaic wetland of PAD, extensive salt plains, and internationally significant gypsum karst formations.

Criterion (ix) – WBNP represents the most complete and most prominent example of the boreal grassland ecosystem of the Great Plains in North America. It is the only place where the predator-prey relationship between wolves and wood bison continues uninterrupted in a natural setting.

Criterion (x) – The park is the only known natural nesting ground for the endangered whooping crane population, which has been brought back from the brink of extinction through careful management of its small breeding pairs. The park's massive size and intact ecosystems are critical to the long-term conservation of the species in its natural habitat.

In addition, WBNP encompasses the traditional lands of indigenous peoples and Métis communities, particularly the Mikisew Cree First Nation (MCFN). These communities have lived on and depended upon the land, water, and natural resources within WBNP for generations, and continue to do so today. The natural and cultural heritage of the park remains integral to their livelihoods, way of life, and cultural identity.

2) Pressures on the World Heritage Site of Wood Buffalo National Park

Although WBNP is renowned for its vast size, remoteness, and lack of resource extraction or industrial activities within its boundaries, the WBNP World Heritage Site (WBNP-WHS) is, like many other Natural World Heritage Sites globally, vulnerable to external development pressures beyond its borders. The Peace and Athabasca River sub-basins and Lake Athabasca, which drain a watershed of approximately 600,000 square kilometres across Northern British Columbia, Alberta, and Saskatchewan, ultimately converge in WBNP at PAD.

The upstream and nearby development activities pose significant threats to the OUV of WBNP-WHS. These include changes in water flow from hydroelectric dam construction, oil sands development, pulp and paper production, forestry, agriculture, and urban expansion.

In addition to these external development pressures, WBNP-WHS is also affected by climate change. Rising average annual temperatures have led to earlier spring snowmelt, delayed autumn freeze-up, and shorter durations of seasonal ice cover. These warmer conditions impact the volume and timing of spring runoff and peak river flows.

The cumulative impacts of climate change and development pressures are driving ecological transformations across the PAD landscape. These environmental changes and their cumulative effects are well understood by Indigenous communities, who possess intergenerational knowledge and lived experience of the PAD's environmental dynamics.

3) SEA implementation

In response to a formal request from the Mikisew Cree First Nation (MCFN), the World Heritage Committee called upon the Government of Canada to carry out a Strategic Environmental Assessment (SEA) to examine the cumulative impacts of the upstream development activities; namely hydroelectric dam construction, oil sands extraction, urban development, and mining, on the OUV of PAD, which is a core attribute of the World Heritage Site within WBNP.

Parks Canada mandated that the SEA be conducted in accordance with the Canadian Council of Ministers of the Environment (CCME) guidelines. These guidelines identify key assessment issues and expected outcomes (see *Regional Strategic Environmental Assessment in Canada: Principles and Guidance*). The SEA also had to strictly adhere to the recommendations issued by the World Heritage Centre concerning environmental assessment involving World Heritage properties. The SEA process was structured into four main phases: (1) defining the SEA framework, including objectives and desired outcomes, (2) assessing the current state and trends of the World Heritage values, (3) projecting future trends and the condition of those values, (4) formulating recommendations for mitigating and addressing potential adverse impacts, which are subsequently described.

Stage 1: defining the SEA framework, objectives, and desired outcomes. This stage involved: (1) developing an assessment framework for World Heritage values, and (2) identifying the desired outcomes and setting objectives for the key attributes of those values.

Stage 2: assessing the current status and trends of World Heritage values. This stage included: (1) defining the spatial and temporal scope, (2) establishing the data

collection methodologies, (3) identifying the pathways of effects, and (4) determining the valued components within PAD.

Stage 3: projecting future trends for World Heritage values. This stage was carried out by (1) developing the methodology for cumulative effects assessment, (2) identifying the potential impacts from reasonably foreseeable development, and (3) identifying the potential impacts from future climate change.

Stage 4: formulating recommendations to mitigate impacts. The SEA process directly responded to Decision 41 COM 7B.2 of the World Heritage Committee. The Government of Canada led a collaborative effort with the Governments of Alberta, British Columbia, and the Northwest Territories, as well as Indigenous partners, to develop an action plan to ensure the ongoing protection and maintenance of the OUV of WBNP-WHS. The action plan comprises 7 key work streams: (1) strengthening the indigenous partnerships with WBNP, (2) environmental assessment, (3) connectivity of conservation areas, (4) risk assessment of tailings ponds, (5) environmental flows and hydrology, (6) monitoring and science, and (7) wildlife habitat conservation.

2.2.3 Case study of SEA for the Tana River Delta, Kenya

SEA for the Tana River Delta, designated as a Ramsar Site and Wetland of International Importance, was prepared to support land-use planning in the area. The SEA is the result of extensive consultations at the community, local administration, and organization levels, as well as at the national level, with input from the international SEA experts.

1) Inscription of the Tana River Delta as the Ramsar Site - Wetland of International Importance

The Tana River Delta was declared a Ramsar site and Wetland of International Importance on October 12, 2012. The primary objective of this declaration is to conserve the Tana River Delta, the second most important estuary in East Africa, and its estuarine ecosystem for future generations. This requires careful management of each Ramsar-designated habitat. The core of the Tana River Delta comprises the Tana and the Lamu river basins. The Tana River Delta also includes palm savannas, seasonally flooded grasslands, forest debris, lakes, marine wetlands, and rivers. This combination of habitats makes the Tana River Delta a hotspot for high biodiversity. It has been designated as a Ramsar Site, a Wetland of International Importance, and a critical area for birdlife and biodiversity.

2) Pressures on the Tana River Delta Ramsar Site

The Tana River Delta is sparsely populated and home to three main communities: Pokomo Farmers, Orma Pastoralists, and Wardei Pastoralists. The delta is home to both large-

scale and small-scale irrigated agriculture. Large herds of cattle rely on the delta's pastures during the dry season. Several projects under Kenya's Vision 2030 are planned within the delta and its watershed areas that affect the Tana River Delta.

Over the past decades, the unique characteristics of the Tana River Delta have been threatened by water resources depletion due to development in the upper and middle basins of the Tana River, severe floods and droughts, and by poorly planned and implemented developments that do not take into account local needs or the unique environment of the delta. It is an internationally recognized Ramsar Site due to its wetlands, rich biodiversity, and indigenous population. The Tana River Delta is home to more than 100,000 people who have adapted their traditional ways of life and livelihoods to a rapidly changing environment.

If the special characteristics are to be preserved for the benefit of present and future generations, it is essential to have a clear vision, goals, and guiding principles. This requires land-use planning that preserves the ecosystems and biodiversity of wetlands designated as Ramsar Sites of international importance.

3) SEA preparation

The land-use plan for the Tana River Delta serves as a guideline for policy formulation and decision-making on the delta's future development. This plan is part of the Coordinated Sustainable Management of the Tana River Delta in Kenya project, initiated in July 2011 by the Prime Minister's Office in collaboration with an inter-ministerial technical committee comprising 18 ministries. SEA development is coupled with land use planning to achieve sustainable development. This plan aims to enhance integration of economic, social, and ecological aspects into the Tana River Delta's comprehensive land-use plan. This SEA-Land Use Plan for the Tana River Delta included the following tasks:

- identifying external and internal factors influencing land use in the Tana River Delta,
- ensuring that stakeholder perspectives of the economic, social, and environmental perspectives are integrated into the proposed plan,
- determining the impacts of the proposed plan on sustainable management and development in the Tana River Delta,
- identifying and mapping specific habitats, natural resources, or land-use zones that should be permanently conserved to ensure the survival of the Tana River Delta ecosystem,
- assessing other land-use alternatives that can provide significant information for the desired strategy and plan.

SEA is an essential tool for assessing alternative land-use development in the Tana Delta and for developing the preferred land-use strategy, which is the best balance of development and conservation. Based on the OECD (2006) SEA framework, which serves as the source of the Kenya SEA guidelines (NEMA, 2011), SEA preparation consists of the following stages.

Stage 1: defining the context: screening and setting the context for SEA implementation and other tasks.

Stage 2: conducting a detailed SEA study.

Stage 3: preparing the draft SEA Report.

Stage 4: submitting the report, which provides information that influences decision-making.

Stage 5: review

- executive review,
- board review,
- public review.

Stage 6: reviewing and preparing the final SEA Report

- policy-level decisions,
- plan and program-level decisions.

Stage 7: monitoring and evaluation.

2.2.4 Lessons learned from three case studies

1) The guidance used in the development of SEA for all three case studies. These case studies had principally adopted a strategy-based SEA rooted in the EU Directives. However, the Sundarbans case has a different starting point than the Wood Buffalo National Park (WBNP) and the Tana River Delta, as summarized below.

1.1) The Sundarbans case was designed according to the SEA Guidelines of the Development Assistance Committee of the Organisation for Economic Cooperation and Development (OECD, 2006), which are strategy-based. However, it does not begin with setting the context but rather with refining development plans in the South West Region. This is to produce a key development plan that will be growth-driven in the South West region.

1.2) WBNP conducted the strategy-based SEA in accordance with the Regional Strategic Environmental Assessment in Canada Principles and Guidance (CCME, 2009) to assess the impacts of future development on the WBNP's OUV. This included identifying future developments that could impact Wood Buffalo National Park, including existing and reasonably foreseeable developments such as hydroelectric power, oil sands, pulp and paper mills, and

industrial, mining, forestry, and urban activities. The cumulative impacts of existing development plans in the upper part of the WBNP and within the WBNP on the World Heritage Site were assessed, along with proposed sustainability measures.

1.3) Land use planning for the Tana River Delta, Kenya, through the preparation of the strategy-based SEA, following the National Guideline for Strategic Environment Assessment in Kenya, the National Environment Management Authority (NEMA, 2011). The main objectives are to emphasize the high level of interaction required across all planning processes and to ensure that the needs of the Tana River Delta land use are fully recognized in other development plans, linking the land use plan with different strategic and management plans for the management of Ramsar Sites, protected and public lands, water resources, agriculture, economic development, coastal planning and integrated coastal management, and climate change adaptation.

2) Impact assessment of alternatives

2.1) For the Sundarbans case, a two-step impact assessment was conducted: (1) the Initial Assessment, which assessed impacts on environment and socio-economic dimensions for 3 alternatives: high economic growth, medium economic growth, and low economic growth. The assessment was conducted using an impact matrix analysis. The high-economic growth alternative comprised 9 key sectors: industry, transportation, urbanization, energy, water resources, forestry, agriculture, fisheries, and tourism. (2) The Deeper Assessment, or Detailed Assessment, assessed the cumulative impacts of 9 key sectors under the high economic growth using impact matrix analysis. The preferred alternative was proposed for the sustainability measures. The impact assessment considered the mitigated score for mitigation measures and the risk score in their absence. The sustainability measures were then used to develop a Strategic Environmental Management Plan (SEMP). The assessment of the alternatives utilized both technical and practical assessments. This included matrix-based impact analysis, consultation with relevant agencies, which form the SEMP committee, and the expert judgment method.

2.2) WBNP assessed the impacts of current and future development activities by conducting the Effect Pathway Analysis of development plans, including hydroelectric dams, oil sands, pulp and paper mills, mining, forestry activities, and urban developments. It developed and assessed alternatives to these development plans and proposed measures to promote sustainability. These are then presented as action plans for the main issues within the framework of the 7 action plans mentioned above.

2.3) Land use plan for the Tana Delta employed three scenarios to establish the basis for a land use strategy to maximize the opportunities for sustainable economic development while protecting social and environmental welfare. Scenario A was the continued development of traditional livelihoods; Scenario B was the commercial and industrial approaches; and Scenario C was the hybrid, an integration of Scenario A and B, covering the management of Ramsar Sites, protected areas, and public lands, water resources, agriculture, economic development, coastal planning and integrated coastal management, and climate change adaptation. 6 themes were assessed: land area, water demand, employment and livelihoods, social and cultural conditions, governance and safety, and biodiversity. Based on the analysis of all three alternatives, Scenario C (hybrid) was identified as the most appropriate alternative.

3) Plan development using SEA findings

3.1) For the case of the Sundarbans, it focused on development plans in the South West Region outside the Sundarbans mangrove forest, the Natural World Heritage Site. These plans aim to support the region's and Bangladesh's high economic growth development while minimizing impacts on the Sundarbans World Heritage Site. The SEA results are used to develop the SEMP, which is represented by the strategic measures.

3.2) For the case of WBNP, the current development plans in the upper part of the WBNP area, namely hydroelectric dams, oil sands development, urban development, and mining, were considered, causing potential impact on OUV of the WBNP Natural World Heritage Site. The development plans in the WBNP area used the SEA results to prepare the SEMP, but are referred to as action plans for the main issues outlined in the 7 action plans. In addition, both SEMP and the action plan include recommendations for SEA preparation for specific plans or large projects, as owned by the relevant agencies.

3.3) For the case of land use plan of the Tana River Delta, the results of SEA under Scenario C (hybrid), which is an integrated Scenario A (the continued development of traditional livelihoods) and Scenario B (the commercial and industrial approaches) being used to develop management plans for the Ramsar Sites, protected and public areas, water resources, agriculture, economic development, coastal planning and integrated coastal area management, and climate change adaptation.

2.3 Summary of literature reviews

The review of SEA Guidelines began with impact-based and strategy-based SEA in Section 2.1, followed by three strategic environmental assessment case studies in Section 2.2. Key points are summarized as follows:

2.3.1 SEA preparation for the Natural World Heritage relevant plans in the Thailand context

In the Thai context, SEA for Natural World Heritage shall be explicitly anchored in safeguarding the Outstanding Universal Value (OUV), integrity, and long-term resilience of the property. All stages of SEA, from screening to monitoring and evaluation, shall be referenced against the Statement of Outstanding Universal Value (SOUV) and its defined attributes.

SEA should be strategy-based, integrating the SEA guidelines of ODPM et al. (2005), OECD (2006), CCME (2009), and NEMA (2011). It also incorporates content from the IUCN (2013) and UNESCO/ICCROM/ICOMOS/IUCN (2022), which are impact-based SEAs, as well as insights from the Sundarbans, Wood Buffalo National Park, and the Tana River Delta land-use plan. This involves 5 key steps: (1) setting the context and scoping, (2) development and assessment of alternatives, (3) measures for sustainability, (4) drafting the reports and plans, and (5) follow-up through monitoring and evaluation.

