

COMPONENT 2

INTEGRATION OF NATURAL CAPITAL ACCOUNTS INTO LOCAL DEVELOPMENT PLANNING AND OPERATIONS



THE INTEGRATION OF NATURAL CAPITAL ACCOUNTING IN PUBLIC AND PRIVATE
SECTOR POLICY AND DECISION-MAKING FOR SUSTAINABLE LANDSCAPES

NATURAL
CAPITAL

Funded by



Executing Agencies



INTEGRATION OF NATURAL CAPITAL ACCOUNTING INTO LOCAL DEVELOPMENT PLANNING AND OPERATIONS

OUTPUT 2.2.4

PROMOTE THE ADOPTION OF SEA
IN THE PREPARATION OF
MUNICIPAL/DISTRICT SPATIAL
DEVELOPMENT PLANS IN KRABI
PROVINCE

OUTPUT 2.2.5

ASSIST IN THE DEVELOPMENT
AND TESTING OF EIA-BASED
TOOLS FOR ASSESSING FINANCIAL
IMPACTS OF PROPOSED
DEVELOPMENTS ON NC

Author

Rapee Pholpanich, National Institute of Development Administration (NIDA)

Adis Israngkura, Thailand Development Research Institute (TDRI)

Thippawan Keawmesri, Thailand Development Research Institute (TDRI)

Acknowledgement

This report was prepared under the overall guidance and support of the Office of Natural Resources and Environmental Policy and Planning (ONEP). We would like to express our sincere appreciation to Waste Water Control and Treatment Section, Division of Public Health and Environment, Ao Nang Subdistrict Administrative Organization (Ao Nang SAO), Krabi Province and Krabi Wastewater Management Office, Wastewater Management Authority (WMA) their constructive suggestions and valuable participation throughout the preparation of this report.

Contents

Acknowledgement.....	i
Executive Summary	v
1. Strategic Environmental Assessment (SEA)	1
1.1 Introduction.....	1
1.2 Wastewater Management Plan according to SEA Recommendations.....	2
2. Environmental Impact Assessment (EIA).....	3
2.1 Introduction.....	3
2.2 Wastewater Management Plan according to EIA Recommendations	4
References.....	6

Executive Summary

Thailand uses a Strategic Environmental Assessment (SEA) system alongside EIA. Environmental Impact Assessment (EIA) has evolved to include environmental-economic considerations. Together, these two systems cover both project-level assessment, focused on preventing and reducing direct impacts and strategic-level planning, which looks at cumulative impacts and guides the overall direction of development.

Tourism is the primary economic activity in Ao Nang Sub-district, Mueang Krabi District, Krabi Province yet it is also generating significant environmental pressures, particularly in relation to wastewater and solid waste. The following recommendations are proposed for developing a wastewater management plan in alignment with SEA principles are as follows: (1) Plan tourism development and land use in accordance with the area's carrying capacity by setting limits on tourist numbers, entrepreneur numbers and wastewater volumes to prevent environmental overload; (2) Use baseline data to establish clear sustainability indicators, including population, wastewater, solid waste, and treatment system capacity; (3) Ensure that environmental dimensions are incorporated into the assessment of wastewater and solid waste solutions through cost-benefit analysis to compare alternatives; (4) Establish an independent committee to oversee the SEA planning process and eliminate conflicts of interest; and (5) Adopt a co-governance decentralization model, where the central government sets standards and provides budgetary support while local bodies carry out implementation and oversee operations on the ground.

Over the past decade, Environmental Impact Assessment (EIA) has evolved to include environmental-economic considerations, particularly for water resource development projects. By assigning the requirement of valuation over the affected environmental assets. This reflects a growing recognition that natural resources have real economic worth, even when they are not priced in the market. As a result, environmental valuation has become an important tool for informing policy decisions and approving major development projects.

