Report #01

Climate Risks and Hazard Analysis in ASEAN: Inventory of Nature-based Solutions (NbS) Experiences in ASEAN Member States

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Disclaimer

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The report is one of several undertaken under the TAF-GTEI to provide insights into the awareness, role and uptake of nature-based solutions across ASEAN. It has not been formally endorsed by the European Union, ASEAN or ASEAN Member States.

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List of Abbreviations

Abbreviations	Definitions
AIIB	Asian Infrastructure Investment Bank
AMS	ASEAN Member States
APAEC	ASEAN Plan of Action for Energy Cooperation
ASEAN	Association of South-East Asian Nations
CB	Capacity Building
CBA	Cost-Benefit Analysis
CCM&A	Climate Change Mitigation & Adaptation
CIS	Climate Information Services
CPA	Community Protected Areas
CRA	Climate-Resilient Agricultural
CTCN	Climate Technology Centre and Network
DENR	Department of Environment and Natural Resources
DRR	Disaster Risk Reduction
EbA	Ecosystem based Approach
EE	Energy Efficiency
ENGP	Enhanced National Greening Program
EU	European Union
EUD	European Union Delegation
EWS	Early Warning System
FFI	Flora Fauna International
FREDA	Forest Resource Environment Development and Conservation Association
GCM	Green Climate Fund
GEF	Global Environment Facility
GGGI	Global Green Growth Institute
GHG	Green House Gas
GIS	Geographic Information System
IBRRI	Indo-Burma Ramsar Regional Initiative
ICZM	Integrated Coastal Zone Management
IFAD	International Fund for Agricultural Development
IKI	Indonesia Funders International Climate Initiative
IRENA	The International Renewable Energy Agency
IRRI	International Rice Research Inst
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management

JNKE	Junior Non-key Expert
KCCP	Ketapang Community Carbon Pools
KDB	Korean Development Bank
KE	Key-expert
LDC	Landlocked Developed Country
LuxDev	Luxembourg Development Cooperation Agency
MoAC	Ministry of Agriculture and Cooperatives
MoE	Ministry of Environment
MoNRE	Ministry of Natural Resources and Environment
MONREC	Ministry of Natural Resources and Environmental Conservation
MPA	Marine Protected Areas
NATURA	Nature-based Solution for Urban Adaptation
NbS	Nature-based Solutions
NGP	National Greening Program
ONEP	Office of Natural Resources and Environmental Policy and Planning
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAM	Protected Areas Management
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RE	Renewable Energy
SCeNe	Southeast Asia Climate and Nature-based Solutions
SCI	Save the Children Indonesia
SCRP	Southern Cardamom REDD+ Project
SEI	Stockholm Environment Institute
SNKE	Senior Non-key Expert
SLM	Sustainable Land Management
TA	Technical Assistance
TAF-GTEI	Technical Assistance Facility to the Green Team Europe Initiative
TOR	Terms-of-Reference
UNEP	United Nations Environment Programme
WB	World Bank
WHO	World Health Organization
WWF	World Wildlife Fund

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Executive Summary

The ASEAN region, comprising diverse landscapes and densely populated coastal and riverine areas, is among the world's most vulnerable to climate change. It faces escalating climate hazards such as floods, droughts, tropical cyclones, heatwaves, and sea-level rise, all of which threaten human lives, economic stability, food security, and critical ecosystems. Key sectors -especially agriculture, water resources, and fisheries- are increasingly disrupted by hydrological and meteorological extremes, while urban areas struggle with heat stress, flooding, and strained infrastructure. Environmental degradation, including deforestation and coastal erosion, further intensifies the region's exposure to climate risks.

Future projections indicate that climate-related disasters will become more severe and frequent, with annual flood damages expected to exceed USD 49 billion by 2050 and droughts reducing regional water availability by up to 30%. Heatwaves are projected to triple in frequency and stronger typhoons may increase displacement and economic losses. The socio-economic impacts are vast, ranging from displacement and health crises to tourism disruptions. Building resilience through regional cooperation, sustainable land and water management, and adaptive infrastructure is critical to safeguarding ASEAN's populations and economies in the face of mounting climate threats.

NbS Offers Practical Responses to Southeast Asia's Challenges

Southeast Asia faces interconnected challenges, including climate change, disaster risks, food and water insecurity, and biodiversity loss. These issues are further exacerbated by rapid urbanisation, high population density, and reliance on fragile ecosystems. Nature-based Solutions (NbS) offer a transformative framework to address these challenges. By protecting, managing, and restoring ecosystems, NbS integrate ecological restoration with social and economic benefits, providing a sustainable development pathway in a region where livelihoods are closely tied to natural systems.

Framework for Scalable NbS in Southeast Asia

This study employs an analysis of biophysical conditions, land-use categories, and ecosystem-based approaches (EbA) to contextualise NbS within Southeast Asia's unique challenges. It evaluates attributes such as ecosystem services, socio-economic dynamics, and environmental risks, enabling the development of scalable and adaptive strategies. Stakeholder consultations and field assessments further reinforce a landscape-based framework that integrates ecological, cultural, and socio-economic dimensions. The report categorises NbS into three types, establishing a framework for their application:

Minimal intervention solutions focus on conserving ecosystems such as mangroves, forests, and wetlands, which provide essential services such as carbon sequestration and storm protection.

Sustainable management solutions balance ecological resilience with human use in managed landscapes, including agriculture, urban green spaces, and coastal zones. These approaches address issues such as soil degradation and water scarcity.

High-intervention solutions create new ecosystems, such as urban green infrastructure and artificial reefs, to mitigate challenges from urbanisation and industrialisation. Together, these solutions address the immediate and long-term needs of rapidly transforming landscapes while reducing climate vulnerabilities.

Opportunities and Barriers for NbS Implementation in Southeast Asia

The study highlights critical NbS attributes, including alignment with biophysical conditions, relevance to land-use categories, and capacity to deliver ecosystem services like resource provision, ecological regulation, and cultural cohesion. However, it also identifies barriers to successful implementation, including technical complexities, environmental constraints, socio-economic disparities, and institutional gaps.

Table 1. Opportunities and Barriers for NbS Implementation

Opportunities	Barriers
Significant ecosystem service benefits	Technical complexities, limited site-specific data, and institutional gaps
Potential for socio-economic improvements	Challenges in ensuring equitable benefit-sharing and overcoming socio-economic disparities
Lessons from successful case studies	Missteps in planning and insufficient community involvement in projects

To address these barriers, the study recommends tailoring NbS to the socio-economic and biophysical contexts of each region, ensuring they are context-specific and aligned with local priorities.

Table 2. Study Recommendations to the Socio-Economic and Biophysical Context

Recommendations	Key Actions
Leverage local opportunities with tailored planning	Design NbS to align with specific socio-economic and biophysical contexts
Embed NbS into broader policies and frameworks	Integrate solutions into climate adaptation, disaster risk reduction, and sustainable development plans
Build capacity and foster transparent governance	Train stakeholders, strengthen governance structures, and ensure equitable benefit-sharing
Engage communities and monitor progress	Involve local stakeholders throughout the project lifecycle and refine solutions through adaptive management
Scale successful pilots with sustained investment	Expand proven solutions and secure funding through public-private partnerships and climate finance

This technical report provides a critical resource for understanding and scaling up NbS, emphasising the need for integrated, localised approaches that reflect the region's diverse landscapes and priorities. It offers a practical framework for implementing NbS at scale, ensuring alignment with community and ecosystem needs to drive sustainable development in Southeast Asia.