2.3.2 Implementation of SEA results

The SEA results will be implemented through the Strategic Environmental Management Plan (SEMP) for Natural World Heritage Sites. This SEMP shall be submitted to the World Heritage Committee for consideration. This SEMP is a plan that delivers the preferred alternative in the form of measures for sustainability for the proposed development plans, such as transportation plans, industrial plans, energy plans, water resource plans (through river basin master plans), and conservation plans, such as the Natural World Heritage Management Plan (NWHMP), covering responsible agencies, activities to be carried out, and time periods, as shown in **Figure 2-1.**

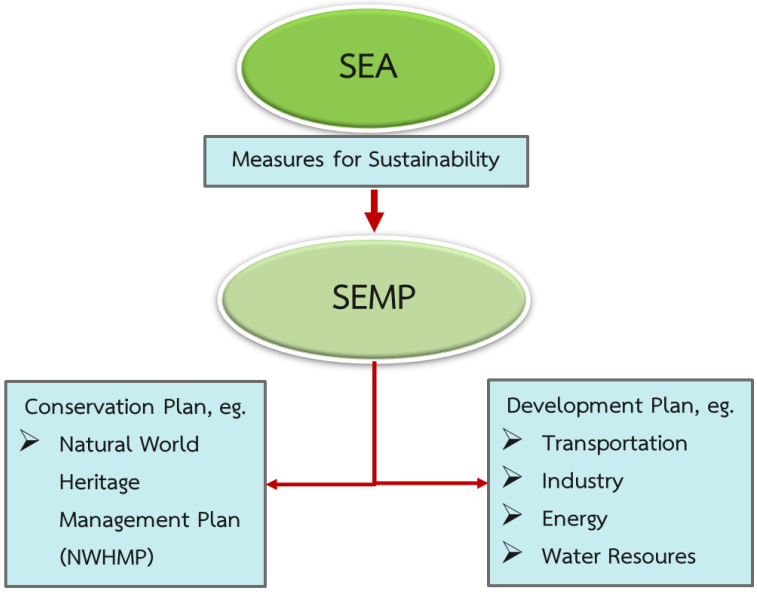

Figure 2-1: Preparation of SEA, SEMP, and NWHMP

Chapter 3

SEA Process for Natural World Heritage

This chapter presents the procedural framework for conducting strategy-based Strategic Environmental Assessment (SEA) in planning relevant to the Natural World Heritage. The framework is designed to safeguard the Outstanding Universal Value (OUV), integrity, and long-term resilience of the property, while supporting sustainable development consistent with Thailand's obligations under the World Heritage Convention.

SEA for Natural World Heritage requires a strategic perspective that goes beyond project-level assessment. It addresses cumulative, indirect, and long-term impacts arising from multiple policies, plans, and programs. All stages of the SEA process are therefore aligned with the Statement of Outstanding Universal Value (SOUV) and its attributes, ensuring that development pathways remain within the Limits of Acceptable Change (LAC) and do not compromise World Heritage status.

The SEA process consists of 5 interrelated stages, as summarized in **Figure 3-1**:

Stage 1: Setting the context and scoping, including review of relevant policies and plans; identification of key issues and thematic baseline data; delineation of the study area; identification of plans subject to SEA; formulation of the planning vision; stakeholder analysis; and preparation of the Scoping Report.

Stage 2 : Development and assessment of alternatives, focusing on realistic, implementable development pathways, including Business-as-Usual (BAU) and assessing them against Environmental and Social Quality Objectives (ESQOs) linked to OUV attributes.

Stage 3: Formulation of measures for sustainability, applying the mitigation hierarchy to enhance positive impacts and avoid, reduce, or compensate for adverse effects.

Stage 4 : Preparation of the SEA Report and integration into planning instruments, including the Strategic Environmental Management Plan (SEMP) and the Natural World Heritage Management Plan (NWHMP).

Stage 5 : Monitoring and evaluation, emphasizing both implementation compliance and tracking changes in OUV attributes and cumulative pressures.

These stages are iterative and supported by stakeholder engagement, scientific evidence, and adaptive management to ensure that conservation and development objectives are balanced over time.

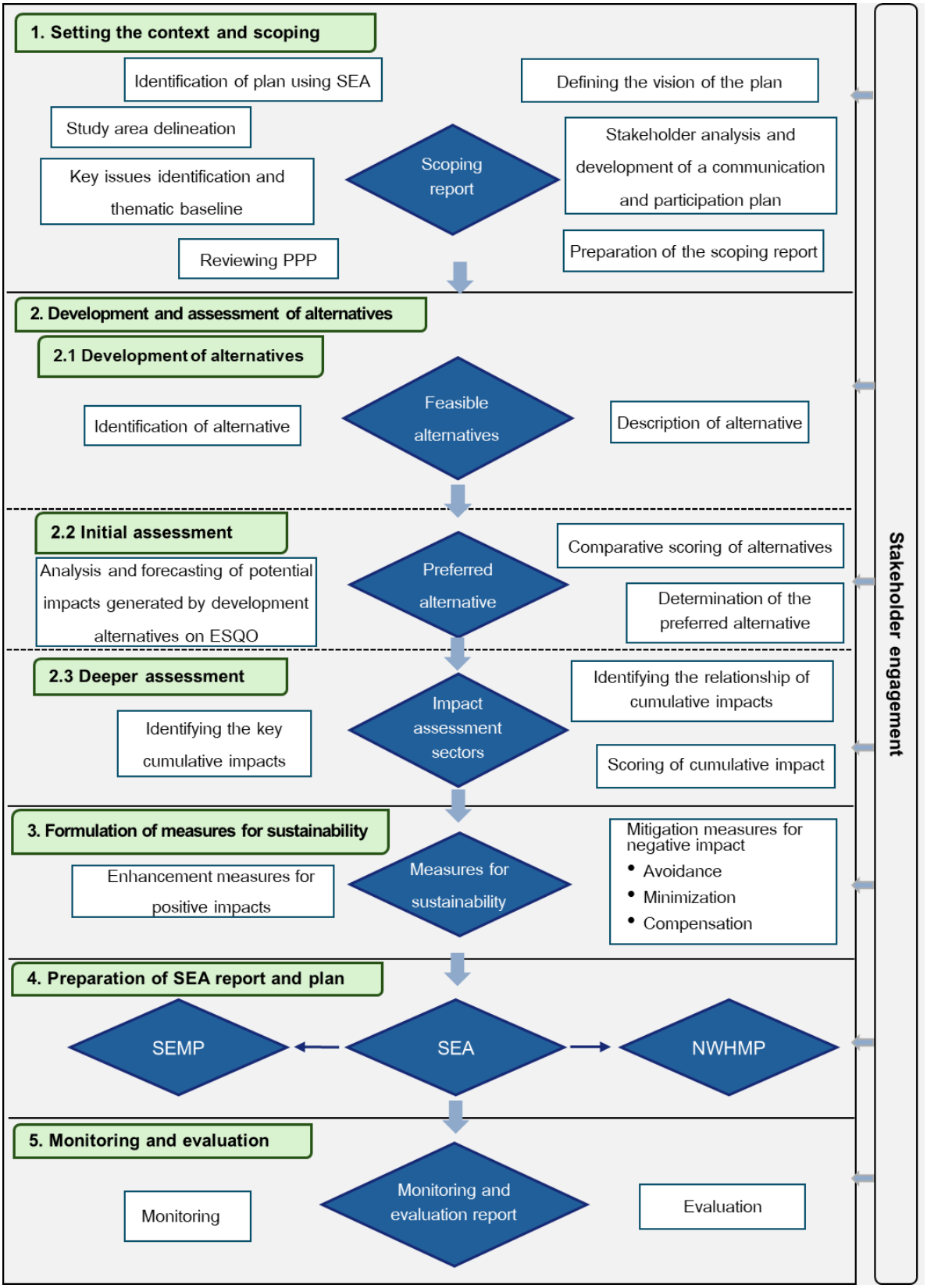

Figure 3-1: SEA process for Natural World Heritage

3.1 Setting the context and scoping

Setting the context and scoping is the first stage of the SEA process, aiming to define the study framework for the SEA and an appropriate planning framework relevant to the Natural World Heritage. Setting the context and scoping are interconnected steps: the former involves reviewing relevant documents and conducting a preliminary analysis of available data and materials to identify the thematic, spatial, and temporal scope. This is followed by scoping, which establishes: (1) the spatial and temporal scope for conducting SEA and plans relevant to the Natural World Heritage, (2) the key thematic scope, methods, and criteria to be applied in the subsequent stages of the SEA process, and (3) stakeholder participation. The expected outputs from this stage include two key documents: the Scoping Report and the communication and stakeholder participation plan.

Setting the context and scoping stage consists of 7 sub-steps: (1) reviewing the policies, plans, and programs relevant to the SEA preparation; (2) identifying the key issues and preparing the thematic baseline data; (3) defining the geographic scope of the study area; (4) identifying the specific plan to be assessed by the SEA and designating objectives for both plan and SEA; (5) formulating the vision of the plan; (6) analysing the stakeholders and developing communication and stakeholder participation plan; and (7) preparing the Scoping Report. Details of these stages are subsequently described.

3.1.1 Reviewing policies, plans, and programs relevant to SEA

The review of relevant policies, plans, and programs (PPPs) or mega-projects for conducting SEA is carried out to select PPPs or mega-projects (referred to as proposed actions) associated with various development plans located within and around the Natural World Heritage Sites. These PPPs are considered to generate potentially significant positive and negative impacts. The review process begins with a preliminary review of PPPs, followed by selecting PPPs for SEA preparation, as described accordingly.

1) Preliminary review. It includes collecting a list and descriptions of the relevant PPPs, along with information about the plan-owning agencies. Each PPP is then summarized and documented using a standard template. This preliminary review may involve a brainstorming session with the plan-owning agencies to verify, revise, or add to the list for completion. An example of a standard template of the Sundarbans case is presented in **Table 3-1**.

Table 3-1: The standard template of PPPs (The Sundarbans case)

Items	Enter the name of the PPP
Title/date of source document	Specify the URL or source document reference for the PPP
Date of approval/ draft	Indicate the date that PPP was approved or the date that the most recent draft was prepared
Main sector	Specify the primary sector(s) covered by the PPP
Responsible institution/ agency	Indicate the ministry or agency that prepared or is implementing the PPP
Status	State whether the PPP is approved or currently in progress
Scope	Describe the primary focus of the PPP, including its objectives and general content
Main objectives	Indicate the environmental and/or socio-economic objectives as stated in the PPP
Key activities undertaken	Describe the major activities implemented/proposed in the Southwest region (e.g., constructed infrastructure, ongoing operations)
Impacts	Specify known positive or negative impacts, such as: - Environmental impacts - Social impacts - Economic impacts
Beneficiaries / affected parties	Identify the primary beneficiaries or those negatively affected
Implementation cost	Indicate the cost – if known
Screening result	Specify whether it is "Included" or "Not included" in the Strategic Environmental Assessment (SEA)

Source: Modified from CEGIS/Integra (2021b)

2) PPP analysis for selecting PPPs relevant to the SEA process. The process is conducted as follows:

2.1) Preliminary impact identification. This step aims to determine the level of both positive and negative impacts of each PPP on environmental, social, and economic components. Expert judgment will be applied to assess each PPP's potential positive and negative impacts on the components above. The results of this expert analysis will be recorded in an impact identification table, with levels indicated as high, medium, or low, as illustrated in **Table 3-2**. Some PPPs may have both positive and negative impacts on the environmental, social, and economic components.

Table 3-2: Example of a table for identifying various impacts

Environmental Impact			Social Impact			Economic Impact				Environmental Impact			Social Impact			Economic Impact		
Negative Impacts										Positive Impacts								
H	M	L	H	M	L	H	M	L		H	M	L	H	M	L	H	M	L
H				M				L		H				M				L

Note: H = High, M = Medium, L = Low

Source: Modified from CEGIS/Integra (2021b)

2.2) Selection of relevant PPP for SEA. This step involves identifying which policies, plans, and programs (PPPs) should undergo SEA. The selection is based on a set of criteria developed by the SEA team, ideally through consultation with stakeholders to ensure mutual acceptance and understanding. An example of such criteria and conditions is shown in **Text Box 3-1**. Once the criteria are established, they are applied to screen each PPP and mega-project, with results recorded in the last row ("screening outcome") of **Table 3-1.**

Text Box 3-1: Illustrative example of criteria and conditions for PPP screening: The Sundarbans case

To determine whether a PPP carries high risk (i.e., significant negative impact) or substantial benefit (i.e., significant positive impact), which warrants inclusion in the SEA preparation, the PPP should meet one or more of the following criteria:

- PPP is likely to have wide-ranging impacts;
- PPP is likely to have direct or indirect impacts on the Sundarbans area;
- PPP is likely to result in permanent impacts or, in the case of negative impacts, irreversible ones;
- PPP has impacts likely to be cumulative to a significant degree.

All PPPs receiving high positive or negative scores (whether in environmental, social, economic, or all dimensions) shall be included in the SEA. For those receiving moderate scores, expert judgment will be applied following consultation within sectoral groups.

Decision-making for moderate scores

For PPPs rated at a moderate level, expert judgment is applied after discussion among relevant sectoral groups. Consideration will be given to whether the PPP is likely to have significant impacts in the Southwest Region or within the Sundarbans area.

Discussion of significant negative impacts

The nature, scope, and rationale of any significant adverse impacts arising from PPPs implemented in the Southwest Region will be discussed in the Thematic Baseline Papers.

Source: Modified from CEGIS/Integra (2021b)

The results of PPP selection are presented in a table listing the selected PPPs and their overall impacts. For clarity, PPPs should be grouped by sector, such as fisheries, forestry, tourism, industry, and disaster management. An example is illustrated in **Table 3-3**.