At the provincial level, and in the case of Ao Nang Sub-district, Mueang Krabi District, Krabi Province specifically, the EIA system operates through a decentralization arrangement in which authority has been delegated from the central ONEP office to the Krabi Provincial Office of Natural Resources and Environment (ERC). A provincial-level ERC serves as the review mechanism, but only for building, land allocation, and community service projects reflecting the presence of an environmentally protected area covering Ao Luek, Mueang Krabi, Nuea Khlong, Khlong Thom, and Ko Lanta districts.

Recommendations for developing a wastewater management plan aligned with EIA principles are as follows: (1) Strengthen the legal and enforcement of laws against legally licensed operators and regulation of unlicensed businesses through municipal ordinances to control wastewater sources, with a greater role for local administrative organizations in enforcing regulations and seriously addressing unlicensed operations; (2) Establish baseline data for impact assessment, including population figures, wastewater volumes, tourist numbers, tourism revenue, water quality, and ecosystem conditions all of which form the essential foundation for environmental valuation; (3) Conduct environmental valuation using methods as suggested; (4) Integrate social costs and social benefits into project decision-making; and (5) Invest in wastewater collection and

treatment infrastructure while simultaneously building the capacity of local administrative organizations in both personnel and technology. This involves integrated operations between various agencies such as local administrative organizations, local government agencies, state enterprises, and the private sector, using the provincial governor's mechanism to drive and connect them.

1. Strategic Environmental Assessment (SEA)

1.1 Introduction

Strategic Environmental Assessment (SEA) is a planning and decision-support tool that integrates environmental, social, and economic considerations into the development of policies, plans, and programs before specific projects are implemented. Unlike Environmental Impact Assessment (EIA), which focuses on individual projects, SEA operates at a broader strategic level to guide sustainable development and ensure that environmental concerns are addressed early in the decision-making process. SEA helps decision-makers evaluate alternative development pathways and select options that best balance economic growth, social well-being, and environmental protection.

In Thailand, SEA has been promoted as an important mechanism for sustainable development planning, particularly for large-scale policies, sectoral strategies, and area-based development initiatives. According to the Strategic Environmental Assessment Guidelines developed by the National Economic and Social Development Council (NESDC), SEA provides a systematic framework for assessing the long-term and cumulative effects of development activities that may not be adequately addressed through project-level assessments alone. By considering environmental issues at the earliest stages of planning, SEA can help prevent environmental conflicts, reduce future risks, and improve the effectiveness of development decisions.

The SEA process consists of five key stages: screening, scoping, developing and assessing alternatives, formulating sustainability measures, and public participation. Screening determines whether a policy, plan, or program requires SEA. Scoping identifies key strategic issues, defines sustainability objectives, and establishes relevant indicators. The development and assessment of alternatives involve comparing different development scenarios, including a “no-action” alternative, to evaluate potential environmental, social, and economic consequences. Sustainability measures are formulated to minimize adverse impacts and enhance positive outcomes, while comprehensive public participation ensures transparency and stakeholder engagement throughout the process.

A distinguishing feature of SEA is its emphasis on evaluating cumulative and long-term impacts across a wider geographic and policy context. It provides an opportunity to incorporate concepts such as carrying capacity, natural capital, ecosystem services, and environmental economics into development planning. Cost-benefit analysis and environmental valuation methods can be applied to compare alternatives and identify development options that maximize social benefits while minimizing environmental degradation. This allows policymakers to make more informed decisions based on both economic performance and environmental sustainability.

SEA has been applied in Thailand to various strategic initiatives, including regional spatial planning, energy development planning, conservation area management, and transportation studies. As environmental challenges become increasingly complex, SEA plays a critical role in ensuring that development policies and plans align with sustainable development goals. By integrating environmental considerations into strategic decision-

making, SEA supports balanced growth, protects natural capital and ecosystem services and promotes the long-term well-being of communities and the environment.