1. Climate Risks and Hazards in the ASEAN Region: A Multifaceted Threat

1.1. Context

ASEAN, located in Southeast Asia, is one of the region's most vulnerable to climate change, facing rising sea levels, floods, droughts, heatwaves, and increasingly severe weather event.[1] Geographically, ASEAN comprises diverse landscapes, including mountains, plateaus, floodplains, deltas, and coastal areas. Five ASEAN countries (Philippines, Myanmar, Thailand, Cambodia, Vietnam) are among the world's 20 most climate-vulnerable nations, with most of its population resides in riverine and coastal plains, that are highly susceptible to periodic hazards such as floods, tsunamis, and cyclones.[2]

The region faces significant climate risks driven by fossil fuel use and land-use changes, particularly deforestation and peatland exploitation in Indonesia. Key hazards include floods, droughts, and cyclones affecting large populations, with Vietnam, Cambodia, and the Philippines highly vulnerable to sea-level rise threatening agriculture and livelihoods. Marine heatwaves degrade fisheries across the region, while localised challenges include heavy precipitation in Brunei, droughts and floods in Cambodia and Lao PDR, and cyclones and flooding in Indonesia and Myanmar. Malaysia faces rising temperatures impacting agriculture, while the Philippines experiences cyclones, floods, and marine heatwaves. Singapore, though less exposed to natural disasters, contends with urban heat islands and economic disruptions, while Thailand grapples with flooding, droughts, and cyclones affecting agriculture and infrastructure.[3,4]

1.2. Major Climate Risks and Hazards (limited to past five years)

1. Hydrological Hazard

- **Floods** are the most prevalent hazard among ASEAN countries, causing substantial impacts on human lives, economies, and the environment. The frequency of major floods has also already increased, now occurring every 1–2 years compared to every 5–10 years previously.
    - **Riverine floods.** Driven by monsoon rains and tropical cyclones, riverine floods are a recurring hazard in Southeast Asia, causing widespread displacement and economic losses. In 2020, devastating monsoon floods impacted Vietnam, Laos, and Cambodia, displacing millions and severely affecting livelihood[5]. Similarly, Malaysia experienced severe flooding in December 2021, displacing over 70,000 people and causing extensive property damage. In Indonesia, extreme rainfall in the Batanghari River Basin, Sumatra, threatens tropical peatlands with deeper and more widespread flooding, endangering agriculture and unique ecosystems under future climate scenarios.[6]
    - **Coastal floods.** Driven by sea-level rise, coastal flood poses significant risks to low-lying areas and deltas in Southeast Asia. In the Philippines, Typhoon Vamco (2020) caused severe damage to coastal communities, highlighting the vulnerability of extensive coastlines.[7] In Indonesia, Jakarta faces critical risks from coastal erosion and saltwater intrusion, with parts of the city projected to be submerged by 2050 due to sinking land and rising seas, exacerbated by mangrove loss, which undermines natural defences. Similarly, Viet Nam's Mekong Delta,

[1] IPCC, *Climate Change 2022: Impacts, Adaptation and Vulnerability* (Geneva: Intergovernmental Panel on Climate Change, 2022).
[2] ASEAN, *ASEAN State of Climate Change Report* (Jakarta: ASEAN Secretariat, 2023).
[3] Arriola, S. Y. (2024, February 1). *Acting Now for Tomorrow: Addressing Climate Mobility Challenges in Southeast Asia*. Retrieved from The ASEAN Magazine:
[4] Pereira, J., Zain, M., & Shaw, R. (2022). *Climate Change Adaptation in Southeast Asia.* Singapore: Springer.
[5] Hansen, K. (2020). *Excessive monsoon rains flood Asia. NASA Earth Observatory*. Retrieved from NASA Earth Observatory: https://earthobservatory.nasa.gov/images/147006/excessive-monsoon-rains-flood-asia
[6] Yamamoto, K., Sayama, T., & Apip. (2021). Impact of climate change on flood inundation in a tropical river basin in Indonesia. *Progress in Earth and Planetary Science*.
[7] Destination Earth. (2023). *Philippines*. Retrieved from Destination Earth: https://destination-earth.eu/case-studies/philippines

experiencing sea-level rise (3.6 mm/year) and land subsidence, faces threats to agriculture, livelihoods, and GDP under higher warming scenarios.[8,9]

- **Droughts** also posed a significant threat, particularly during El Niño events. Water tables drop by up to 2 meters during El Niño episodes, and the frequency of these events has increased, occurring every 2–7 years with growing severity.
    - **Agricultural droughts.** Driven by prolonged dry spells and exacerbated by climate change, agricultural droughts significantly impact food security and rural livelihoods in Southeast Asia. Thailand experienced severe drought in 2019, disrupting rice production and affecting rural communities.[10] Similarly, the 2019-2020 drought in the Mekong River Basin, among the worst in decades, reduced water availability for agriculture and hydropower, affecting countries like Thailand, Vietnam, and Indonesia.[11] In Indonesia, prolonged drought in 2023 further disrupted agricultural production and water supplies. Aquaculture in the Mekong Region is also highly vulnerable, as climate-related risks like droughts, floods, and extreme temperatures disrupt fish and shrimp farming.[12] In addition, climate change in Thailand intensifies water scarcity during dry seasons, flood hazards during wet seasons, and landslide risks in mountainous areas due to extreme rainfall and land-use changes.[13]
    - **Water scarcity.** Driven by population growth, economic development, and climate change, water scarcity poses significant challenges to water availability.[14] Singapore, a water-scarce nation, has proactively implemented stringent water conservation measures to address these challenges and mitigate climate change impacts on its limited water resources.[15]

2. Meteorological Hazards

Countries like Myanmar, the Philippines, Vietnam, and Thailand rank among the most affected by extreme climate events globally.[16]

- **Tropical cyclones**, particularly typhoons, pose significant risks to Southeast Asia, causing strong winds, heavy rainfall, storm surges, and landslides. The Philippines, Vietnam, and Thailand are frequently impacted, with Typhoon Goni (2020) devastating the Philippines, leading to significant loss of life and infrastructure damage.[17] Similarly, Typhoon Rai (2021) caused over 400 fatalities, displaced 1.8 million people, and resulted in USD 900 million in damages in the Philippines.
- **Heatwaves**, driven by rising temperatures, are becoming more frequent and intense, posing significant health risks, especially for vulnerable population.[18] Thailand experienced a severe heatwave in 2019, leading to heat-related illnesses and fatalities, with Bangkok in April 2023 saw

[8] EPA, U. (2025). *Climate Change Indicators: Coastal Flooding*. Retrieved from US EPA: https://www.epa.gov/climate-indicators/climate-change-indicators-coastal-flooding

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[10] Patel, K. (2020). *Drought Hits Thailand*. Retrieved from NASA Earth Obervatory: https://earthobservatory.nasa.gov/images/146293/drought-hits-thailand

[11] Renaud, F., Chardot, L., Hamel, P., Cremin, E., Ng, D., & Balke, T. (2021). *Adaptation and Resilience in ASEAN: managing disaster risks from natural hazards*. Retrieved from Foreign, Commonwealth UK Gov

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[18] World Meteorological Organization. (ND). *Heatwave*. Retrieved from World Meteorological Organization: https://wmo.int/topics/heatwave

the record-breaking temperatures reaching 45°C, intensifying public health challenges and straining energy demand for cooling infrastructure.