Table 3-3: Illustrative example of PPP screening results: List of PPPs and overall impacts

Sector	Code	Name of PPP	Negative Impact	Positive Impact
Forestry	001	Forest Policy 1994		
	002	Draft National Forest Policy 2016		
	003	Bangladesh Forestry Master Plan 2017–2036		
	004	Shrimp Mohal Management Policy 1992		
Fisheries	005	National Fisheries Policy 1998		
	006	National Fisheries Strategy 2006		
	007	National Shrimp Policy 2014		
	008	Public Water Body (Jalmahal)		

Sector	Code	Name of PPP	Negative Impact	Positive Impact
Water Resources	009	Policy on Establishment of Gher-Based Aquaculture Zone in Bhabadah Area (2019)		
	010	National Water Policy (1999)		
	011	National Water Resources Management Plan (2001)		
	012	National Strategy for Water Supply and Sanitation (2014)		
Power and Energy	013	National Power and Energy System Master Plan (2016)		
	014	Draft National Energy Policy (2006)		
	015	Renewable Energy Policy of Bangladesh (2008)		
	016	Energy Efficiency and Conservation Master Plan (2015–2030)		
	017	Gas Sector Master Plan (2018)		
	018	Private Sector Small Power Plant Policy Guidelines (2008)		
	019	Sectoral Strategy for Energy and Power (SSP) (2018)		
	020	National Action Plan for Clean Cooking (2020–2030)		
Tourism	021	National Tourism Policy (2010)		
Urbanization	022	Draft National Urban Development Policy (2011)		
	023	National Industrial Policy (2016)		

Source: Modified from CEGIS/Integra (2021b)

Note:

Negative Impact						Positive Impact					
High		Medium		Low		High		Medium		Low	

3.1.2 Key issues identification and thematic baseline

Key issues identification considers the significant positive and negative impacts that may result from implementing PPPs, aiming to identify and define key issues. The identification process may be guided by the criteria proposed by Fisher and Phylip-Jones (2015), consisting of the following four criteria. (1) Legal or Policy Criteria–issues that are Any Member State that considers it necessary or mandated by existing laws or policies; (2) functional criteria–based on activities expected to bring about changes in environmental systems; (3) normative criteria–reflecting the values that society places on environmental quality and characteristics; and (4) controversy – topics that are sources of argument among stakeholders.

Once these key issues are identified, they are organized into themes to further prepare the document as **thematic baseline papers** that demonstrate the interrelation of the key issues within a single theme. It leads to an understanding of the economic, social, and environmental systems. In addition, these papers are also used for analysis during the development and assessment of alternatives and to communicate with stakeholders during the participatory process. Thematic baselines, however, should not be detailed, but should be as follows: (1) synthesising information, for example, environmental baselines should focus on resilience, vulnerability, and the importance of key ecosystem services and ecosystems valued to good quality of life; (2) presenting key measures and/or objectives for key environmental protection identified in national, regional, and international legal instruments; or (3) assessing the action compliance with various international agreements (NEMA, 2011).

Steps and procedure for preparation of thematic baseline data are as follows:

1) **Preparation of the impact theme list.** This can be categorized into environmental, social, and economic for the SEA team's brainstorming. Examples of impact themes are (1) environment and ecosystem theme, such as climate change, pollution and waste, delta geomorphology, river dynamics, flooding, water management, and land resources, etc, and (2) social and economic theme, such as economic and industrial development in the South West Region, social issues and challenges, and institutional governance, etc.

Afterward, the topics will be subjected to a public hearing using appropriate methods for the group of stakeholders, both online and on-site, such as focus group meetings and in-depth interviews, to identify additional topics and define anticipated impacts on key issues under various themes. The results of public participation should be reviewed and revised in line with recommendations from stakeholders across sectors. A list of themes and key issues related to environmental, ecological, and social and economic problems will be compiled, along with comments and examples of potential impacts, as illustrated in the Sundarbans case in **Table 3-4.**

Table 3-4: Illustrative example of a list of impact issues: The Sundarbans case

Themes and key issues	Comments/ Examples of potential impact
Environment and ecosystem	
1. Climate change - Emission of GHG - Rising sea level - Seawater intrusion - Erratic rainfall - Rising average temperature - Cyclone and storm surges	Climate change resulting from greenhouse gas emissions from various development activities, including communities, industries, and agriculture. These problems, such as rising sea levels, seawater intrusion, erratic rainfall, rising average temperatures, cyclones, and storm surges, further affect people's livelihoods, agriculture, and food security in the South West Region.

Themes and key issues	Comments/ Examples of potential impact
2. Pollution and wastes - Water pollution (Brackish water and seawater) - Groundwater pollution - Air pollution - Soil pollution - Oil - Plastic waste - Noise pollution (particularly from water transportation in the Sundarbans Forest) - Waste treatment and disposal	1) Wastes, including wastewater, air pollution, garbage, hazardous wastes, oil, plastic wastes, etc., cause environmental pollution induced by development projects in areas related to the Sundarbans. If not properly managed, these pollutants, including surface water pollution, groundwater pollution, air pollution, soil pollution, and noise pollution, affect the ecological integrity of the South West Region of Bangladesh and the Sundarbans. 2) Noise pollution from the movement of large boats along the main rivers in the Sundarbans can disturb wildlife movement, cause population fragmentation, and potentially lead to inbreeding within the same population group.
3. Delta Morphology, river dynamics, floods, and water management	1) River flow dynamics: The decline in river flows in the Southwest could impact water use for various developments, including communities, agriculture, industry, energy, and infrastructure. This has implications for economic sustainability, regional security, livelihoods, and crop production. 2) Natural disasters: Floods, tropical cyclones, and storm surges impact development in various areas, including communities, agriculture, and industry, with ramifications for the economy and society at both the regional and local levels. 3) Riverbank erosion is a significant problem in the Sundarbans forests due to waves generated by large, high-speed ships, river sedimentation, the formation of new islands, and changes in waterways. Furthermore, rising sea levels in the southwestern region are exacerbating the problem. 4) Sedimentation and deposition are caused by river flow and tidal currents. Therefore, sediment management through dredging and sediment removal is necessary to maintain river flow and benefit various water uses. Sediment removal can affect tree regrowth, the survival of existing forests, and the biodiversity of benthic organisms living on the river bottom. 5) Groundwater and soil salinity are caused by a decrease in freshwater upstream and sedimentation in waterways, leading to seawater intrusion. This increases groundwater and soil salinity levels, which in turn reduces soil fertility and biodiversity.
4. Land resources	1) Excessive use of chemical-based agriculture causes soil degradation. 2) Inappropriate land use leads to conflicts and soil degradation. 3) Coastal erosion from development activities such as fishing and agriculture.

Themes and key issues	Comments/ Examples of potential impact
5. The Sundarbans, other ecosystems, and wildlife conservation	1) Biodiversity loss, resulting in changes in natural ecosystems: This is a result of development activities, which affect river flow, seawater intrusion, sedimentation, waste pollution, and noise pollution, particularly from shipping. This may impact biodiversity (especially in the Sundarbans forests). 2) Extinction of key species and their food sources due to hunting and habitat degradation caused by human activities. 3) Climate change may contribute to biodiversity loss. 4) Invasive alien species (IAS), particularly water hyacinth, have become a significant problem, clogging some small waterways and canals. Meanwhile, *Prosopis juliflora* ("devil's thorn," an invasive alien plant found in arid and coastal areas) is spreading along embankments. However, local people use it for firewood. There is currently no significant invasive alien species problem in the Sundarbans forests, but the forest managers are concerned about its future spread. 5) Improving forest management and expanding protected areas, such as wildlife sanctuaries, national parks, community conservation areas, safari parks, ecological parks, and botanical gardens, to sustain biodiversity and provide ecosystem services. 6) Restoring wetlands and forests through strengthening effective laws and enforcement, and ensuring strict law enforcement are essential for the sustainability of the Region's ecosystems.
6. Tourism in the Southwest Region and the Sundarbans	1) Impacts from tourism are similar to those from communities, such as water use, wastewater, solid waste, noise, and the creation of tourist attractions in sensitive areas such as national parks. 2) Transportation routes within the tourist attractions may affect biodiversity and disrupt habitats for both plants and animals. 3) The number of tourists exceeds the capacity of the Sundarbans.
7. Fisheries, agriculture, and other land uses	1) Misuse of land, such as the use of agricultural land for industrial and community development, encroachment on forest areas, especially for agriculture, and the construction of housing, resulting in the reduction and degradation of forest areas. 2) Conflicts over agricultural and fisheries land use. 3) Pollution from agriculture and fisheries causes environmental pollution, such as water pollution from chemicals used in agriculture and fisheries.
8. Infrastructure	Impacts from infrastructure such as road transport, water transport, and shipping, and from large-scale projects such as dam construction and industrial plant construction, which are development activities that require the preparation of an SEA for various development plans.

Themes and key issues	Comments/ Examples of potential impact
9. Power and energy	The impact of energy development (power plants, networks, and transmission lines) on the environment, notably air pollution and greenhouse gas emissions, requires environmental assessment at various levels, including SEA for energy plans and EIA for power plant projects.
10. Urbanization	Urban expansion and urbanization affect land use and are a source of community pollution, particularly problems of solid waste, wastewater, and noise, induced by both housing and transportation.
Socio-Economic	
11. Economic and industrial development in the Southwest Region	1) Impacts on natural resources use and environmental pollution from economic development activities, such as industry, small and medium-sized enterprises (SMEs), transportation, agriculture, forestry, fisheries, services and tourism, mining, shipping, and the challenges in developing the economy and industry into a high level of development of special economic zones. 2) Income country by 2041 under a sustainable development approach without impacting the OUV of the Sundarbans Natural World Heritage Site. 3) Positive impacts include the creation of labour and employment opportunities and the establishment of financial and marketing promotion agencies, such as cooperatives. 4) Impacts from diseases and disasters, such as COVID-19 and other disasters.
12. Social issues and challenges	1) Population growth leads to increased resource consumption. Furthermore, people also generate environmental pollution, impacting the health and hygiene of the population, particularly children and the elderly, if natural resources and the environment are not adequately managed. 2) This creates conflicts, power struggles, and power structures in the use and management of natural resources and the environment, which affect economic and social development. 3) Economic and social development influences job creation and labour migration, with local workers potentially migrating to urban areas where jobs are more abundant than in rural areas. 4) Lack of education and knowledge about natural resources and the environment poses limitations to development that require a balance of economic, social, and environmental aspects, thus hindering sustainable development in the Region. 5) Other social challenges, such as gender and child perspectives, culture, heritage, and local wisdom, are relevant to participatory environmental management. 6) Illegal activities (e.g., illegal hunting and logging, illegal fishing, and government corruption) contribute to the decline and

Themes and key issues	Comments/ Examples of potential impact
	degradation of natural resources and pose challenges to the economic security of local populations. 7) The impact of emerging diseases, such as COVID-19.
13. Institutional governance	1) Institutional environmental assessment management based on sound governance principles, including - Government relations with other organizations - Cross-border cooperation, agreements, and memoranda of understanding (MOUs). 2) Assessment of institutional capacity to implement the developed plans, which will serve as a monitoring and evaluation process.

Source: Modified from CEGIS/ Integra (2021d)

2) Identification of environmental and social quality objectives and indicators

2.1) Environmental and social quality objectives (ESQOs)

Once the key issues have been identified, it should define Environmental and Social Quality Objectives (ESQOs) for each key issue. These ESQOs will be used for both the assessment of alternatives and the monitoring and evaluation of the SEA-based Plans' implementation. For example, minimizing the impact of climate change, reducing all types of pollution, increasing local employment opportunities, etc.

2.2) Designation of indicators and target values. The target value of an indicator should be consistent with the Limits of Acceptable Change (LAC), the minimum or maximum value or level of acceptance that triggers change, particularly in an undesirable direction, for use in monitoring and evaluation. These values or levels can be referenced in the ESQOs. However, if such values or levels are unavailable, a method agreed upon by the various stakeholders can be used (Odhengo et al., 2014a). Furthermore, indicators should be linked to all 17 Sustainable Development Goals (SDGs). Target values may be established based on national or international standards, or by international agreements. An example of ESQOs and SDGs is presented in **Table 3-5.**

Table 3-5: Illustrative example of issues and themes, objectives, and SDGs: The Sundarbans case

Themes and key issues	Objectives (ESGOs)		SDGs
Environment and ecosystem			
1. Forests, protected areas, and biodiversity	1	Reduce the overexploitation and degradation of natural resources and ecosystem services, as well as the loss of biodiversity, particularly of keystone species and their associated ecosystem services	6,14,15
	2	Reduce illegal activities in protected areas and biodiversity hotspots	15

Themes and key issues	Objectives (ESGOs)		SDGs
	3	Reducing the introduction and spread of invasive alien species	15
2. Waste and pollution	4	Reduce improper and unsafe waste accumulation and disposal (in both urban and industrial areas)	3,6,14
	5	Reduce all types of pollution, including air, soil, water, noise, and light pollution	3,6,14,15
	6	Reduce greenhouse gas emissions	13
3. Climate change and disaster	7	Reduce the risk of climate change and natural disasters (saltwater intrusion, flooding, storm surges, etc.)	1,13
4. Water	8	Increase freshwater flow in the river during the dry season	6
5. Land degradation	10	Reduce land loss due to degradation (bank erosion/stream channel, soil salinity, soil erosion, etc.)	15
6. Land use change	11	Reduce loss of agricultural land (such as conversion to shrimp pond)	15
Socio-Economic			
7. Economic development	12	Promote inclusive and sustainable economic growth, ensuring that key biodiversity and ecosystem services are not compromised	8,9
8. Employment	13	Enhance employment opportunities and access to new jobs, particularly in agriculture, tourism, and nature-based sectors	8,9
9. Health and sanitation	14	Improve public health and environmental health by reducing exposure to environmental risks, such as reducing the risk of disease outbreaks	3
	15	Improve and expand access to clean water and sanitation services	3,6
10. Education, skill, and training	16	Improve access to education for all, increase attendance (by reducing dropout rates), and improve skills development and training	4
11. Migration	17	Reduce migration from rural areas (including disaster-prone and hazard-prone areas) to urban areas	1,2,3,4,6,8
12. Women and children	18	Improve gender equality and empower women	5
13. Social inclusion	19	Increase the inclusion of landholders, landless people, and marginal landholders in development activities in the Southwest region	10,16
14. Conflict and stability	20	Minimize land use conflict	15
15. Cultural heritage and natural heritage	21	Conserve heritage sites (historic buildings, archaeological and cultural sites) and enhance cultural	11

Themes and key issues	Objectives (ESGOs)		SDGs
		diversity (e.g., languages, arts), including the natural heritage of the Sundarbans	
16. Food	22	Improve food safety	2
17. Agriculture and fishery	23	Increase agricultural and fisheries productivity	2
18. Power and energy	24	Increase the use of renewable energy	7,9
	25	Increase the efficiency of energy production and consumption	
	26	Increase access to affordable energy	7
19 Tourism	27	Improve tourism management and behavior to limit noise, pollution, and other adverse impacts, and to remain within the Sundarbans' tourism carrying capacity. Reduce migration from rural areas (including disaster-prone and hazard-prone areas) to urban areas	8,151,2,3,4,6,8
20. Infrastructure, transportation, and communication	28	Improve community connectivity and access to infrastructure services and facilities	11
	29	Improve the current and future physical infrastructure of transportation services (rail, road, air, water) to be appropriate	9

Source: Modified from CEGIS/Integra (2021c)

2.3) Thematic baseline paper. It is a document that synthesizes key data of relevant factors and the current conditions of each theme. These papers consolidate relevant key issues under a single thematic heading to illustrate the interconnections among expected impacts and to establish a clear framework for reviewing all associated information. This approach fosters a system-level understanding of each theme and provides a crucial reference for scoring and evaluating alternatives during the SEA process. Each paper should include a comprehensive analysis of the status, trends, vulnerabilities, and importance of the theme in question. For example, a theme on wildlife and ecosystem conservation may encompass issues such as biodiversity loss, alien species invasions, and habitat fragmentation. Thematic papers should be developed according to the content structure outlined in **Text Box 3-2**, which includes elements such as thematic scope, spatial coverage, data sources, legal frameworks, and indicators for monitoring and evaluation. The development of each thematic paper must be supported by consultations with external experts, including academic researchers and community-based experts with local knowledge, to ensure scientific credibility and contextual relevance.