1.2 Wastewater Management Plan according to SEA Recommendations

Tourism is the primary economic activity in Ao Nang Sub-district, Mueang Krabi District yet it is also generating significant environmental pressures, particularly in relation to wastewater and solid waste. The following recommendations are proposed for developing a wastewater management plan in alignment with SEA principles:

1) Addressing the wastewater situation in Ao Nang, which is directly affecting both the tourism sector and marine ecosystems. Untreated or insufficiently treated wastewater is flowing into the sea along Ao Nang Beach, particularly during the high season while the existing local treatment system cannot handle total wastewater volumes. The result is landscape degradation and odor problems that directly damage the area's tourism image. There is therefore a clear need for wastewater treatment planning that is aligned with the carrying capacity of Ao Nang. This involves setting limits on tourist numbers, entrepreneur numbers and wastewater volumes to ensure that the treatment system does not fail under peak visitor loads. This aligns with the application of SEA principles as an integrated component of district or provincial spatial development planning corresponding to the Screening stage of the SEA process, which identifies policies, plans, or projects with potentially significant impacts.

2) Establishing a baseline data foundation for the design of policies, plans, or projects. Essential data for Ao Nang Sub-district should include population figures, per capita wastewater generation rates, per capita solid waste generation rates, wastewater and waste sources, treatment system capacity, and coverage of the centralized wastewater system. This data enables an understanding of the local context, an analysis of the problem situation, its causes, the area's potential, and the needs of stakeholders including analysis from provincial-level Natural Capital Accounting to inform wastewater management strategies. This corresponds to the Scoping stage of SEA, which defines strategic issues and sustainability indicators.

3) Ensuring that environmental dimensions are incorporated into the assessment of wastewater and solid waste solutions, for example by including the cost of restoring natural water bodies through phytoremediation, aeration, and canal dredging as a reflection of wetland water filtration value; assessed using the Replacement Cost method; and by valuing marine wildlife tourism using the Travel Cost Method, consistent with the recommendations in Chapter 4. The primary long-term solution is comprehensive wastewater treatment planning, which can be implemented alongside efforts to improve in-canal treatment efficiency and solid waste management, using the Ao Nang Water Quality Management Center as a model for clean water development, complemented by waste management charters, Green Hotel and Green Hotel Plus standards, and the hotel waste responsibility program; all working toward the goal of elevating the area to a globally recognized sustainable tourism destination. This corresponds to the Developing and Assessing Alternatives stage of SEA, in which scenarios are constructed to identify the most appropriate development pathway.

4) Applying the SEA process to the governance of large-scale development plans. Although NESDC is responsible for developing the SEA process at the national level, in practice the plan-owning agency oversees

SEA report preparation to ensure quality and compliance; typically by engaging consultants; while the Subcommittee on Academic Affairs and Public Participation provides technical guidance and recommendations. Plan-owning agencies can therefore establish procurement committees, plan oversight committees, and independent committees to supervise the SEA preparation process, thereby eliminating conflicts of interest.

5) Adopting a co-governance decentralization model for area-level SEA processes. In practical terms, this means devolving a portion of authority to the provincial level while retaining central government support; enabling the SEA process to be effectively grounded in local realities. Provinces and local bodies hold contextual knowledge and factual data that the central government does not, but they typically lack the budgetary resources required; particularly for wastewater treatment infrastructure, which demands substantial investment. Maintaining consistent national standards is essential in this arrangement; for example, the criteria and rates for wastewater treatment fees must adhere to the Polluter Pays Principle, ensuring equity across different areas.

2. Environmental Impact Assessment (EIA)

2.1 Introduction

Environmental Impact Assessment (EIA) is a systematic process used to identify, predict, evaluate, and manage the potential environmental effects of proposed development projects before decisions are made and actions are taken. The primary objective of EIA is to ensure that economic development proceeds in a manner that minimizes adverse impacts on natural resources, environmental quality, public health, and community well-being while promoting sustainable development. EIA serves as a key regulatory tool for preventing environmental degradation by integrating environmental considerations into project planning and decision-making processes.

The EIA system was first introduced in the United States in 1969 and later adopted in Thailand through environmental legislation that evolved into the current National Environmental Quality Promotion and Conservation Act. In Thailand, EIA is administered by the Office of Natural Resources and Environmental Policy and Planning (ONEP) and is required for development projects that may significantly affect environmental quality, natural resources, public health, or local communities.