3. Geophysical Hazards

- **Earthquakes and tsunamis.** Southeast Asia's location in the Pacific Ring of Fire makes it highly prone to earthquakes and tsunamis, posing significant risks to life and infrastructure. The 2018 Sulawesi earthquake and tsunami in Indonesia caused widespread devastation and a high number of casualties, highlighting the region's vulnerability to seismic activity.[19]

- **Volcanic eruptions.** Southeast Asia's numerous active volcanoes pose significant risks to nearby communities, with eruptions causing widespread disruption.[20] The 2018 eruption of Mount Agung in Bali, Indonesia, disrupted air travel and tourism, highlighting the economic and social vulnerabilities associated with volcanic activity.[21]

4. Environmental Degradation

Climate events are accelerating the degradation of critical ecosystems. Coral reefs, essential for fisheries and tourism, face bleaching due to rising sea temperatures. For example, the 2020 marine heatwave in Southeast Asia caused extensive coral bleaching in the Coral Triangle.

- **Deforestation**, particularly in Indonesia's Sumatra and Kalimantan regions, contributes to climate change by releasing carbon dioxide, exacerbating biodiversity loss, and increasing vulnerability to hazards like floods and landslides.[22] The 2019 haze crisis, driven by forest and peatland fires, disrupted air travel, closed schools, and caused severe health impacts across Indonesia, Malaysia, and Singapore.

- **Coastal erosion**. Driven by rising sea levels, coastal erosion poses a major threat to Southeast Asian communities, infrastructure, and ecosystems.[23] Vietnam's Mekong Delta is particularly vulnerable, with escalating erosion endangering agricultural land and livelihoods.[24] Similarly, coastal areas in Vietnam, the Philippines, and Cambodia face increasing risks, while Brunei Darussalam experiences rising sea levels, freshwater salinity, and biodiversity loss, disrupting agriculture and fisheries.[25]

- **Marine ecosystems**. Marine heatwaves and ocean acidification are adversely affecting fisheries and biodiversity, leading to socio-economic challenges for coastal communities.

5. Socioeconomic Impacts

- **Humanitarian crises**. Floods, typhoons, and heatwaves disproportionately impact vulnerable communities, leading to displacement and food insecurity. During Typhoon Rai, the Philippines' emergency response system faced challenges due to simultaneous COVID-19 restrictions, highlighting the compound effects of overlapping crises.

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[25] Shams, S. (2023). Impact of Climate Change on water resources in the Context of Brunei Darussalam: IWRM Perspectives. *In SRICOENV 2022: Proceedings of the 3rd Sriwijaya International Conference on Environmental Issues, SRICOENV 2022, October 5th, 2022*.

- **Displacement and migration**. Climate-induced disasters can lead to displacement and migration, both within and across borders.

- **Food security**. Climate change impacts agricultural production, threatening food security and increasing the risk of malnutrition.[26] Climate change is undermining agricultural productivity through reduced yields, increased salinity from sea intrusion, and vulnerability to extreme weather. Regional integration and reliance on transboundary resources like the Mekong River add complexity, as climate variability risks disrupting food security and global supply chains. In Cambodia, climate change is severely disrupting its rain-fed agricultural sector, with projected temperature increases, erratic rainfall, extreme floods, prolonged droughts, and heightened pest infestations threatening rice yields and food security, exacerbating poverty and indebtedness among farming communities.[27] In Malaysia, climate change poses significant risks its rice production and food security, with rising temperatures, increased precipitation, and extreme weather events threatening paddy yields, exacerbated by small-scale farming, lack of economies of scale, and import dependence.[28]

- **Economic losses**. Climate-related disasters cause significant economic losses, impacting infrastructure, tourism, and other sectors.[29] Advanced economies and emerging markets in AMS, reveals that vulnerability to direct climate change impacts significantly increases sovereign borrowing costs, with bond yields rising progressively for highly vulnerable nations. This underscores the financial risks posed by climate hazards, emphasising the need for enhanced climate resilience, particularly in ASEAN regions.[30] In Kratie, Cambodia, climate-induced disasters like floods, storms, and droughts severely impact micro businesses in the tourism and hospitality sector, disrupting operations and profits. Adaptive responses are often temporary and reactive, influenced by factors like location and supply chain dependency, while some businesses exploit opportunistic behaviours during crises.[31] Meanwhile in Indonesia, rising temperatures, humidity, and extreme climate events significantly reduce international tourists, highlighting the tourism sector's vulnerability to heat stress, humidity discomfort, and disaster disruptions.[32] The economic costs of climate hazards in ASEAN are escalating. According to the ASEAN State of Climate Change Report (2021), annual losses due to natural disasters already exceed USD 10 billion.

- **Health impacts**. Climate change increases the risk of heat-related illnesses, vector-borne diseases, and mental health issues. Climate change worsens vector-borne diseases like dengue. A study published in *The Lancet Planetary Health* (2022) highlighted that increasing temperatures and erratic rainfall have expanded mosquito habitats in ASEAN countries.[33]

- **Urban vulnerability**: urban areas face challenges from heat islands, flooding, and inadequate infrastructure to cope with climate-induced risks. Rapid urbanisation has amplified the UHI effect, particularly in cities like Bangkok, Jakarta, and Manila. High temperatures exacerbate energy demand for cooling and deteriorate air quality, increasing public health risks.

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1.3. Projected Climate Risks and Future Impact

Climate change is expected to intensify the severity and frequency of natural hazards across ASEAN countries, creating cascading risks for ecosystems, economies, and societies.

- **Floods** will become more destructive, with rainfall intensity projected to increase by up to 30% in certain regions, such as the Mekong Delta, and annual flood damages exceeding USD 49 billion by 2050.[34] Sea-level rise, projected to reach 0.4–0.8 meters by 2100 under high-emission scenarios, will exacerbate coastal and riverine flooding, with major cities like Bangkok, Jakarta, and Ho Chi Minh City facing permanent inundation.[35]
- **Coastal erosion and storm surges** are expected to affect 30% more people, further displacing millions and leading to economic losses of up to USD 4 trillion annually by the end of the century.[36]
- **Droughts** driven by intensified El Niño events are predicted to reduce regional water availability by 15–30% and double their frequency in countries like Thailand and Cambodia. These droughts will have far-reaching impacts, particularly on agriculture, with staple crop yields like rice declining by 25–40% in some areas by 2050, threatening food security and rural livelihoods.[37]
- **Heatwaves** will grow threefold in frequency by mid-century, with urban centres experiencing temperatures exceeding 40°C and heat indices surpassing 45°C. This will disproportionately affect urban populations, straining public health systems and increasing mortality rates.[38]
- Mountainous areas, such as the Philippines and Lao PDR, are projected to see a 40% increase in **landslide**-prone zones due to intensified rainfall and deforestation, threatening both rural and peri-urban communities.[39]
- **Tropical storms** are expected to become more intense, with category 4 and 5 typhoons increasing in frequency by 50% and delivering higher wind speeds and up to 30% more rainfall per event. These storms will lead to higher rates of displacement, fatalities, and economic losses, compounding the vulnerability of already at-risk populations.[40]

2. International Union for Conservation of Nature (IUCN) Global Standard for Nature-based Solutions (NbS)

ASEAN increasingly recognises Nature-based Solutions (NbS) as part of a comprehensive approach to tackle climate change and ecological degradation in the region. For the past few years, there have been various definitions proposed for NbS. Until finally at the **5th United Nations Environment Assembly (UNEA) meeting in February 2022 in Nairobi** that a global consensus was reached on NbS. According to this consensus, *NbS are Actions to protect, conserve, restore, sustainably use, and manage natural or modified terrestrial, freshwater, coastal, and marine ecosystems that effectively and adaptively address social, economic, and environmental challenges while simultaneously providing human well-being, ecosystem services, resilience, and biodiversity benefits*.