Text Box 3-2: Illustrative example structure of thematic baseline paper: The Sundarbans case

The thematic baseline paper is developed according to the number of identified themes. Once prepared, these documents will be made publicly available through the SEA website and continuously updated throughout the SEA process to ensure the information remains current and relevant. The content structure of each baseline paper includes the following key components:

- Introduction
- Responsible authorities or lead agencies: Identification of key government bodies, private sector actors, or non-governmental organizations responsible for managing the resources or issues related to the theme, including their roles, mandates, and current actions.
- Relevant laws and regulations: An overview of the legal and policy frameworks that govern the thematic area.
- Overview of related PPPs: A brief description of the associated PPPs, including an assessment of their environmental, social, or economic impacts and their underlying drivers, including significant development initiatives or mega projects.
- Drivers of change: Key forces influencing change within the thematic area.
- Key issues: A synthesis of the most relevant and critical issues related to the theme.
- Bibliography: Cited references and data sources.
- Annexes: Supplementary materials and technical data.

These baseline papers will provide national and Southwest Regional (SW Region) data and trends, forming a critical information base for the baseline chapter of the main SEA Report. They will be used in subsequent analytical steps.

Source: Modified from CEGIS/Integra (2021c)

For example, thematic baseline papers may be developed on topics such as climate and climate change, pollution and waste, tourism, and urbanization, among others. Further details on the preparation of these baseline documents can be found in the Scoping Report and Final SEA Report prepared by CEGIS/Integra (2021b and 2021d). Each theme includes a defined scope of content, which outlines the key elements to be addressed within that thematic area. An excerpt of this scope is illustrated in **Table 3-6**. All thematic baseline papers can be accessed online at: www.seasw-sundarbansbd.org.

Table 3-6: Illustrative example of content of baseline thematic paper: The Sundarbans case

No.	Baseline thematic paper	Content of baseline paper
1	Climate and climate change	- Basic climate characteristics of the Southwest region and related issues (including trends and greenhouse gas emission projections) - Review of evidence, trends, and projections related to climate change - Climate change scenarios - Potential impacts of climate change - Adaptation and mitigation measures
2	Pollution and wastes	- Pollution: air, water, soil, and noise: impacts and future scenarios - Waste and waste management: urban, rural, industrial, agricultural, electronic waste, end-of-life vehicles, waste oil, plastic, hazardous waste (e.g., expired pesticides), and recycling/reuse
3	Delta Morphology, river dynamics, floods, and water management	- Hydrological conditions: river systems, freshwater, water levels, drainage patterns, and future projections - Geomorphology: river morphology analysis, shoreline change, sedimentation, and erosion/deposition forecasts - Natural hazards: floods, tropical cyclones, storm surges - Water-related infrastructure development - Current and future risks - Programs to mitigate potential risks
4	Land resources	- Physical conditions: topography, landscape, soil types, geology, and hydro-meteorology - Agricultural zones, ecological zones, and land use - Soil types - Land resource management strategies: agriculture, fisheries, forestry - Key issues and challenges - Coastal Polders
5	The Sundarbans, other ecosystems, and wildlife conservation	- Landscapes - Protected areas and wildlife sanctuaries - UNESCO World Heritage Sites and Outstanding Universal Value - Flora and fauna - Management of the Sundarbans and other ecosystems - Natural resource use - Role of the Sundarbans in the national and regional economy - Challenges and key issues
6	Tourism in the Southwestern Region and the Sundarbans	- Status of the tourism industry: major destinations, facilities, development constraints, tourist numbers and carrying capacity, community participation, cultural tourism - Potential and future trends: ecotourism, cultural, archaeological, historical, river-based, and rural tourism - Carrying capacity and tourism in the Sundarbans - Impact of COVID-19 on the tourism sector

No.	Baseline thematic paper	Content of baseline paper
7	Fisheries, agriculture, and other land uses	- Land use data - Determinants of land use - Land use policies - Agriculture - Forestry - Fisheries - Urban and rural settlements - Land use changes and their impacts
8	Infrastructure	- History and basic data on infrastructure and communication - Status and trends in infrastructure (2011–2020) - Road transportation - Water transportation: rivers, navigation systems, shipping - Communication - Other types of infrastructure - Summary of 5-year development plans and dual-level visions - Subsector transportation forecasts - Mega Projects
9	Power and energy	- Basic information: energy sources, consumption, production, infrastructure (power plants and transmission systems), indicators, impacts, accidents, etc. - Future trends: projections of energy production and consumption, expected new power plants, grid and pipeline systems - Energy statistics - Air pollution (current situation and trends) - Greenhouse gas emissions (current situation and trends)
10	Urbanization	- Background context - Cities, towns, and small urban centers, including their roles, services, locations, and land use - Trends and challenges: area and population dynamics, land use change, urban expansion, urbanization trends, key issues, waste management, air quality, and transportation - Impacts of urban expansion
11	Economic and industrial development in the Southwest Region	- Economic situation: employment, food security, exports/imports, prices, and incentives - Tax and subsidy policies - Economic activities: industry, SMEs, transportation, agriculture, forestry, fisheries, services, tourism, mining, waterway transport, etc., and their impacts and market trends - Development of special economic zones - Labor, employment, and cooperative opportunities - Challenges to economic and industrial development - Impacts of COVID-19

No.	Baseline thematic paper	Content of baseline paper
12	Social issues and challenges	- Population - Education - Livelihoods - Health - Gender and child perspectives - Culture, heritage, and local knowledge - Conflicts, power struggles, and power structures - Security, law, and social order - Impacts of COVID-19
13	Institutional governance	- Background related to institutional governance - Governance structure across national, regional, and local levels - Environmental assessment and management - Key governance issues - Government relationships with other organizations - Cross-border cooperation, agreements, and memoranda of understanding (MOUs) - Institutional capacity (this topic to be further developed when COVID-19 conditions permit institutional-level surveys)

Source: Modified from CEGIS/Integra (2021b and 2021d)

3.1.3 Study area delineation

Delineating the SEA study area is a critical component of the SEA process, as activities that may affect the OUV of a Natural World Heritage site can originate both within and beyond the site boundaries. The assessment shall, therefore, encompass all relevant and interconnected areas to ensure a systematic and comprehensive analysis of potential impacts. The SEA study area generally comprises the following two components.

1) The designated Natural World Heritage property. This includes the precisely defined boundaries, coordinates, and area as officially recognized and inscribed by the World Heritage Committee and UNESCO. This area forms the core zone of the study. It should be explicitly mapped and referenced using spatial analysis tools, such as Geographic Information Systems (GIS), to ensure clarity and consistency in spatial referencing and boundary delineation.

2) Areas where they generate or receive impacts on OUV. These include sources of activities that may have significant effects on the OUV, and Impact-receiving zones, which may lie inside, adjacent to, or beyond the inscribed property boundaries. This component addresses a range of impact types, including positive and negative, direct and indirect, cumulative, and transboundary impacts. The spatial extent of these areas depends on the scope and nature of the potential effects, such as impacts on forest structure, biodiversity, watershed, or surface water availability.

Determination of these study areas should be supported by expert analysis using scientifically sound and appropriate tools, including expert brainstorming sessions, impact modeling, and other predictive methods, to estimate and visualize the likely spatial extent of influence of development activities.

3.1.4 Identification of the plan subject to SEA

Identification of plans and programs subject to the SEA process is a critical step, as such plans serve as primary tools for the conservation and restoration of Natural World Heritage Sites to maintain or recover the integrity of their OUV, as recognized by UNESCO. Once the target plan is identified, it is essential to clearly define its objectives, which will shape the substantive scope of the SEA study, as well as its temporal scope or planning timeframe. Additionally, the specific objectives of the SEA must be identified to ensure that the assessment enhances the plan's effectiveness and contributes to integrated decision-making. Together, the objectives of the plan and SEA determine the study's overall analytical framework.

1) **Identification of the plan subject to SEA** depends on the specific conditions and context determined by the responsible agency assigned to lead the process. This decision must be tailored to the circumstances of each case. In most instances, the target plan is already specified in the TOR for SEA.

2) **The objectives of the plan** are typically outlined in the TOR. However, the SEA team should work closely with the responsible agency to refine and clarify these objectives, ensuring they are well-defined and aligned with the overall SEA process. A clear articulation of the plan's objectives helps establish the goals, conceptual framework, and direction for conducting SEA. This includes a focus on assessing anticipated environmental, social, and economic impacts arising from the implementation of current and future development plans (CEGIS/Integra, 2021b).

3) **Determination of the temporal scope** is a crucial element that enables realistic analysis and forecasting throughout the SEA process, ensuring that the resulting plan can be feasibly implemented. The timeframe for consideration is often specified in the TOR. However, the SEA team should also consult with the responsible agency to ensure appropriateness. In most cases, plans related to Natural World Heritage properties adopt a 20-year planning horizon, which may be subdivided into short-term (5 years), medium-term (10 years), and long-term (20 years) periods. This step typically begins with internal consultations among subject-matter experts within the SEA team, followed by formal discussions with the responsible agency and/or any other stakeholders deemed relevant by that agency.

4) The SEA objectives may be specified in the overall TOR. To ensure the clarity of the study, the SEA team must specify these in detail. Thus, the SEA team must understand the SEA format and the appropriate SEA process and procedures in accordance with the SEA guidelines to align with the planning process. SEA objectives can be defined in several ways including (1) specifying them item-by-item, following the SEA procedures to be conducted, as in the Sundarbans example; (2) specifying them in an overall format, as in the Wood Buffalo National Park (WBNP) example, as shown in **Text Box 3-3**; and (3) defining objectives by dimension, including the environment, society, and economy. Each dimension may have further sub-objectives. Accordingly, clarifying the objectives of the planning process will also enable clarifying the SEA objectives.

Text Box 3-3: Illustrative example of SEA objectives preparation

SEA objective: Item-by-item case

1) To consider the environmental, social, and economic impacts of existing PPPs (National and in the South West Region) and address these issues when defining and implementing future and existing PPPs, to promote sustainable development in the Region and the conservation of the Sundarbans and the OUV
2) To assess the impacts of development on the existing biophysical environment and socio-economic conditions simultaneously, facilitating decision-making regarding the transition to a sustainable, resilient, and resource-efficient economy
3) To identify key stakeholders involved in the selected sector and hold consultations to build knowledge about the existing biophysical environment and socio-economic conditions, the impacts of current and proposed development, and possible strategies for future growth in the South West Region
4) To develop alternative strategies to mitigate the direct/indirect, national/transboundary, and cumulative impacts of the development on the Sundarbans and the South West Region more broadly, and to recommend ways to improve environmental management in the public and private sectors with respect to future development activities
5) To establish a comprehensive framework in the form of a Strategic Environmental Management Plan (SEMP) for the South West Region. To support decision-making and monitor the implementation of policies, plans, and programs that may impact the environment and socio-economic conditions of the region, and in particular the Sundarbans

SEA objectives: Overall case

The overall objective of SEA is to assess the cumulative impacts of all development on the WBNP's OUV, incorporating indigenous and scientific knowledge. Specific objectives include:

1) To improve the identification, recognition, and management of cumulative impacts affecting the WBNP.
2) To inform the scope and effectiveness of the project-level environmental assessment
3) To influence the development and implementation of an action plan for the protection of the WBNP's World Heritage OUV

Source: Modified from CEGIS/ Integra (2021d) and IEC (2018)

3.1.5 Defining the plan vision

The vision defines the strategic development framework that guides the planning process toward its ultimate objectives. It should reflect the aspirations of relevant stakeholders and explicitly support the long-term conservation and sustainability of OUV and the key attributes of the Natural World Heritage Site.

There are various methods for developing a vision, depending primarily on the SEA team's expertise. Common approaches include Scenario Analysis, SWOT Analysis, and other strategic planning tools. Stakeholder participation is especially crucial at this stage. The SEA team should engage stakeholders appropriately, as outlined in the communication and participation plan, to ensure the process is inclusive and context sensitive. Most importantly, the vision shall achieve broad stakeholder acceptance to ensure legitimacy and shared ownership.

An example of the planning vision of the Tana River Delta Land Use Plan is stated in **Text Box 3-4**.

Text Box 3-4: Illustrative example of planning vision of the Tana River Delta land use plan

> *"The land in the Tana River Delta is sustainably managed by stakeholders for stakeholders, thereby ensuring ecosystem integrity and sustainable livelihoods for present and future generations*."