An EIA study typically assesses four major environmental dimensions (Four Tiers): physical resources, biological resources, human use values, and quality of life. Physical resources include factors such as soil, water, air quality, noise, and geology. Biological resources encompass ecosystems, forests, wildlife, aquatic species, and other ecological components. Human use values examine how people depend on environmental resources for agriculture, transportation, industry, and other activities. Quality of life considerations include social, cultural, economic, and health-related impacts on communities.

The EIA process generally consists of six key stages: screening, scoping, impact assessment and report preparation, review, decision-making, and monitoring. During these stages, environmental impacts are identified and evaluated, mitigation measures are developed. Project alternatives are considered to reduce

environmental harm. Public participation also plays an important role in ensuring transparency and incorporating stakeholder concerns into the assessment process.

Recent developments in EIA have emphasized the integration of environmental economics, natural capital, and ecosystem services into environmental assessments. This approach recognizes that natural resources and ecosystems provide valuable economic and social benefits that should be considered alongside financial costs and benefits. By incorporating environmental valuation into project analyses, EIA can support more informed and sustainable decision-making, helping balance economic growth with environmental protection for present and future generations.

2.2 Wastewater Management Plan according to EIA Recommendations

At the provincial level, and in the case of Krabi Province specifically, the EIA system operates through a decentralization arrangement in which authority has been delegated from the central ONEP office to the Krabi Provincial Office of Natural Resources and Environment. A provincial-level ERC serves as the review mechanism, but only for building, land allocation, and community service projects reflecting the presence of an environmentally protected area covering Ao Luek, Mueang Krabi, Nuea Khlong, Khlong Thom, and Ko Lanta districts.

Ao Nang Sub-district, Mueang Krabi District, is also one of the South's most significant mass tourism destinations, known for its dramatic limestone cliffs, sandy beaches, and open sea vistas surrounded by islands. It serves as a major hub for boat connections, piers, and tourism amenities including accommodation, restaurants, retail shops, tour operators, and longtail boat services catering to large volumes of visitors during the high season from November to April. This concentration of tourism activity has given rise to wastewater problems that are now affecting marine ecosystems and, in turn, feeding back negatively into the tourism sector itself.

The key natural resource and environmental assets of Ao Nang or what the EIA system classifies as biological resources include forested areas and significant tree species, wetlands and mangroves, and rare flora such as cycads. Fauna of conservation concern include dugongs, coral reefs, and seagrass beds. The area's principal ecosystem services, which represent its spatial development potential and fall under the human use value dimension of the EIA framework, are beach tourism and marine wildlife tourism.

The main wastewater challenges and obstacles are: (1) many operators particularly small businesses — lack wastewater treatment systems; (2) existing treatment infrastructure is insufficient in both capacity and coverage, reflecting a public utilities system that has not kept pace with the area's growth; (3) legal and enforcement limitations; (4) budget constraints for wastewater treatment projects, compounded by treatment fee revenues that are insufficient to sustain operations; (5) a shortage of personnel and limited institutional capacity; (6) low public awareness of environmental responsibility and persistent behaviors of littering and discharging wastewater into public spaces; and (7) policy shortcomings and misaligned incentives for example, flat-rate treatment fees that are unfair to operators who have invested in compliant treatment systems. (Based on interviews with agencies and stakeholders conducted between September and November 2025.)

The following recommendations are proposed for developing a wastewater management plan for Ao Nang Sub-district, Mueang Krabi District, in alignment with EIA principles:

1) Strengthening legal and enforcement frameworks by expanding the authority of local bodies to enforce regulations against legally licensed operators and take meaningful action against unlicensed operations using municipal ordinances. For example, the provincial ERC should assess wastewater volumes from buildings and conduct ecosystem service valuations using the cost of restoring natural water bodies through phytoremediation, aeration, and canal dredging to remove sediment — as a reflection of wetland water filtration value.