Meanwhile, the **International Union for Conservation of Nature (IUCN)** defines *NbS as actions that protect, sustainably manage, and restore natural or modified ecosystems in ways that address societal challenges effectively and adaptively, while providing benefits to human well-being and biodiversity.*

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[34] World Bank, *Climate Risk and Adaptation in Asia* (Washington, DC: World Bank, 2020).
[35] IPCC, *Special Report on the Ocean and Cryosphere in a Changing Climate* (Geneva: IPCC, 2019).
[36] Ibid.
[37] ASEAN, *ASEAN State of Climate Change Report* (Jakarta: ASEAN Secretariat, 2023).
[38] Ibid.
[39] UNEP, *Landslides and Climate Change: Risk in Mountainous Areas* (Nairobi: United Nations Environment Programme, 2021).
[40] IPCC, *Climate Change 2022*.

In 2020, **IUCN published the first issue of IUCN Global Standard for NbS**, which guides and assesses NbS projects focusing on adapting solutions. The Standard aims to provide a common framework for designing, implementing, and evaluating activities that follows the NbS framework or consist elements of NbS to address global sustainability challenges.

The IUCN Global Standard identifies **seven major societal challenges** to which NbS is considered a response:

1. Climate change mitigation and adaptation
2. Disaster risk reduction (DRR)
3. Economic and social development
4. Human health
5. Food security
6. Water security
7. Environmental degradation and biodiversity loss.

The key element of the IUCN Global Standard for NbS is built around eight criteria, providing a structured way to evaluate NbS projects by addressing key aspects needed for their success and sustainability. The criteria cover the identification of societal challenges, design considerations at various scales, and the need for positive outcomes in biodiversity, society, and the economy. Below are the eight criteria of Global Standard for NbS.

1. NbS effectively address societal challenges. Projects should tackle relevant societal challenges identified by local communities through stakeholder engagement.
2. Design of NbS is informed by scale. Projects must consider the scale of environmental and social impacts and integrate with other initiatives to enhance durability.
3. NbS result in a net gain to biodiversity and ecosystem integrity. NbS projects should contribute positively to biodiversity, with measurable conservation outcomes and minimised adverse impacts.
4. NbS are economically viable. Projects should demonstrate economic feasibility through cost-benefit analysis and diversified funding options.
5. NbS are based on inclusive, transparent and empowering governance processes. Transparent governance, respect for stakeholder rights, and clear decision-making documentation are essential.
6. NbS equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits. Projects should handle ecosystem trade-offs transparently and fairly, ensuring no excessive harm to vulnerable groups.
7. NbS are managed adaptively, based on evidence. Projects must incorporate continuous monitoring, evaluation, and learning to respond to changing ecosystem needs.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context. Projects should align with policy frameworks to support scaling, sustainability, and alignment with national and global targets.

This approach helps ensure NbS implementation are not only effective in the short term but are also robust, adaptable, and capable of delivering long-lasting, scalable benefits.

3. Nature-based Solutions as a Holistic and Integrated Approach to Addressing Societal Challenges in Southeast Asia

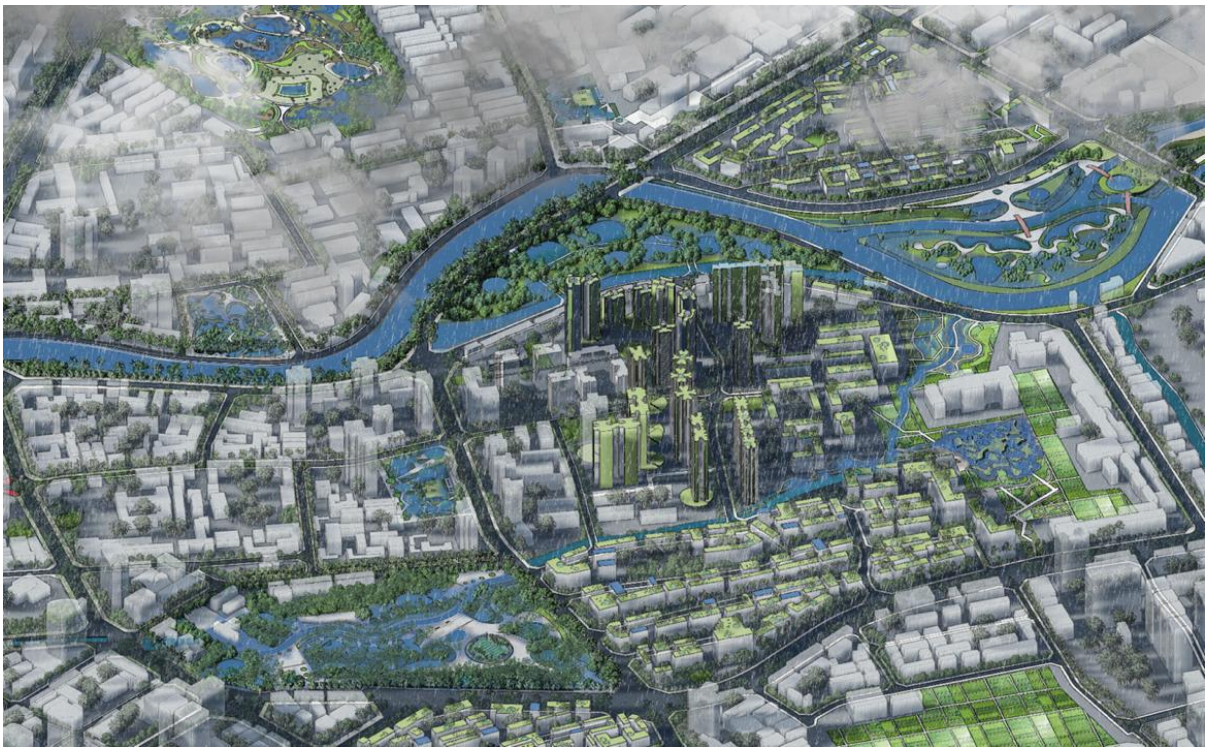
NbS have emerged as a transformative framework to address the pressing societal challenges, encompassing both climate and non-climate hazards as well as human-induced disaster risks. Far from being a collection of stand-alone interventions, NbS require a systems-based approach rooted in ecological, cultural, and socioeconomic realities.

NbS offers a unique and transformative opportunity for Southeast Asia, a region of 675 million people, many of whom depend heavily on nature for their livelihoods and are among the most vulnerable to climate change. The region is globally significant for its rich biodiversity and ecosystems, boasting 15% of the world's tropical forests, 20% of plant and animal species, 25 million hectares of peatland, 35% of the planet's coral reefs, and other unique ecosystems. Southeast Asia is also a critical carbon sink, holding approximately 25% of the world's investible forest carbon, 19–49% of global blue carbon, and nearly 97% of tropical peatlands' carbon stocks (Southeast Asia Climate and Nature-based Solutions (SCeNe) Coalition, n.d.). Five of the world's top 20 most biodiverse countries are in the region (Indonesia, Malaysia, Philippines, Vietnam, Thailand), yet it faces alarming rates of land and forest degradation, coupled with high climate vulnerability (Stockholm Environment Institute (SEI), 2024). This enables countries in the region to collaborate and use NbS to protect biodiversity, build climate resilience, and support sustainable development.