Source: Modified from Odhengo et al. (2014a)

3.1.6 Stakeholder analysis and development of a communication and participation plan

Stakeholders play a crucial role in the SEA process, particularly in the context of Thailand, where the stakeholder groups, including civil society, community-based organizations, and the private sector, are relatively strong and actively seek involvement. Their participation is crucial for expressing concerns, sharing future aspirations, and contributing to informed decision-making. However, engaging every stakeholder group directly may not always be feasible. Therefore, stakeholder analysis is necessary to understand the interests, influence, and significance of different stakeholder groups and to tailor engagement strategies accordingly. Stakeholders may participate in various forms, from providing information to offering comments to participating in assessments throughout the SEA process. To ensure transparency and structure in these participations, **a Communication and Participation Plan** should be developed. This plan helps manage time and financial resources efficiently, ensures inclusivity, and clarifies roles and participation methods. The communication and participation plan should be developed early in the SEA process and then shared with stakeholders for feedback and endorsement, ensuring it reflects shared expectations. Detailed methodologies can be referenced from Thailand's SEA Guidelines (NESDC, 2021).

For the World Heritage contexts, a good example of stakeholder engagement is presented in the Strategic Environmental Assessment of the Wood Buffalo National Park (WBNP) World Heritage Site (IEC, 2018), as illustrated in Text Box 3-5.

Text Box 3-5: **Illustrative example of stakeholder engagement process: The Wood Buffalo National Park World Heritage Site case**

1. Implementation of the engagement process

The leading actors involved were Parks Canada Agency and Indigenous Engagement Coordinators, working in collaboration with Independent Environmental Consultants (IEC). They engaged with 11 Indigenous groups directly associated with the Wood Buffalo National Park (WBNP), as well as other nearby Indigenous communities.

Engagement methods included in-person meetings, telephone calls, workshops, written submissions, and consultations with Elders, knowledge holders, technical officers, and community advisors.

Information dissemination was carried out through newsletters, the official SEA website, and the publication of draft SEA Reports to ensure accessibility by the public and all stakeholders.

Additional stakeholders involved included industry representatives, Environmental NGOs (ENGOs), researchers, and government agencies.

2. Respect for traditional knowledge

Use of Indigenous knowledge: Indigenous groups, such as the Mikisew Cree First Nation (MCFN), contributed by sharing stories rooted in their cultural traditions, providing lived experiences, and long-term observations of the land.

Flexible approach: Parks Canada adapted its methods to authentically reflect Indigenous perspectives, allowing contributors to choose how their statements were phrased and whether their names would be cited in the report, thereby showing respect and enhancing credibility.

3. Input from other groups

Researchers contributed through academic papers, grey literature, and technical commentary on topics such as ecosystems, flooding, and pollution, thereby enriching the systemic understanding of the region.

Government agencies, including provincial authorities from Alberta and the Northwest Territories, played crucial roles in transboundary management, which could either support or hinder the fulfilment of World Heritage conservation criteria.

4. Community voices reflected

"We are the scientists—we are the people on the land." – Ron Campbell

This statement illustrates how traditional land users closely observe environmental changes, such as declines in wildlife populations and deterioration in water quality. When Western scientists confirm these findings, it reinforces the value and legitimacy of local knowledge.

5. SEA outcomes

Insights gained from the engagement process were integrated into the WBNP Management Plan and subsequently reported to the World Heritage Committee. Comments beyond the formal scope of the SEA were not included in the main report but were recorded in appendices, ensuring official documentation and transparency.

Source: Modified from IEC (2018)

3.1.7 Preparation of the Scoping Report

The Scoping Report constitutes a formal decision-support document that defines the scope of the SEA in terms of geographic coverage, substantive focus, and timeframe. It outlines the proposed procedures and methods and may serve as a basis for stakeholder consultation to obtain feedback and recommendations, or for submission to the authorised institution for formal review and approval.

The SEA team is responsible for preparing this report using the core structure illustrated in Text Box 3-6, which can be adapted as appropriate, particularly when SEA steps are tailored to a specific contextual application.

Text Box 3-6: The structure of the Scoping Report

1. Rationale: Explanation of the main drivers for conducting the SEA

2. Objectives: Clear articulation of both the SEA objectives and those of the plan being developed through the SEA process

3. Scope of study

3.1 Design of the SEA process, the planning process, and the participation process, including methods to be used at each stage

3.2 Review and analysis of relevant policies, plans, frameworks, regulations, reports, and documents, as well as tools used for identifying: key issues, themes, Environmental and Social Quality Objectives (ESQOs), Limits of Acceptable Change (LAC), thematic baseline papers, study area boundaries, temporal scope, and vision of the plan

3.3 Stakeholder analysis and the development of a communication and participation plan

4. Scoping outcomes

4.1 Integrated structure of the SEA process, the planning process, and stakeholder engagement

4.2 Relevant policies, plans, frameworks, and legal instruments related to the SEA

4.3 Identified key issues, themes, ESQOs, LAC, and associated baseline documents

4.4 Defined the spatial and temporal scope and the plan's vision

4.5 Stakeholder involvement and the communication and participation strategy

5. Next steps: Outline of subsequent stages in the SEA process

Source: Modified from CEGIS/ Integra (2021b)

3.2 Development and assessment of alternatives

The development of alternatives is the designation of approaches or models to be used as strategies in planning. This process ensures that the plan's implementation achieves its objectives and vision. This step is crucial and considered the heart of SEA, generating a range of alternatives. The alternatives being developed include business-as-usual (BAU) and others. Remarking that BAU is an alternative being continued as specified in the relevant plans, reviewed

and consulted with appropriate agencies, without any plans to be developed through the SEA process (NESDC, 2021). Importantly, these alternatives can be implemented to achieve the plan's objectives. Once the alternatives are developed, an assessment is performed. Various alternatives, including the BAU alternative, are evaluated to arrive at a single, preferred alternative. Once the preferred alternative is identified, an in-depth impact assessment is conducted. This anticipated cumulative impact of activities that could be developed under the preferred alternative will inform measures to enhance positive impacts and mitigate negative ones. However, at this stage, there is a wide range of concepts and approaches for developing alternatives, including methods for assessing them. Therefore, this stage presents principles and methods that may be appropriate for SEA and for the preparation of plans for Natural World Heritage Sites. In essence, this stage should involve extensive consultation with various stakeholders.

3.2.1 Development of alternatives

Development of alternatives involves formulating multiple pathways to achieve the plan's objectives and vision. The alternative should reflect key characteristics as follows: (1) realistic–capable of achieving the plan's objectives in practice, (2) reasonable–based on empirical data across environmental, social, and economic dimensions, (3) viable–technically and financially appropriate, and (4) implementable–executable within the plan's timeframe and resource constraints. This step consists of identifying and describing each developed alternative.

1) Identification: This sub-stage employs data derived from thematic baseline papers and stakeholder consultation of various sectors to formulate initial alternatives. These alternatives being developed include an alternative implemented as usual, called the Business-as-Usual (BAU) (Do-nothing/ Null Variant), reflecting the continuation of existing trends and plans. The BAU alternative will serve as a benchmark for comparing other alternatives. The framework for generating alternatives is based on four commonly referenced models: need, mode, location, and timing. The optimal number of development alternatives is 2-5.

2) Description: It details a descriptive narrative of each developed alternative, conveying its core characteristics to enable an appropriate basis for comparative assessment. This narrative also identifies any limitations of such a developed alternative. This descriptive narrative is commonly referred to as **a scenario**, which is a set of conditions, activities, and situations used to illustrate how a particular alternative (NEMA, 2011).

Methods for Developing Alternatives include:

1) Initially, the SEA team should involve the plan owner and relevant agencies identified in the plan review process to jointly design alternatives and scenarios until several alternatives and scenarios are identified, which may still be numerous.

2) Afterward, all alternatives and scenarios are intensively and comprehensively consulted with various stakeholders. Several comments and suggestions are considered and refined, both the number and details of each alternative and scenario are refined until an appropriate number of alternatives and a scenario with more information that meet the recommendations are obtained.

3) The alternatives and scenarios are again consulted with various stakeholders to ensure mutual acceptance. This is a crucial step and may require iterative refinement, which is necessary and should be undertaken.

An example of identification and description of developed alternatives for the Sundarbans case is presented in **Text Box 3-7 and Table 3-7.**

Text Box 3-7: Illustrative example of development alternatives: The Sundarbans case

1. Low growth, a development alternative that emphasizes cautious development
2. Medium growth*, a development alternative that follows current trends
3. High growth, a development alternative that develops rapidly for high economic goals

* The medium growth alternative is considered the status quo or Business-as-Usual alternative.

Source: Modified from CEGIS/Integra (2021d)

Table 3- 7: Illustrative example of summarized details of development alternatives: The Sundarbans case

Factors	Forecast		
	Low growth	**Medium growth**	**High growth**
Economic dimension			
GDP growth rate	Low or stagnant	Moderate	Rapid
GDP per capita	Changes proportionate to population growth	$4,046 to $12,535 by 2031	$12,536 or more by 2041
----------	----------	----------	----------
Food security	Moderate – nutritional value and affordability declining	Moderate to high – improvements in nutrition and purchasing power	High – improved food quality and nutritional value
----------	----------	----------	----------
Social dimension			
Total population	High growth due to higher fertility rates	Slight increase from baseline	Slight increase from baseline, but lower than the medium growth scenario
Poverty and inequality	No reduction	Moderate reduction	Significant reduction
Female employment	Low	Slight increase	Moderate increase
----------	----------	----------	----------

Factors	Forecast		
	Low growth	Medium growth	High growth
Environmental dimension			
Water quality	Severely degraded	Moderately degraded	Significantly improved
Soil salinity	Increased	Moderately decreased due to improved freshwater flow and SLM adoption	Significantly reduced due to enhanced freshwater flow and SLM adoption
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Source: Modified from CEGIS/Integra (2021c)

3.2.2 Initial assessment

The initial assessment is a step taken to analyze the results of developing alternatives and to assess **the preferred alternative** with the least impact on the Natural World Heritage Site. The preferred alternative will then be used for an in-depth cumulative impact analysis in the next step. An appropriate assessment methodology is an Impact Matrix, which compares the alternatives against the qualitative environmental and social objectives (objectives-led assessment) (CEGIS/Integra, 2021d) specified in the previous step. This is done by creating criteria for considering the level of scores, both positive and negative (+, -), and levels, such as high (4, 5), medium (3), low (1, 2), or no effect (0). The SEA team should present it to various stakeholder groups for revision and acceptance before proceeding with the impact assessment of the alternatives.

The initial assessment process involves three main steps:

1) Analysis and forecasting of potential impacts generated by development alternatives on ESQO. In this forecasting, various tools can be used, including the DPSIR Model (Drivers–Pressures–State–Impact-Response) to analyze the relationships between multiple factors affecting Natural World Heritage Site, the use of environmental mathematical models such as air and water quality, forest area changes to study long-term impacts, and the use of GIS and spatial modeling for physical impact analysis.

2) Comparative scoring of alternatives. Each alternative is scored based on its expected advantages and disadvantages, through brainstorming of the SEA team and stakeholder feedback.

3) Determination of the preferred alternative. This task uses data from the impact comparison to analyze and identify an alternative that balances development and conservation. The criteria used to select the preferred alternative include: the lowest environmental impact (least affected forest areas and ecosystems), the highest economic benefit (positive effect on GDP growth), and the least social impact (reducing migration and conflict).

For the Sundarbans case, initial assessments were conducted for two different scenarios:

1) Risk score. The conditions considered for the risk score cases are as follows: (a) existing environmental and social protection policies, regulations, and practices are not fully or effectively implemented or enforced, (b) no mitigation or impact reduction measures are taken, or measures are ineffective to avoid, minimize, restore, mitigate, or compensate for potential impacts induced by development, and (c) the use of clean and sustainable technologies is not enforced.

2) Mitigated score. The conditions considered for the mitigated score cases are as follows (a) existing environmental and social protection policies, regulations, and practices are fully and effectively enforced, (b) the government has taken adequate measures to avoid, minimize, restore, mitigate, or compensate for potential impacts from development, and (c) to ensure the use of clean and sustainable technologies.

As shown in **Tables 3-8** and **3-9**, the assessment indicated that the High Growth scenario was the preferred alternative, demonstrating substantial positive contributions toward achieving economic and social goals and strong alignment with environmental objectives.

Table 3-8: Illustrative example of initial assessment by consideration of risk score: The Sundarbans case

Objectives	Risk score		
	High growth	Medium growth	Low growth
Environmental objectives – by key issues			
Forests, protected areas, and biodiversity			
1. Reduction of overexploitation	-3	-2	-4
2. Reduction of illegal activities	-3	-2	-3
3. Reduction of invasive alien species	-3	-2	-3
Land use change			
Reduction of agricultural land conversion to unsuitable uses (e.g., shrimp farming)	-2	-3	-3

Socio-economic objectives – by key issues			
Economic growth	-2	-2	-3
Employment	-2	-2	-3
Migration	-2	-2	-2

Remark: Risk score presented by -1 to -5 by
-1 Slightly negative score
-2 Moderately negative score
-3 Very negative score
-4 Significantly negative score
-5 Very significantly negative score
Source: Modified from CEGIS/Integra (2021c)

Table 3-9: Illustrative example of initial assessment by consideration of mitigated score: The Sundarbans case

Objectives	Mitigated score		
	High Growth	Medium Growth	Low Growth
Environmental Objectives – by Key Issues			
Forests, Protected Areas, and Biodiversity			
1. Reduction of overexploitation	0	+2	+4
2. Reduction of illegal activities	0	+2	+3
3. Reduction of invasive alien species	0	+2	+3
Land Use Change			
Reduction of agricultural land conversion to unsuitable uses (e.g., shrimp farming)	0	0	0

Socio-Economic Objectives – by Key Issues			
Economic growth	+1	+3	+4
Employment	0	+2	+3
Migration	+1	+3	+4

Remark: Risk score presented by +1 to +5 by
+1 Slightly positive score
+2 Moderately positive score
+3 Very positive score
+4 Significantly positive score
+5 Very significantly positive score
Source: Modified from CEGIS/Integra (2021c)

The impact analysis of three development alternatives, based on the Sundarbans case's risk and mitigated scores, is shown in **Table 3-10.** It indicates that Alternative 3 (High Growth) has a lower Risk Score than Alternative 1 (Low Growth) and Alternative 2 (Medium Growth), while having a higher mitigated score than the other alternatives. Therefore, the High Growth alternative is preferred. This alternative has the potential to create significant positive impacts on achieving social and economic development objectives and has a relatively substantial positive impact on attaining environmental development objectives.