2) Ensuring that environmental impact assessments are supported by adequate resource and impact data as foundational inputs for environmental valuation using appropriate tools and methods. In order to provide data for planning the sustainable and balanced use of natural resources and the environment preventing overexploitation.

To this end, the following baseline and contextual data should be collected for Ao Nang Sub-district: socioeconomic baseline data such as the number of affected residents, occupational profiles, income from livelihoods, tourist numbers, and tourism revenue; natural resource data such as the status of threatened and endangered species, coral reefs, and seagrass beds; and environmental data such as estimated water use and projected wastewater volumes from buildings, land subdivisions, and community services used for residential and commercial purposes, along with surface water quality, groundwater quality, coastal water quality, and the cost of restoring community mangrove forests. Data from provincial-level Natural Capital Accounting should also be systematically collected and utilized.

3) Integrating environmental economic values into project investment analysis, where social benefit is defined as the sum of financial revenue and external benefits, and social cost as the sum of financial cost and external costs. This framework underpins the calculation of Economic Net Present Value (ENPV), the Social Benefit to Social Cost Ratio (SB/SC Ratio), and the Economic Internal Rate of Return (EIRR). From an environmental economics perspective, the net social surplus, the excess of social benefit over social cost, represents the true net benefit or genuine profit of a project. For example, a wastewater treatment facility addresses the problem of externalities by reducing pollution and generating social benefits such as reduced damage to water resources and ecosystems, improved environmental quality that supports the tourism sector, and reduced waterborne disease, leading to better public health outcomes.

4) Creating incentives for the conservation of natural resources and the environment, particularly in relation to wastewater management. Local authorities should charge treatment fees based on actual wastewater volumes generated, and consider reduced waste collection fees for those who practice waste separation.

5) Developing public utility infrastructure by constructing or expanding wastewater treatment facilities and collection systems, while simultaneously strengthening local administrative organizations through additional staffing, adequate budgetary support, and the development of expertise in wastewater treatment technology. This involves integrated operations between various agencies such as local administrative organizations, local government agencies, state enterprises, and the private sector, using the provincial governor's mechanism to drive and connect them.

References

- Adis Israngkura. (1999). Environmental valuation: What is it, how is it done, and for whom? Working Paper No. 3279. National Institute of Development Administration.
- Department of Environmental Quality Promotion. (1999). Environmental Law Handbook for the Public: Environmental Impact Analysis Reports. Bangkok: Department of Environmental Quality Promotion.
- Deuja, A., Ueda, K., Panyametheekul, S., Gheewala, S.H., & Prapasongsa, T. (2022). Health impacts and cost assessment of fine particulate matter formation from rice straw utilization in Thailand. *Thai Environmental Engineering Journal*, 36(1), 33–47.
- National Economic and Social Development Council. (2021). Strategic Environmental Assessment Guidelines (Revised Edition).
- National Economic and Social Development Council. (2024). Handbook for academic oversight of plan preparation using SEA.
- Office of Natural Resources and Environmental Policy and Planning. (2024). The Environmental Impact Assessment System in Thailand.
- Office of Natural Resources and Environmental Policy and Planning. (2025). Guidelines for improving the efficiency of environmental measure formulation in EIA reports.
- Pathawi Sirinaphakul. (2022). An appropriate strategic environmental assessment for Thailand: A comparative legal and institutional study of Australia. *Ramkhamhaeng University Journal of Law*, 11(1), 111–138.
- Rapee Pholpanich and Sompote Kunnot. (2018). Physical capital, human capital, natural capital, social capital and economic growth. *NIDA Development Journal*, 58(3), 155–169.
- Solow, R.M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, 70(1), 65–94.
- Sompote Kunnot. (2022). Environmental Economics. Bangkok: Fast Books.
- Somsakhaw Phetranon. (2010). Environmental Economics. Bangkok: Kasetsart University Press.
- Swan, T.W. (1956). Economic growth and capital accumulation. *The Economic Record*, 32(2), 334–361.
- Watcharin Chinnavoravattana. (2023). Policy for transitioning to a green economy: A comparative study of Thailand and other countries. Bank of Thailand.