The interconnected crises of biodiversity loss, climate change, and unsustainable land use have often been addressed in isolated and fragmented ways, limiting their effectiveness. However, Southeast Asia's diverse forests, soils, and agricultural systems hold immense potential for enhancing carbon sequestration and restoring degraded ecosystems. This creates opportunities for integrated responses and regional partnerships that leverage NbS to achieve the elusive 'triple win' of biodiversity conservation, climate resilience, and sustainable development. According to Vicarelli et al. (2024), 71% of studies confirm that NbS consistently mitigate hazards efficiently, with mangroves, forests, and coastal ecosystems particularly effective. These solutions not only rival engineering-based alternatives in reducing risks but also provide critical co-benefits such as biodiversity restoration, carbon sequestration, and improved livelihoods.

For Southeast Asia, where communities are deeply reliant on ecosystem services, the financial and ecological sustainability of NbS presents an unparalleled opportunity to simultaneously build climate resilience, reduce disaster risks, and tackle poverty. The diversity and complexity of Southeast Asia's landscapes demand a localised and integrated approach to implementing NbS.

Figure 1 Visualisation of 'Resilient City Landscape' during cloudburst episode



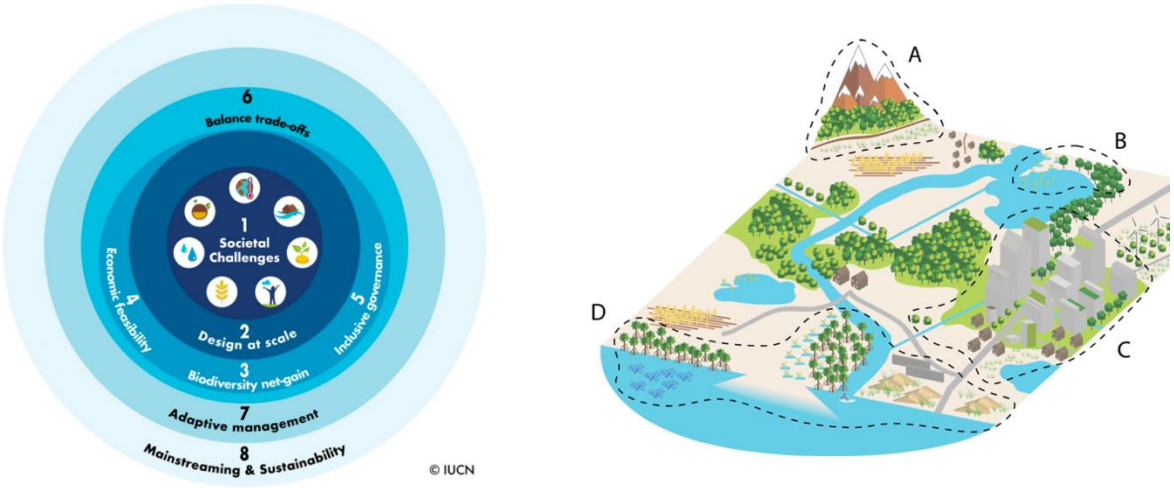
Source: Author

In this context, through extensive characterisation efforts, we have identified nine potential categories of geographical areas that apply to ASEAN countries typical challenges regarding CMM and Eco-DRR, to develop them into 'climate-sensitive landscape categories. In the next report #02, we propose a description of these nine categories and identify the NbS Attributes in the context of identified landscape-based approaches. These categories reflect the interconnectedness of ecosystems, human activities, and cultural heritage in the region, enabling the contextualisation, implementation, scaling up, and synergising of multiple NbS while ensuring alignment with local communities and their cultural practices.

This approach has been inspired by the IUCN Global Standards for NbS's eight main criteria, and has given a deeper focus on the first two criteria:

1. **Addressing societal challenges** through the lens of ecological and social priorities.
2. **Designing NbS at a landscape scale**, recognising that ecosystems, communities, and economies are deeply interlinked.

Figure 2 Eight criteria that make up IUCN Global Standard for NbS and their dynamic land/seascape approach



Source: IUCN

We bring therefore the seven key societal challenges that NbS aim to address in the context of Southeast Asia:

- **Climate Change Mitigation and Adaptation**

  NbS aim to reduce greenhouse gas emissions, enhance carbon sinks, and build resilience to climate-related risks. In Southeast Asia, mangroves and peatlands play pivotal roles in sequestering carbon and buffering coastal communities from rising sea levels and storm surges.

- **Disaster Risk Reduction**

  Natural ecosystems like forests, wetlands, and coral reefs provide critical services that mitigate risks from floods, landslides, and tsunamis. NbS in riverbeds and coastal zones of the Mekong Delta or upland watersheds in Indonesia integrate ecological restoration with disaster preparedness, safeguarding livelihoods.

- **Food Security**

  Agroforestry and sustainable agricultural practices enhance food production while preserving ecosystem services. In Southeast Asia, NbS are essential to mitigate soil degradation and drought in farming communities and ensure sustainable rice and aquaculture systems.

- **Water Security**

  NbS improve water availability, quality, and management through watershed restoration, wetland conservation, and urban greening. This is particularly critical in urbanising regions like Hanoi and Jakarta, where water pollution and scarcity are mounting challenges.

- **Human Health**

  By enhancing air and water quality and reducing urban heat islands, NbS contribute to healthier environments. Urban parks and green corridors in cities like Bangkok and Manila also provide mental health benefits and spaces for recreation.

- **Economic and Social Development**

  NbS create green jobs, support sustainable tourism, and foster inclusive economic opportunities. Southeast Asia's reliance on ecotourism, fisheries, and smallholder farming underscores the need for NbS that empower local economies while preserving biodiversity.

- **Biodiversity Conservation**

  NbS protect and restore habitats, ensure species connectivity, and combat ecosystem degradation. From reforestation in wildlife corridors of the Philippines to coral reef restoration in Indonesia, conserving biodiversity is integral to sustaining ecosystem services.

Figure 3. Seven key societal challenges

Source: IUCN

In Southeast Asia, these societal challenges are deeply interlinked with the region's biophysical diversity and human livelihoods. Riverbeds are not just hydrological systems but spaces for fisheries and agriculture. Forests serve as biodiversity hotspots, carbon sinks, and sources of livelihoods for indigenous communities. Coastal and marine ecosystems are vital to fisheries, storm protection, and tourism but face threats from overexploitation and climate change. Similarly, cities, ports, and industrial areas embody human-induced transformations, demanding NbS that bridge ecological restoration and urban resilience.

Beyond our focus on societal and landscape scale challenges, the final product of NbS catalogue aims at taking all the eight IUCN criteria in the context of ASEAN Member States. Producing biodiversity and human well-being benefits, addressing trade-offs transparently, ensuring economic feasibility, inclusiveness and participatory processes, evidence-based approaches and adaptive management are all part of proposed NbS case presentations.