Table 3-10: Illustrative example of summary of result analysis and impact analysis of alternatives on risk and mitigated scores: The Sundarbans case

Objectives	Alternative 1 High Growth		Alternative 2 Medium Growth		Alternative 3 Low Growth	
	R	M	R	M	R	M
Environment	-34	+30	-23	+19	-32	+2
Socio-economic	-24	+67	-40	+38	-36	+9
Total	**-58**	**+97**	**-63**	**+57**	**-68**	**+11**

Remark: R = Risk Score and M = Mitigated score
Source: Modified from CEGIS/ Integra (2021c)

3.2.3 Deeper assessment

Deeper assessment is an assessment of the impacts of alternatives by analyzing and forecasting the cumulative effects that may arise from the proposed development plan, which is the preferred alternative derived from the initial assessment (i.e., high growth). This assessment examines the potential cumulative impacts of the proposed development and whether they are manageable. This allows for the design of strategies to address both positive and negative impacts.

The cumulative impact assessment method involves identifying significant cumulative impacts, determining the relationships among cumulative impacts from multiple factors, and calculating cumulative impact scores for the preferred alternative.

1) Identifying the key cumulative impacts. This is to identify the key cumulative impacts of the proposed plan on the Natural World Heritage Site. The potential impacts include environmental and socio-economic impacts; physical impacts (e.g., delta geomorphology, river dynamics, flooding and water management including erosion and sedimentation), biological impacts (e.g., Sundarbans mangroves, other ecosystems and wildlife conservation), and socio-economic impacts (e.g., economic and industrial development in the South West, fisheries, agriculture and other land uses). These potential impacts were based on the SEA team's analysis and stakeholder consultations

2) Identifying the relationship of cumulative impacts resulting from multiple factors. This step uses tools such as linkage diagrams to show the connections between proposed plans, natural processes, and environmental and socio-economic impacts. An example of identifying the relationship of the cumulative effects using linkage diagrams in the case of the Sundarbans is shown in **Figure 3-2.**

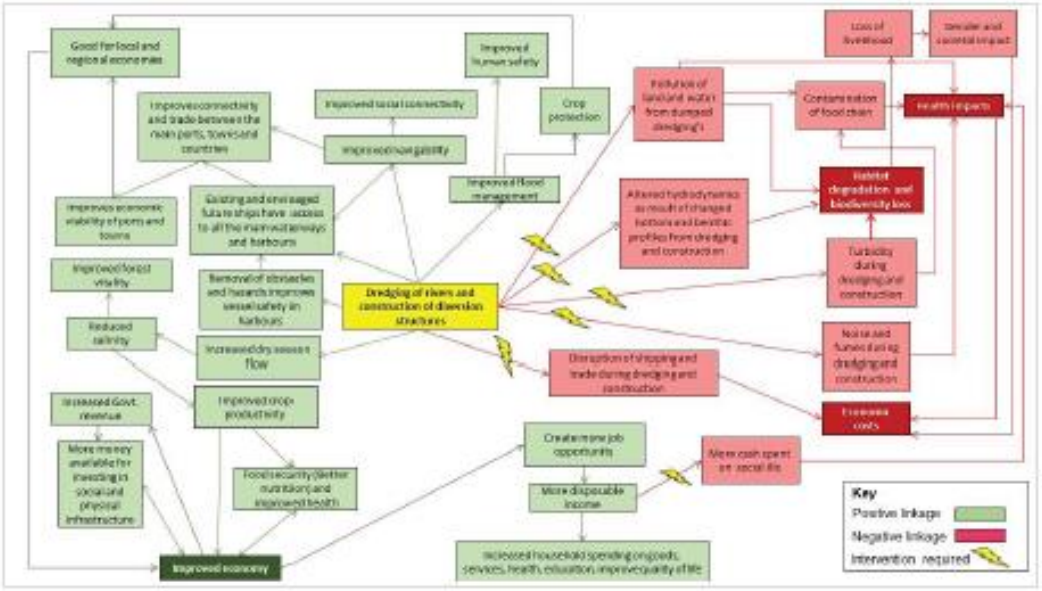

Figure 9.10: Water: Dredging of rivers and construction of diversion structures (to enhance dry season flow and control floods)

Main cumulative impacts

Positive: Improved economy.
Negative: Economic costs; habitat degradation and loss of biodiversity; negative health impacts

Source: CEGIS/Integra (2021d)

Figure 3-2: Example of cumulative impact linkage diagram: The Sundarbans case

As shown in **Figure 3-2**, the linkage diagram indicates that cumulative impacts from the proposed river dredging and water-diversion structures to increase river flow in the dry season and support flood control will be positive. They may also result in high economic costs and reduce the risk of flooding in flood-prone areas. The negative impacts may increase economic costs, degrade aquatic habitats, cause biodiversity loss, and raise public health concerns for local communities.

3) Scoring of the cumulative impact. This step involves calculating the cumulative impact score for the proposed programs, based on the preferred alternative, for each objective, using the Impact Matrix tool to assess impact across multiple dimensions. This can compare cases with enforcement and effective mitigation measures to cases without law enforcement and mitigation measures.

For the Sundarbans case, the cumulative impact analysis is divided into two cases: **Scenario 1**, in which there is no law enforcement and no impact mitigation measures, as shown in **Table 3-11**. The cumulative impact score across 9 sectors is -223, comprising -104 from the environmental aspect and -119 from the socio-economic aspect. The proposed plans with the most negative impacts or risks are water resources, forestry, fisheries, transport,

industry, energy, cities, tourism, and agriculture. As for the objectives of the 9 sectors, the first three negative cumulative impacts on the environment are reducing overuse/ habitat degradation. Loss of biodiversity and ecosystem integrity (-20), reduction of unsafe waste disposal (-14), reduction of all forms of pollution (-14), reduction of greenhouse gas emissions (-12), while the top three negative socio-economic impacts are: promoting significant and diverse economic development, increasing economic growth (-23), improving food security (-12), increasing agricultural and fisheries productivity (-11), creating new/improved employment and income opportunities (-11), and improving public health and well-being services (-10).

For **Scenario 2**, the availability of effective law enforcement and mitigation measures is shown in **Table 3-12**. The score of +322 derives from the environment (+111) and socio-economic (+211) domains. The most significant impacts are in water resources, energy, industry, cities, forestry, transportation, fisheries, tourism, and agriculture. Considering the objectives of the 9 sectors, the top three cumulative positive environmental impacts are: reducing overexploitation/habitat degradation, loss of biodiversity, and ecosystem integrity (+21); reducing all forms of pollution (+20); and reducing unsafe waste disposal (+17). Meanwhile, the top three cumulative positive socio-economic impacts are: promoting significant and diverse economic development; increasing economic growth (+32); improving food security (+19); increasing agricultural and fisheries productivity (+16); and creating new/improved employment opportunities and incomes (+16).

Table 3-11: Analysis and comparison of the cumulative impact of the proposed actions, divided according to objectives for the case without mitigation measures: The Sundarbans case

Environmental and socio-economic issues and objectives			Industry	Transport	Urban	Energy	Forestry	Fisheries	Water	Tourism	Agriculture	Total
Environmental aspect												
Forest, protected areas, and biodiversity	1	Reduce over-exploitation/degradation of habitats, loss of biodiversity, and ecosystem integrity and services	-3	-2	-1	-3	-3	-3	-3	-2	0	**-20**
	2	Reduce illegal activities related to protected areas and biodiversity	0	0	0	0	-3	-3	0	0	0	**-6**
	3	Reduce the introduction and spread of Invasive Alien Species	0	0	0	0	0	-3	0	0	-3	**-6**
Waste and pollution	4	Reduce poor management and unsafe disposal of solid and liquid waste (urban & industrial)	-3	-3	-3	-3	0	-2	0	0	0	**-14**
	5	Reduce all forms of pollution (air, land, water, noise, light, etc.)	-3	-3	-3	-3	0	-1	0	0	-1	**-14**
	6	Minimize emissions of greenhouse gases	-2	-2	-1	-3	-3	0	0	0	-1	**-12**
Climate change and disasters	7	Reduce vulnerability to climate change and natural disasters (salinity intrusion in rivers, floods, storm surges, etc.)	0	-2	-1	0	-2	0	-3	0	0	**-8**
Water	8	Increase dry season freshwater flow in rivers	0	0	0	-1	-1	0	-4	0	0	**-6**
	9	Reduce high/peak flows in rivers during the monsoon season	0	0	0	0	-1	0	-3	0	0	**-4**
Land degradation	10	Minimize loss of land due to degradation (e.g, erosion of riverbanks/water channels, soil salinity, soil erosion, etc.)	0	-1	0	0	-1	-3	-3	0	0	**-8**
Land use change	11	Minimize conversion of agricultural land (e.g., conversion to shrimp ponds)	-1	0	0	0	-1	-4	0	0	0	**-6**
		Cumulative score	**-12**	**-13**	**-9**	**-13**	**-15**	**-19**	**-16**	**-2**	**-5**	**-104**
Socio-Economic												
Economic growth	12	Ensure significant economic development and diversification, and an increase in economic growth	-2	-3	-3	-2	-1	-4	-4	-2	-2	**-23**
Employment	13	Enhance opportunities for employment and new/improved livelihoods (particularly for fisheries, agriculture, and eco-tourism)	-1	0	-1	-1	-1	-1	-4	-1	-1	**-11**
Health and sanitation	14	Improve health services and health of society (eg, by reducing vulnerability to diseases)	-1	-1	0	0	-3	0	-3	-2	0	**-10**
	15	Improve and extend water supply and sanitation services	-1	-1	-1	0	0	0	-3	0	0	**-6**

Environmental and socio-economic issues and objectives			Industry	Transport	Urban	Energy	Forestry	Fisheries	Water	Tourism	Agriculture	Total
Education, skills, and training	16	Improve access to education for all, increase attendance (by reducing drop-out rates), and improve skills development and training	0	-1	-1	0	0	0	0	-1	0	**-3**
Migration	17	Reduce migration from rural (disaster-prone and risk-prone) areas to urban areas	-2	0	-1	0	0	0	0	0	0	**-3**
Women and children	18	Improve gender equality and empowerment of women	-1	0	0	0	-1	0	0	-1	0	**-3**
Social inclusion	19	Increase the inclusion of landless and marginal landholders in development activities in the SW region	0	0	0	0	-2	0	0	0	0	**-2**
Conflicts and security	20	Reduce disputes over the use of land	-2	0	0	-2	0	-3	0	0	0	**-7**
Cultural and natural heritage sites	21	Preserve heritage sites (historic buildings, archaeological and cultural sites and enhance cultural diversity (eg, language, arts, etc.) and Sundarbans natural heritage sites	-1	0	0	-1	-3	0	-2	-2	0	**-9**
Food	22	Improve food security	-1	-1	0	-1	-1	-2	-4	0	-2	**-12**
Agriculture and fisheries	23	Increase agricultural and fish production	-1	-1	0	-1	-1	-1	-4	0	-2	**-11**
Power and energy	24	Increase uptake of renewable energy	0	0	-1	-1	0	0	0	0	0	**-2**
	25	Increase efficiency in the production and consumption of energy	0	0	0	0	-1	0	0	0	0	**-1**
	26	Increase access to affordable energy	0	0	0	0	-1	0	0	0	0	**-1**
Tourism	27	Improve tourism management and behavior to limit noise, pollution, and other negative impacts	0	-1	0	0	-2	0	0	-2	0	**-5**
Infrastructure, transportation, and communications	28	Improve the connection of communities, and improve access to infrastructure, services, and facilities	0	-2	0	-1	0	0	0	0	0	**-3**
	29	Optimize the existing and future physical footprint of transport services (rail, road, waterways)	0	-2	-1	-2	0	0	-2	0	0	**-7**
		Cumulative score	**-13**	**-13**	**-9**	**-12**	**-17**	**-11**	**-26**	**-11**	**-7**	**-119**
		Cumulative score in total	**-25**	**-26**	**-18**	**-25**	**-32**	**-30**	**-42**	**-13**	**-12**	**-223**

Source: Modified from CEGIS/ Integra (2021c)

Table 3-12: Cumulative impact analysis and comparison by sectoral objective: The Sundarbans case

Issue		Description	Industry	Transport	Urban	Energy	Forestry	Fisheries	Water	Tourism	Agriculture	Total
Environmental aspect												
Forests, protected areas, and biodiversity	1	Reduce overexploitation, habitat degradation, biodiversity loss, and ecosystem degradation	+4	+1	+1	+3	+4	+3	+4	+1	0	**+21**
	2	Reduce illegal activities in protected areas and biodiversity hotspots	+2	0	0	+2	+4	+4	0	0	0	**+12**
	3	Reduce the spread of invasive alien species	+1	0	0	+1	0	+2	0	0	+3	**+7**
Waste and pollution	4	Reduce unsafe waste management and disposal	+2	+3	+4	+4	0	+3	0	+1	0	**+17**
	5	Reduce all forms of pollution (air, soil, water, noise, light, etc.)	+3	+3	+3	+4	0	+1	+4	+1	+1	**+20**
	6	Reduce greenhouse gas emissions	+1	+2	+1	+2	+2	0	0	0	+1	**+9**
Climate change and natural disasters	7	Reduce vulnerability to climate change and natural hazards (e.g., saltwater intrusion, floods, storms)	0	+2	+1	0	+2	0	0	0	+3	**+8**
Water resources	8	Increase freshwater flow during the dry season	0	0	0	0	+1	0	+4	0	0	**+5**
	9	Reduce river flow extremes during the monsoon	0	0	0	0	+1	0	+3	0	0	**+4**
Land degradation	10	Reduce topsoil loss (e.g., erosion, salinization, land degradation)	0	+1	0	0	+1	+2	+3	0	0	**+7**
Land use change	11	Reduce agricultural land conversion (e.g., shrimp farms)	+1	0	0	0	0	0	0	0	0	**+1**
		Cumulative environmental score	**14**	**12**	**10**	**16**	**15**	**15**	**21**	**3**	**5**	**111**
Socio-economic												
Economic growth	12	Promote inclusive and significant economic development and growth	+4	+4	+4	+4	+2	+4	+4	+3	+3	**+32**
Employment	13	Increase employment and income opportunities (especially in fisheries, agriculture, and ecotourism)	+2	+2	+2	+1	+1	+2	+4	+2	0	**+16**
Health and sanitation	14	Improve health services and public well-being (e.g., reduced disease vulnerability)	+2	+1	+3	+1	+3	0	+3	+1	0	**+14**
Water supply and sanitation systems	15	Improve and expand water supply and sanitation services	+2	+1	+3	+1	0	0	+4	0	0	**+11**