In addition to these criteria, the development of this NbS catalogue draws upon seminal studies and projects emphasising holistic approaches to NbS. These include EcoShape's *Building with Nature: Creating, Implementing and Upscaling NbS* and WWF Australia's *Freshwater NbS in the Mekong Sub-region*, both of which illustrate the importance of integrating ecological functionality with societal needs in complex landscapes.

4. Inventory of NbS Attributes and Risk Analysis of NbS Implementation in AMS landscapes and seascapes

The first phase of the NbS characterisation study aimed to reach a holistic understanding of NbS to be presented in the catalogue. Before developing a categorisation of NbS in targeted geomorphological and socio-economic contexts of AMS, we identified the main types and attributes of NbS, based on the typology defined by Eggermont et al. (2015)[41] and considered as a reference by the ThinkNature – ClimateAdapt EU project,[42] as well as defined by the UNDRR 2021 report.[43]

The NbS attributes are distinguished as follows:

- **3 NbS types** following the level of human intervention on nature and bio-engineering techniques applied.
- **7 biophysical conditions** in relation with **5 land use categories** in Southeast Asia.
- **11 EbA** addressed by NbS.
- **10 NbS challenges.**
- **4 types of ecosystem-based services** provided: supporting, provisioning, regulating and maintaining, supporting social and cultural traditions and cohesion.

The first efforts of categorisation of NbS have been based on the level of intervention and the type of engineering involved in ecosystem management. This typology helps clarify the extent of human intervention in ecosystems and highlights varying goals, from conservation to urban and ecological restoration. The three types address each different ecological and societal needs.

NbS Type 1: Better Use of Protected/Natural Ecosystems

Type 1 NbS involves minimal intervention, aiming to preserve and enhance ecosystem services (ES) through protection and conservation. Strategies under this type include managing natural reserves, marine protected areas (MPAs), and coastal ecosystems like mangroves. In Southeast Asia, mangrove forests are a typical example, offering coastal protection from storms, supporting biodiversity, and providing sustainable resources to local communities. However, challenges arise in managing these protected areas effectively due to issues such as overharvesting, coastal development, and climate change impacts, which threaten these fragile ecosystems.

NbS Type 2: NbS for Sustainability and Multifunctionality of Managed Ecosystems

Type 2 NbS focuses on sustainable management practices for extensively or intensively managed ecosystems, such as agricultural landscapes, urban green spaces, and coastal zones. This approach aims to balance human use with ecological resilience, as seen in agroecological practices that increase biodiversity and forest resilience. In Southeast Asia, agricultural and coastal management is crucial, as many rural communities depend on these landscapes. However, challenges include balancing productivity with environmental health, addressing soil degradation, and ensuring water resource management in the face of droughts and floods.

NbS Type 3: Design and Management of New Ecosystems

Type 3 NbS involves high levels of intervention, including the creation of artificial or heavily modified ecosystems. Examples include green infrastructure like green roofs, urban green corridors, and water management systems that mitigate urban flooding and improve air quality. In Southeast Asian cities, where rapid urbanisation leads to issues like heat islands and pollution, Type 3 solutions are valuable for enhancing urban liveability. However, implementing such intensive interventions presents challenges, such as high initial costs, the need for maintenance, and aligning designs with local biodiversity needs.

[41] Nature-based Solutions: New Influence for Environmental Management and Research in Europe, H Eggermont 2015
[42] https://climate-adapt.eea.europa.eu/en/knowledge/adaptation-information/research-projects/ThinkNature
[43] Nature-based Solutions for Disaster Risk Reduction: Engaging for resilience in support of the Sendai Framework 2015-2030, UNDRR 2021.

Figure 4. Three types of NbS

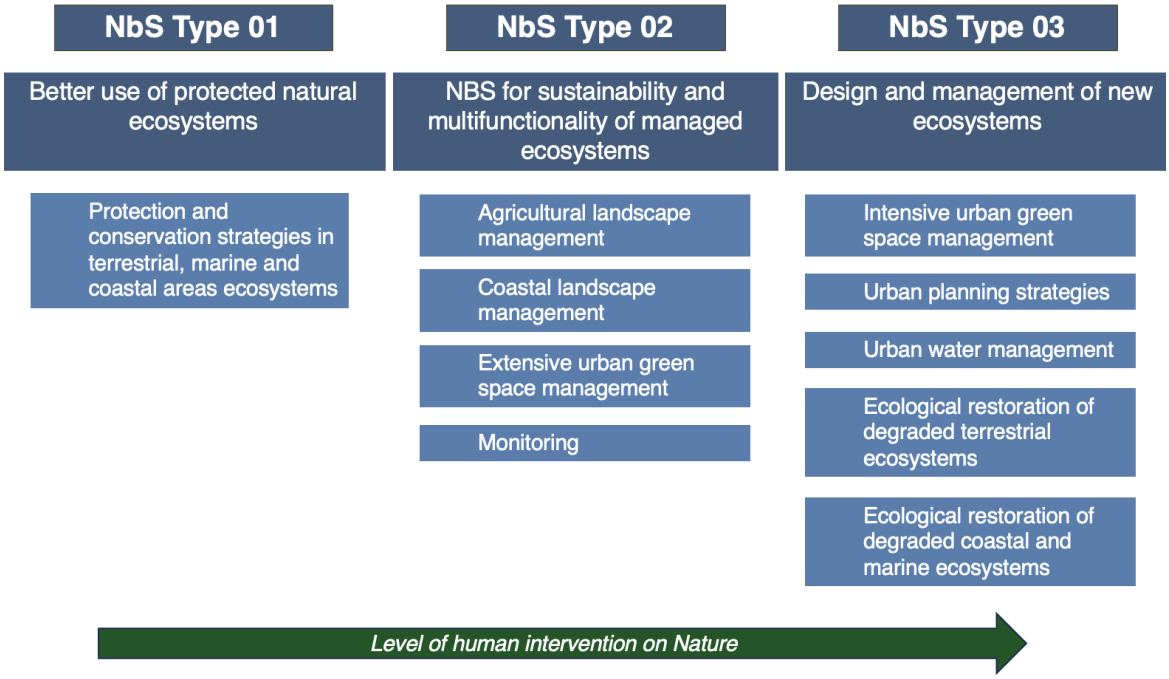


Figure 5. Seven biophysical conditions and five land use categories with complex relations in the local contexts of Southeast Asia

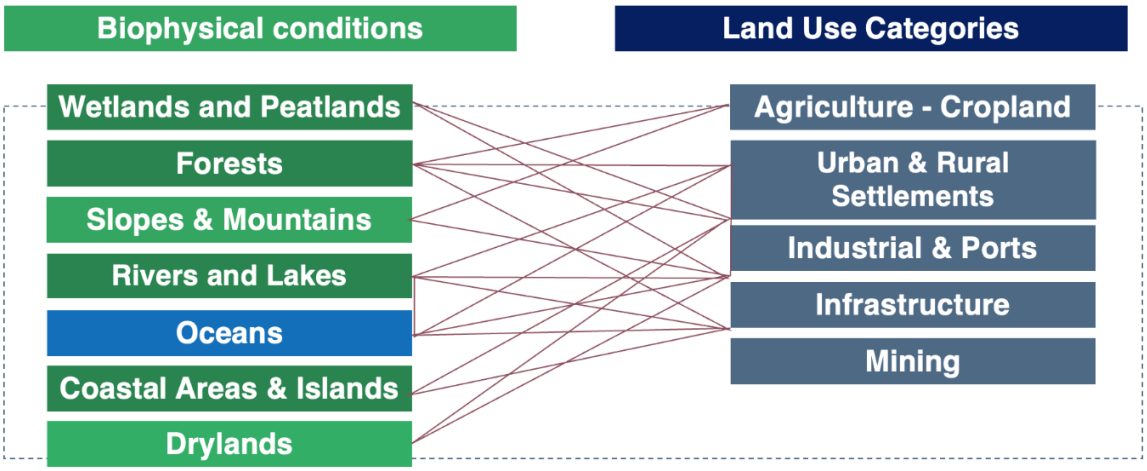


Table 3. Eleven (11) Identified Ecosystem-based Approaches (EbA) addressing climate adaptation with NbS applications in Southeast Asia

No	Ecosystem-based Approach (EbA)	Description
1	Ecosystem-based Disaster Risk Reduction (Eco-DRR)	Restoration of mangroves, wetlands, riverbanks and dune ecosystems to buffer against storms, floods, tsunamis, and coastal erosion — crucial for delta regions like the Mekong and Chao Phraya.
2	Ecosystem-based Adaptation (EbA) to Climate Change	Integrated management of agroforestry, wetlands, and coastal ecosystems to enhance resilience of farming, fisheries, and settlements to sea level rise, extreme weather, and salinisation.
3	Integrated Coastal Zone Management (ICZM)	Planning for sustainable use of coastal mangroves, sandy beaches, seagrass beds, balancing urban development (e.g., ports, resorts) with conservation in areas like the Sulu-Sulawesi Marine Ecoregion.
4	Integrated River Basin Management (IRBM)	Restoration and sustainable management of rivers, estuaries, and floodplains, ensuring sediment flow, reducing upstream pollution, and maintaining water security in areas like the Ayeyarwady and Mekong basins.
5	Marine Spatial Planning (MSP)	Zoning and co-management of marine parks, fisheries zones, ports, to balance biodiversity protection, livelihoods, and marine traffic in biodiverse seascapes like the Coral Triangle.
6	Forest and Landscape Restoration (FLR)	Reforesting degraded catchments, buffer zones and wildlife corridors, using native species (e.g., dipterocarps in Malaysia) to reduce erosion, enhance biodiversity, and support carbon sinks.
7	Sustainable Agriculture and Agroecology	Diversified farming systems — such as polyculture, organic farming, aqua silviculture, and paludiculture (wetland agriculture) — adapted to increasingly saline and flood-prone landscapes.
8	Urban Green Infrastructure (UGI)	Greening cities through urban parks, bioswales, green roofs, and river revitalisation projects (e.g., Sungai Klang River of Life) to manage stormwater, heat stress, and air pollution.
9	Community-based Natural Resource Management (CBNRM)	Local stewardship of fisheries, forests, mangroves, and agricultural lands through community-managed protected areas, indigenous knowledge integration, and participatory governance.
10	Ecological Engineering	Designing infrastructure (e.g., eco-ports, permeable pavements, living breakwaters) that mimic natural processes — for instance, hybrid grey-green solutions for coastal protection.
11	Protected Area Networks and OECMs (Other Effective Area-based Conservation Measures)	Expanding marine parks, riverine conservation areas, and wildlife sanctuaries, while recognising community-managed and culturally significant areas as key biodiversity strongholds outside formal protected zones.

Table 4. Ten (10) Identified Challenges to Nature-based Solutions (NbS) Application and Success in the context of Southeast Asia

No	NbS Application Challenge	Description
1	Fragmented Governance and Institutional Silos	Ministries and agencies often work in isolation (e.g., separate water, forestry, fisheries authorities), leading to disjointed NbS implementation without cross-sector coordination, especially in river basins and coastal zones.
2	Limited Technical Capacity at Local Levels	Many local governments and community groups lack the skills for NbS planning, ecosystem restoration, monitoring, or adaptive management — particularly outside urban centers.
3	Insufficient Sustainable Financing Mechanisms	Most NbS projects rely on short-term grants. There are few financial models to sustain NbS efforts over 10–20 years, which restoration projects need.
4	Low Community Ownership and Appropriation	Without early and meaningful participation, local communities (e.g., fisherfolk, farmers, indigenous groups) may view NbS as external interventions rather than as their own solutions, reducing effectiveness and long-term stewardship.
5	Rapid and Intensifying Climate Change Impacts	The pace of sea level rise, extreme storms, and droughts sometimes outstrips NbS adaptation rates (e.g., mangroves can't keep pace with sudden salinity increases), especially in deltas and low-lying islands.
6	Maintenance and Long-Term Stewardship Gaps	NbS projects often fail after the initial funding ends because ongoing maintenance (e.g., replanting, invasive species control, monitoring) is neglected or unfunded. This is critical in reforestation, wetland restoration, and green urban spaces.
7	Transboundary Management and Political Complexity	Rivers like the Mekong, Salween, and major marine ecosystems cross national borders, but regional cooperation is often weak or politically sensitive, undermining basin-wide NbS efforts.
8	Land Use Conflicts and Inadequate Spatial Planning	Expanding agriculture, aquaculture, mining, and urbanization often outcompete or destroy potential NbS sites, particularly in deltas and coastal zones where land is economically valuable.
9	Short-Term Development Pressures	Governments often prioritise rapid economic gains (e.g., tourism, port construction, export agriculture) over longer-term resilience strategies, making NbS politically less attractive.
10	Lack of Robust, Context-Sensitive Data	Good NbS design depends on detailed local data (e.g., ecosystem services mapping, climate risk projections), which are often missing or outdated in Southeast Asian countries, especially in rural and remote areas.

Table 5. Contributions of the four types of Ecosystem-based Services (EbS) to the environment, economy and local communities in Southeast Asia

Ecosystem-based Service (EbS)	Descriptions
1. Supporting Services	**NbS enhances the underlying ecological processes** that make other services possible — such as nutrient cycling, soil formation, and habitat provision. Examples include wetland restoration supporting fish nurseries, agroforestry improving soil health, and coral reef protection sustaining marine biodiversity.
2. Provisioning Services	NbS ensures the sustainable supply of natural resources like food (fish, fruits, rice), freshwater (through watershed protection), timber, fiber, and medicinal plants. Initiatives like mangrove-friendly aquaculture and rainforestation farming in Southeast Asia support both livelihoods and ecosystems.
3. Regulating Services	NbS strengthens natural regulation of climate, water, and biological processes, reducing risks such as floods, droughts, coastal erosion, and heat waves. Mangrove belts buffer storm surges, forested hills reduce landslide risks, peatlands sequester carbon, and green urban spaces mitigate urban heat.
4. Cultural Services	NbS revitalises cultural identity, traditional practices, recreation, and community cohesion. Protected sacred forests, community-managed coastal zones, and ecotourism initiatives reconnect people with nature, support indigenous stewardship, and maintain the spiritual and aesthetic values tied to Southeast Asia's rich natural landscapes.

In Southeast Asia, applying these NbS typologies is particularly challenging due to complex land-use pressures, high population density, and significant climate vulnerabilities. Although this first effort of categorisation poses the bases of the understanding of NbS types globally, it does not address all specific biophysical conditions and land use categories adding pressure on ecosystems within socio-cultural conditions observed in ASEAN Member States.