Issue		Description	Industry	Transport	Urban	Energy	Forestry	Fisheries	Water	Tourism	Agriculture	Total
Education and skills development	16	Improve access to education and skill development	+1	+1	+3	+1	+1	+1	0	+2	+1	**+11**
Migration and displacement	17	Reduce rural outmigration (especially from vulnerable and disaster-prone areas)	+3	0	+3	0	0	0	0	0	0	**+6**
Women and children	18	Promote gender equality and empower women	+3	0	0	0	+1	0	0	+2	0	**+6**
Social inclusive	19	Increase the participation of smallholders and landless in development activities	+2	0	+2	+1	+2	0	0	0	0	**+7**
Conflicts and security	20	Reduce land use conflicts	+2	0	0	+2	0	+3	0	0	0	**+7**
Natural and cultural heritage	21	Conserve cultural and natural heritage (e.g., historical buildings, archaeological sites, Sundarbans World Heritage Site)	+1	0	+2	+1	+3	0	+3	+3	0	**+13**
Food security	22	Improve food security	+2	+2	+1	+1	+1	+4	+4	+1	+3	**+19**
Agriculture and fisheries	23	Increase agricultural and fisheries productivity	+1	+1	0	+1	+2	+4	+4	0	+3	**+16**
Energy	24	Increase the use of renewable energy	+1	0	+3	+3	+2	0	0	0	0	**+7**
	25	Improve efficiency in energy production and use	+2	+1	+2	+2	0	0	0	0	+3	**+10**
	26	Increase access to affordable energy	+2	0	+2	+4	1	0	0	0	0	**+9**
Tourism	27	Improve tourism management and practices to reduce pollution and negative impacts	0	+1	0	0	+3	0	0	+3	0	**+7**
Infrastructure, transport, and communication	28	Enhance community connectivity and access to infrastructure, services, and amenities	0	+3	+2	+3	0	0	0	0	0	**+8**
	29	Improve current and future efficiency of transport infrastructure (e.g., rail, roads, waterways)	0	+4	+2	+4	0	0	+2	0	0	**+12**
		Cumulative socio-economic score	**30**	**21**	**34**	**32**	**21**	**18**	**28**	**17**	**10**	**211**
		Total score (all categories)	**44**	**33**	**44**	**48**	**36**	**33**	**49**	**20**	**15**	**322**

Source: Modified from CEGIS/ Integra (2021c)

3.3 Formulation of measures for sustainability

Sustainability measures are strategic initiatives derived from the assessment of the preferred alternative, designed to enhance positive impacts and to avoid, reduce, or compensate for adverse impacts arising from proposed programs, thereby supporting the long-term conservation and sustainable development of the Natural World Heritage Site. These measures are formulated based on the impact assessment of the preferred alternative and are intended to be integrated into the formulation of SEMP, as outlined below.

3.3.1 Enhancement measures for positive impacts. These measures are guidelines or methods that will enhance and develop the results of preferred alternatives to create greater benefits, for example, by creating new habitats for animals.

3.3.2 Mitigation measures for negative impacts. It is a change in approach or action taken by other methods to avoid negative impacts from the implementation of preferred alternatives. The mitigation measures should reduce the adverse effects to the lowest possible level (As Low As Reasonably Practicable Level: ALARP Level). Such measures come in various forms with different levels of implementation called the mitigation hierarchy, consisting of three forms as follows:

1) **Avoidance:** The most effective form of mitigation, involving the elimination of potential impacts by altering or cancelling the proposed actions, and, for example, prohibiting development in ecologically sensitive or vulnerable areas.

2) **Reduction:** This is to mitigate impacts where they cannot be avoided, such as measures to develop or improve transportation routes through Natural World Heritage Sites in a manner that does not disrupt wildlife movement, such as wildlife tunnels or corridors.

3) **Compensation:** It is a measure that, if it cannot be avoided and reduced, then compensation shall be provided. For example, in the case of climate change, compensation measures include purchasing carbon credits because greenhouse gas emissions cannot be avoided. Compensation measures include planting forests in other areas to offset reductions in greenhouse gas emissions.

To develop these sustainability measures, the SEA team should prepare a preliminary draft and present it to the relevant agencies for feedback and recommendations, as these measures may apply to those agencies' future operations. Once conclusions have been reached and improvements have been made, stakeholders should be encouraged to understand and receive recommendations from various sectors to determine appropriate measures for future implementation.

The Sundarbans case has identified measures for sustainability for key development activities for the period 2021-2041 across sectors such as industry, transport, urban development, energy, and power generation, as shown in **Table 3-13.**

Table 3-13: Measures for sustainability for key sector development: The Sundarbans case

Sectors	Key activities	Impacts requiring interventions	Recommended avoidance or mitigation measures
Industry	Rapidly expanding industrialisation	Increased use of agrochemicals	- Providing information, training, and extension support on the appropriate use of agrochemicals - Enhancing the application of tailor-made fertilizer based on soil testing, supporting environment-friendly and organic products - Enhancing the use of bio-fertilizer - Enhancing conservation agriculture where possible - If use of artificial chemicals is unavoidable, ensure correct use, storage, and disposal, as per manufacturers' recommendations /research-based findings
		Air, water, noise, and soil pollution during construction and operations	- Ensuring new developments conform to the National Pollution Standards - Ensuring industries in new economic zones adopt technologies with minimum emissions of NOx and no emissions of SOx - Wastes should be sorted at source and disposed of in accordance with applicable laws, standards, and guidelines - Applying or installing best available technology (bearing in mind affordability) to minimize pollution
		Increased waste and e-waste	
Transport	Expansion and/ or improvement of road and railway networks	Accidents and inconvenience to road users during construction	- Appropriate safeguards must be in place to avoid or minimize ribbon development, particularly to prevent the establishment of informal settlements or businesses within the registered public spaces - Adequate road signage (e.g., speed limits, no-overtaking zones, curves, etc.) must be provided. - Speed control measures must be in place (e.g., speed bumps, traffic enforcement, speed cameras, etc.)
		Accidents due to increased traffic volume and faster driving on better road conditions	
		Air, noise, particulates, and soil pollution are generated during construction, including greenhouse gas (GHG) emissions from vehicles	- Enforcing vehicle emission standards and imposing penalties for older vehicles (such as additional license renewal fees) - Conducting regular vehicle roadworthiness inspections - Promoting the use of unleaded and low-sulfur fuels
		Flooding in specific areas is draining the roads	- Careful locating roads and railways, avoiding areas prone to flooding, or if unavoidable, designing them to minimize the impact of flooding - Designing appropriate infrastructure (e.g., drains and bridges) to prevent water retention

Sectors	Key activities	Impacts requiring interventions	Recommended avoidance or mitigation measures
			- Managing waste properly, as drains and stormwater drains are often clogged with garbage, leading to flooding - Maintaining adequate vegetation in watersheds (to reduce surface runoff) - Improved planning and enforcement to prevent people from settling in flood-prone areas - Developing early warning systems to give people time to plan adaptation or evacuation measures
		Land use	The project shall be located in vacant land-use areas previously used for commercial or industrial purposes (brownfield sites) or in existing service areas (existing servitudes), to the extent possible
		Pollution from leaks in and around construction areas	The projects must prepare an approved site management plan covering leakage control measures
	Improving, maintaining, and restoring the water transport network	Increased pollution, waste, noise, and greenhouse gas (GHG) emissions	- Implementation must be conducted in accordance with the established national standards - Ships and piers must be adequately maintained and equipped with equipment to reduce all forms of pollution - Waste (both on board and on land) must be managed at source and disposed of in accordance with applicable laws, standards, and guidelines - Use or implement the best available technology (taking into account cost-effectiveness) to reduce pollution
		Oil spills, cargo ship/ocean liner accidents, and management	- Must have an approved oil spill and accident management plan - Implementing the National Oil Spill and Chemical Contingency Plan (NOSCOP)
		Increased riverbank erosion	- All boat operators must follow good practices, such as controlling speed to prevent excessive noise and waves
		Habitat degradation and loss of biodiversity	- Avoid building infrastructure in areas of high biodiversity importance (e.g., Sundarbans Reserve Forests) and, wherever possible, use Brownfield Sites
Urban	Expansion and modernisation of cities and towns	Pollution (air, water, noise, dust, and soil) and GHG during construction and ongoing	See “Industry”
		Increased volume of waste	

Sectors	Key activities	Impacts requiring interventions	Recommended avoidance or mitigation measures
		Increase demand for potable water	
		Land take and conversion	- Locating projects in brownfield sites or existing servitudes wherever possible
		Increased pressure on urban infrastructure and services	- Ensuring ethical town planning so that inhabitants derive maximum benefits from modernization initiatives, including (but not limited to) - Improved access to utilities such as roads, transport systems, shops, schools, green spaces, etc. - Set up locally accessible health and law-enforcement services - Good waste management - Improve the construction and design of houses and infrastructure - Adopt Low Impact Development (LID) concepts in town planning
		Increased traffic and congestion	
		Increase in crime associated with the city environment	- See above regarding ethical town planning - Maximizing community involvement in crime prevention and promoting cooperation between citizens and police
		More cash spent on social ills	- Education regarding the dangers of inappropriate behavior, including STDs - Using community structures to sensitize communities - Providing adequate policing in areas where such behavior is experienced
Power and energy	New or upgrading of power plants and transmission lines	Air, water, noise, dust, and soil pollution are associated with GHG emissions from construction and operation	See “Industry”
		Generation of waste, including e-waste	
		Land take	
		Electromagnetic radiation and (if nuclear) radiation leakages	- Locating power plants as far as possible from inhabited areas - Ensuring the use of the best available technology
		Bird collisions with power lines	- Aligning for powerlines should avoid wetlands and other important bird habitats - Incorporating ‘bird flappers’ (diurnal and nocturnal designs) to increase power line visibility, especially at river crossings or known pathways

Sectors	Key activities	Impacts requiring interventions	Recommended avoidance or mitigation measures
	Technology investment for increased energy efficiency	Air, water, noise, dust, soil pollution, and GHG emissions	See “industry”
		Habitat degradation, biodiversity loss, and ecosystem service loss	Avoid establishing infrastructure in areas of high biodiversity importance (e.g., Protected Areas, Sundarbans Reserved Forests, etc.) – select brownfield sites where possible
		More cash spent on social ills	See “Urban”
Forestry	Conservation of the Sundarbans forests	Reduced livelihood opportunities and increased demand for the Sundarbans' resources	- Ensuring the affected communities are adequately consulted during planning and raising awareness about the importance of conservation and the creation of sustainable alternative livelihood opportunities - Appointing forest officers to enforce laws and rules, assisted by community structures. - Establishing rules to minimize the use of wildlife or wildlife parts as an ingredient for feed/use, and to minimize poaching (these rules must be well publicized, understandable, and accessible)
		Increased external demand for illegal wildlife products	
Fisheries	Increased shrimp and fish production (capture and cultured)	Conversion of agricultural land and reduced agricultural production	- Case-by-case assessment needed to determine whether the conversion is beneficial (economically and socially) or not for communities or households, and then plan according to assessment results. Ensure affected people are part of the assessment - Avoiding, where possible, the conversion of land zoned for agriculture
		Increased salinisation	- Preventing further expansion of shrimp farming and particularly illegal admission of saline water into the ponds - Limiting shrimp farming to designated areas - Enhancing use of salt-tolerant rice varieties
		Increased feed, fertiliser, and antibiotic use	See “Industry” regarding agrochemicals
		Increase GHG	See “Industry”
		Elite domination	- Case-by-case assessment needed to determine whether the project is locally owned or whether elite capture is likely, and then plan according to assessment results. Ensure affected people are part of the assessment - Depending on trends, it might be necessary to introduce new laws or regulations to prevent elite capture
		More cash spent on social ills	See “Urban”

Sectors	Key activities	Impacts requiring interventions	Recommended avoidance or mitigation measures
Water	Dredging of rivers and construction of diversion structures (to enhance dry season flow and control floods)	Pollution of land and water from the dumping of dredging materials	- Identifying brownfield areas on land where dredge materials can be dumped. - Avoiding the dumping of dredging materials into the open water (to avoid increasing sediments and to conserve the benthic community) - Avoiding the dumping of dredging material on the forest ground
		Altered hydrodynamics because of changed bottom and benthic profiles from dredging and construction	- Understanding baseline profiles before dredging. - Establishing the risk of adverse changes before going ahead
		Turbidity, noise, and fumes during dredging and construction	- Using equipment and vessels that have adequate noise minimization. - Installing pollution abatement and reduction - Consulting with nearby communities to find ways of minimizing - Arranging a suitable dredging time that does not disturb the communities. (e.g., time of day that dredging will take place)
		Disruption of shipping and trade during dredging	- Consulting with river transport stakeholders to find ways of minimizing inconveniences for them, e.g., time of day or time of the year that dredging will take place
		More cash spent on social ills	See “Urban”

Tourism	Development of eco-tourism inside the Sundarbans	Pollution from water vessels	- For all protected areas, visitor numbers should be within the carrying capacity to minimize impacts
			- Adhering to conditions and requirements as set out in the Sundarbans Management Plan, especially ensuring all boat operators adhere to the code of conduct – e.g.
			  - No speeding (boats) to avoid excess noise, bow waves, collisions with dolphins
			  - No noisy tourists
			  - No discharge of waste or pollution
			  - Boat engines are regularly serviced to minimize fuel leakages, noise, exhaust emissions, etc.
			  - Maintain a distance from wildlife (to avoid stressing the animals)
			  - Avoid known wildlife breeding areas

		Pollution from noise, general litter, and sewerage	
		Inappropriate tourist behavior and social interactions by foreign visitors	
		Elite domination	Promote local ownership and servicing of the tourism industry
		Leakage of revenue	- Online revenue payment system for a locally registered company - Promote buying local for as many services and products as possible

Sectors	Key activities	Impacts requiring interventions	Recommended avoidance or mitigation measures
		More cash spent on social ills	See “Urban”

	Diversified tourism activities outside the Sundarbans	Pollution from road and water transport	- Requiring tourist operators to use low-polluting vehicles
			- Ensuring enforcement of tourism guidelines for tourists, tour operators, and the tour management authority - to ensure tourists behave appropriately
			- Penalizing physical damage to the cultural sites caused by tourism
			- Ensure all vehicle and boat operators adhere to a reasonable code of conduct – e.g.:
			  - No speeding (boats) to avoid excess noise
			  - No noisy tourists (especially in sacred sites)
			  - No damage to historical or natural sites
			  - No littering
			  - No inappropriate interaction with locals (use local tour guides as much as possible)

		Inappropriate tourist behavior and social interactions by foreign visitors	
		Physical damage to cultural sites	
Agriculture	Industrialisation of agriculture and increased production	Elite domination	- Case-by-case assessment needed to determine whether the project is locally owned or whether elite capture is likely, and then plan according to assessment results. Ensure affected people are part of the assessment - Depending on trends, it might be necessary to introduce new laws or regulations to prevent elite capture
		Increased use of agrochemicals	- Enhancing the application of tailor-made (including bio) fertilizer based on soil testing, favoring environment-friendly and organic products - Enhancing conservation agriculture where possible - If use of artificial chemicals is unavoidable, ensure correct use, storage, and disposal, as per the manufacturer's recommendations - Preventing the use of agrochemicals, pesticides, or poisons (supposedly purchased for agriculture) to kill or capture fish
		Increased water use for irrigation	Developing a strategy for irrigated crop production to address the risk of over-abstraction
		Arsenic contamination of crops through irrigation	Introducing an arsenic investigation program for irrigation water and rice to ensure health standards are not breached
		Increased GHG	- Increasing the use of renewables like solar and wind - Increasing energy efficiency in both production and consumption of energy
		More cash spent on social ills	See “Urban”

3.4 Preparation of the SEA Report and integration into planning instruments

Report preparation consists of the SEA Report, the Strategic Environmental Management Plan (SEMP) for Natural World Heritage Sites, and the Natural World Heritage Management Plan (NWHMP). The results of the SEA, particularly the sustainability measures, will inform the development of the SEMP and NWHMP. The results of both SEMP and NWHMP can be used to create a World Heritage-related action plan that includes programs, projects, activities, and monitoring and evaluation measures, along with the responsible agencies, timeframes, and budgets for further implementation.

3.4.1 Preparation of the SEA Report

Preparation of the SEA Report involves compiling and summarizing the content of the entire process. This should include: 1) introduction, which should focus the rationale, SEA objectives of SEA implementation, study area, and limitations of SEA implementation; 2) methodology; 3) setting the context and scoping; 4) participation; 5) development and assessment of alternatives; 6) initial assessment; 7) impact assessment of the preferred alternative; 8) measures for sustainability; 9) relevant plan preparation; 10) monitoring and evaluation; and 11) conclusion and recommendations. An example of the SEA Report outline for the Sundarbans case is shown in **Text Box 3-8.**

Text Box 3-8: Outline of the SEA Report: The Sundarbans case

Executive summary
Preface
Table of contents – List of figures – List of tables
Abbreviations
Glossary of Terms
Chapter 1: Introduction
- 1.1 Rationale
- 1.2 Objectives of SEA implementation
- 1.3 Study area – Natural World Heritage Site
- 1.4 Limitations of SEA implementation

Chapter 2: Methodology
- 2.1 SEA Process
  - 2.1.1 Setting the context and scoping
  - 2.1.2 Development of alternatives
  - 2.1.3 Initial and deeper alternative assessment
- 2.2 Public participation
- 2.3 Preparation of related plans
  - 2.3.1 Strategic Environmental Management Plan and Action Plan
  - 2.3.2 Natural World Heritage Management Plan and Action Plan

Chapter 3: Setting the context and scoping
- 3.1 Review of relevant policy, plan, and programs
- 3.2 Identification of key issues and thematic baseline paper
  - 3.2.1 Key issue of the environment

3.2.2 Key issues of socio-economic
3.2.3 Transboundary issues
3.2.4 Mega projects
3.2.5 Preparation of thematic baseline data
3.2.6 Modeling for analysis (If have)
3.3 Delineation of the study area
3.4 Formulation of vision
3.5 Analysis of stakeholders and preparation of the communication and participation plan
3.6 Preliminary stakeholder identification
3.7 Institutional structure and mechanisms
Chapter 4: Participation
Chapter 5: Development and assessment of alternatives
5.1 Identification of development alternatives
5.2 Description and alternative/scenario
Chapter 6: Initial assessment
6.1 Forecasting the impact of the alternative
6.2 Comparison of the impact of alternatives
6.3 Analysis of the preferred alternative
Chapter 7: Impact assessment of the preferred alternative
7.1 Impact assessment of the sector
7.2 Identification of key impacts
7.2.1 Environmental impact
7.2.2 Socio-economic impact
Chapter 8: Formulation of measures for sustainability
8.1 Enhancement for positive impact
8.2 Mitigation measures for negative impact
Chapter 9: Preparation of plans
9.1 Preparation of Strategic Environmental Management Plan
9.2 Preparation of Natural World Heritage Management Plan
Chapter 10: Monitoring and evaluation
10.1 Monitoring
10.2 Evaluation
Chapter 11: Conclusions and recommendations
References
Appendices

Source: CEGIS/Integra (2021d)

3.4.2 Preparation of the Strategic Environmental Management Plan

The Strategic Environmental Management Plan (SEMP) for Natural World Heritage Sites provides a comprehensive framework for managing the cumulative impacts of proposed plans. It gives recommendations for the sustainable management of relevant plans. This includes developing or updating action plans/projects, along with a monitoring and evaluation framework that outlines the responsible agencies for the proposed plans, their methods, timeframes, and budgets.

Additionally, the SEMP outlines recommendations for ongoing research and monitoring, which are essential for tracking changes in critical issues that may lead to negative impacts. It also emphasises that currently minor or low-level impacts could intensify over time due to cumulative trends, underscoring the need for systematic follow-up, monitoring, and evaluation of SEMP implementation.

SEMP is linked to SEA and EIA as follows: SEA is a strategic environmental assessment. The result is an overall vision, along with the plan's goals and context. Specifically, the results of SEA are used to develop a SEMP, an overall management framework, along with goals and indicators, which will lead to the implementation of various measures for sustainability. This may be implemented as a project, requiring a feasibility study covering engineering, economics, the environment, and society. The environmental analysis will include an Environmental Impact Assessment (EIA).

In the Sundarbans case, the SEMP can serve as a strategic management model for sectoral development plans, such as transportation and communications, water resources, forestry, and industry, as illustrated in **Table 3-14.**

Table 3-14: Illustrative example of strategic management for impact mitigation of key sector development in the Sundarbans case

Sectors	Major concerns and issues	Management strategies
1. Transportation and communications	- Air pollution, particularly from increasing road transport - Water pollution from boats and ships	- Conversion to green vehicle fleet (i.e., electric and hybrid cars/lorries) - Improve rules, regulations, and operating guidelines for vessels, including monitoring and enforcement
2. Water resources	- Low dry season freshwater flow in distributary rivers - Freshwater flooding and waterlogging following excessive rainfall in the wet season (mainly in upstream areas)	- Dredging of rivers to enhance dry-season flow through the Sundarbans - Dredging of the Sundarbans' silted-up channels to ensure regular inundation of the forest floor - Construction of diversion structures to augment dry season flow and control flooding - Improvements to drainage network/system infrastructure and management
3. Forestry	- Loss of biodiversity - Degradation of mangrove and riverine habitats - Loss of ecosystem services - Habitat isolation	- Revise Sundarbans Integrated Management Plan to address findings of the SEA and incorporate relevant recommendations of SEMP (include use of modern technology to counter illegal activities, e.g., poaching, poison fishing, etc.) - Fully and effectively implement management plans for the three wildlife sanctuaries (including WHS) - Establish an Inter-Ministerial Coordination Committee for Management of the Sundarbans

Sectors	Major concerns and issues	Management strategies
		- Control of air, water, noise, and light pollution due to increased ship movement through the Sundarbans, including the unloading points (e.g., Harbaria) - Ban night movement of all ships through the Sundarbans
4. Industry	- Air pollution (PM and NOx, and most particularly in the Mongla area), and water pollution - Emission of CO2 - Conversion of agricultural land for industrial development	- Pollution standards should be reviewed and tightened, where necessary, to improve towards the WHO standards

Source: Modified from CEGIS/ Integra (2021e)

A Strategic Environmental Management Plan for a Natural World Heritage Site should include 1) introduction, 2) results of SEA, 3) SEMP methodology, 4) SEMP implementation, and 5) monitoring and evaluation. An example of an SEMP outline for the Sundarbans case is shown in **Text Box 3-9.**

Text Box 3-9: Outline of SEMP: The Sundarbans case

Executive summary
Preface
Table of contents – List of figures – List of tables
Abbreviations
Glossary of Terms
Chapter 1: Introduction
1.1 Rationale of SEMP development
1.2 Objectives of SEMP
Chapter 2: Results of SEA
Chapter 3: Methodology for developing SEMP
Chapter 4: Implementation of SEMP
4.1 Institutional arrangements
4.2 Linkage of SEA and SEMP to the EIA of the project
4.3 Strategic Environmental Management Plan
Chapter 5: Monitoring and evaluation plan
5.1 Monitoring
5.2 Evaluation
References
Appendices

Source: CEGIS/Integra (2021e)

3.4.3 Preparation of the Natural World Heritage Management Plan

The Natural World Heritage Management Plan (NWHMP) was developed by considering SEA results to assess the cumulative impacts of existing and proposed plans within the Natural World Heritage site, and it identifies the preferred alternative and measures to manage these impacts sustainably. These can be used to make recommendations for the development or improvement of the proposed plans, development activities/ projects, and management within the Natural World Heritage area, and to develop a monitoring and evaluation plan, including an action plan outlining the responsible agencies, methods, timeframes, and budgets. Additionally, the NWHMP includes a framework for monitoring and evaluation.

The structure of the NWHMP report is similar to that of the SEMP. It consists of 1) introduction (consisting of 1.1 rationale of NWHMP development, 1.2 objectives of NWHMP); 2) results of SEA preparation, 3) methodology of NWHMP, 4) implementation of NWHMP (4.1 institutional arrangements, 4.2 linkage of SEA and NWHMP to EIA of project, and 4.3 Natural World Heritage Management Plan); and 5) monitoring and evaluation.

In addition, details of NWHMP depend on the law, the regulatory authority, the plan-owning agencies' roles, duties, and actions.

3.5 Monitoring and evaluation

Monitoring shall focus on safeguarding the OUV, integrity, and long-term resilience of the property, particularly through tracking changes in attributes and cumulative pressures arising from plan implementation. This stage constitutes a follow-up process for implementing the relevant plan, consisting of monitoring and evaluating the plan developed through the SEA process (Partidario, 2012). This process determines whether the activities and measures derived from the SEA have been effectively implemented and whether they contribute to achieving the plan’s objectives. Monitoring focuses in particular on changes to OUV, its key attributes, and cumulative impacts arising from plan implementation. In this regard, monitoring and evaluation also serve as a mechanism to assess the effectiveness of SEA in influencing planning decisions and improving environmental governance outcomes.

Monitoring will be carried out for the indicators identified by the ESQOs, based on the determined LAC values. Monitoring should be developed into a monitoring plan that includes objectives, indicators, analytical methods, measurement or sampling areas or sites, responsible agencies, monitoring frequency, and LAC value. In addition to LAC values, it should define corrective, rehabilitative, or mitigative actions if measured values exceed the LAC value. For developing the details of the monitoring plan, it is appropriate to consider the plan's context, which

can be adjusted (on a case-by-case basis), and to specify the frequency of reporting the monitoring results.

Evaluation is essential to determine whether the plan's implementation has achieved its objectives. Key questions that will assist in evaluating the plan's effectiveness and the influence of SEA on plan development include:

(1) The validity of the concepts and methods (including assumptions, if any) used in the SEA implementation.

(2) The influence of SEA on the planning process.

(3) The process for implementing the action plan, including the programs, projects/ activities, and implementation methods, responsible agencies, budgets, and timeframes.

(4) The implementation can contribute to the Sustainable Development Goals and transparency.

(5) The economic, social, and environmental outcomes of the projects/ activities implemented in the action plan.

(6) Recommendations for improvement and revision in future steps.

The plan owner should conduct the evaluation, possibly in collaboration with relevant agencies, or may perform it independently through a third-party review. The evaluation format and methods will primarily depend on the plan owner.

3.6 Conclusion

Preparation of SEA for Natural World Heritage in the Thai context consists of 5 main steps: Stage 1: setting the context and scoping; Stage 2: developing and assessing the alternatives; Stage 3: formulating measures for sustainability; Stage 4: preparing the SEA Report and plans; and Stage 5: monitoring and evaluation. Each stage consists of the following sub-stages:

Stage 1: Setting the context and scoping. This stage includes: (1) reviewing relevant policies, plans, and programs; (2) identifying key issues and developing thematic baseline data; (3) identifying study areas; (4) identifying plans for SEA; (5) establishing the vision for the plan; (6) stakeholder analysis and development of a communication and participation plan; and (7) report preparation.

Stage 2: Developing and assessing the alternatives. Initial assessment of alternatives and impact assessment of alternatives are performed by (1) development of alternatives, which involves identifying feasible alternatives in detail, involving relevant agencies and consulting with stakeholders; and (2) initial assessment of alternatives: analysing the feasible alternatives

achieving ESQO. (3) deeper assessment, assessing impacts of the preferred alternative on the sectors that meet ESQO.

Stage 3: Formulating measures for sustainability. This stage is undertaken after assessing the potential impacts of the preferred alternative. Sustainability measures include actions to enhance positive impacts and mitigate or reduce adverse consequences, including avoidance, mitigation, and compensation.

Stage 4: Preparing the SEA Report and plans. This includes the Strategic Environmental Assessment (SEA) report, the Strategic Environmental Management Plan (SEMP) for Natural World Heritage Sites, and the Natural World Heritage Management Plan (NWHMP).

Stage 5: Monitoring and evaluation: This examines the implementation of SEA-based plans to ensure they are operational and successful.

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