Recent meetings and discussions with regional partners (IUCN, ADB, WWF, UNDRR) have highlighted the importance of the understanding of local landscape and climate conditions in Southeast Asia, the higher potential of NbS projects when implemented in synergy with other NbS, and the need to scale-up NbS to reach more sustainable results on climate adaptation and mitigation, disaster risk reduction, renaturation, and restoration of ecosystems and biodiversity in the long term.

5. Lessons Learnt from Southeast Asia in the Application of Nature-based Solutions (NbS)

This chapter observes and assess complexity and challenges of few NbS projects in ASEAN countries and lessons learnt from their successful and unsuccessful outcomes in 5 examples of projects:

P1. Mangrove Replanting Projects Facing Complexity

- In Vietnam's Mekong Delta, particularly in areas like Ca Mau, Ben Tre, and Kien Giang, the efforts under the National Target Program aimed to combat coastal erosion and support climate adaptation. Many of the **newly planted mangroves** struggled to sustain because of typical common challenges: poor site selection, particularly intertidal mudflats with extreme salinity and lack of community involvement. In some instances, mangroves were planted in areas unsuitable for their growth, such as where inland barriers or aquaculture developments prevent natural water flow, impeding mangrove health. The projects highlighted the importance of selecting appropriate sites and integrating local communities into the project design to ensure continuous monitoring and maintenance.[44]

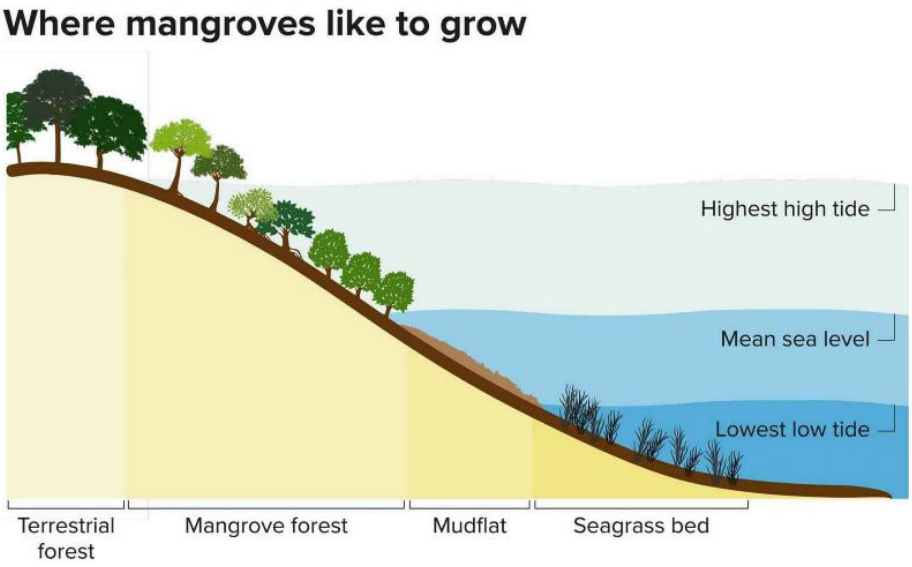
- Numerous mangroves replanting initiatives across the Philippines aimed at reducing coastal vulnerability, but some experienced failure due to inappropriate site choices and species selection. Many projects, like those in regions affected by **high tidal activity, faced challenges due to limited understanding of local hydrological patterns**. Poor community engagement also led to weak maintenance, with local residents often uninvolved in long-term care for the planted areas. This underscored the need for a deeper ecological understanding and for establishing long-term stewardship frameworks with local stakeholders to ensure sustainability.[45]

Volunteers planting mangroves, One Child One Tree Initiative, Bulacan (the Philippines). Source: feed.org.ph

[44] Source: The green giants of Viet Nam's coast: A journey of mangrove revitalization, UNDP Vietnam April 2023: https://undpvietnam.exposure.co/mangrove-revitalization-in-viet-nams-coastal-provinces

[45] Source: Mangrove Restoration: It's More than Just Planting, D.Wodehouse, J.Enright, Jan 2023, APN Science Bulletin; Green Network Asia: https://greennetwork.asia/brief/how-does-community-based-ecological-mangrove-restoration-work/

In the Mahakam Delta in East Kalimantan, Indonesia, extensive **mangrove restoration programs** sought to combat the severe ecological damage from **shrimp farming expansion**. However, the replanting faced multiple setbacks, including a high mortality rate of seedlings, largely because of erosion and water pollution issues. While the Peatland and Mangrove Restoration Agency (BRGM) reported some progress, reforestation goals often fell short. Community participation was hampered by local fears of crocodile encounters and pollution from aquaculture practices. Additionally, restoration strategies lacked wave barriers or erosion control measures, which are crucial in this erosion-prone delta. This case illustrated the need for more robust structural supports and a strong local partnership to create effective and enduring restoration projects.[46]



Source: Knowable; www.knowablemagazine.org

These three cases emphasise key factors in successful NbS projects, including thorough site assessments, species selection that aligns with local environmental conditions, and active community involvement. They reveal a complex set of challenges that can be used to better categorise and improve climate-sensitive landscape restoration projects in Southeast Asia, driving more resilient NbS in similar environments.

[46] Source: Community Based Ecological Mangrove Rehabilitation (CBEMR) in Indonesia: From small (12-33 ha) to medium scales with pathways for adoption at larger scales. Ben Brown, Ratna Fadillah, Yusran Nurdin, Iona Soulsby and Rio Ahmad, 2014. https://planete-urgence.org/en/mahakam-project-mangrove-restoration-and-local-development/

P2: Coral Reef Restoration Effort

- In 2010, mass coral bleaching caused substantial reef damage. Restoration projects involving **artificial reefs and coral transplants** attempted to repair these ecosystems, but outcomes were limited. Coral recovery was inconsistent across regions and closures of damaged sites were extended due to poor recovery rates.

- Coral reef restoration efforts in Malaysia were particularly problematic due to pollution from tourism and coastal development, which affected water quality. Initiatives like the artificial reef project in Tioman faced recurring setbacks from **coastal runoff**, **unregulated fishing**, and even damage

Coral transplantation and mangrove debris removal, Tioman Island, Malaysia. Source: www.divetioman.com

from **recreational activities**. Coralku, an organisation involved in Malaysian reef restoration, highlighted that pollution, high temperatures, and limited funding have hampered long-term restoration success. Significant bleaching events in 2019 and 2020 further threatened coral resilience and exacerbated previous damage (Coralku, Reef Resilience).[47]

Effective reef restoration demands high investment, consistent funding, and ecological understanding of each site's conditions. The Thailand experience revealed that closing off coral sites and regulating tourism could help, but this also required strong collaboration with local industries and robust management to prevent displacement of tourists to other fragile areas. The Malaysia example showed that ongoing community and governmental collaboration, pollution control, and ecological monitoring are essential for supporting coral health and minimising impacts from human activities (Reef Resilience).

[47] Source: https://www.reefcheck.org/reef-check-malaysia-talks-reef-resilience/

P3: Unadopted Slope Stabilisation Efforts in Upland Areas

- In the Philippines, a **rainfall-induced landslide** in Benguet Province highlighted the complexity of stabilising slopes in tropical, high-rainfall areas. Planting initiatives here failed largely due to **inappropriate plant selection** and **poor soil conditions.**[48]

Landslide of Barangay Ucab, Itogon after passage of Typhoon Ompong in 2018, the Philippines. Source: pna.gov.ph

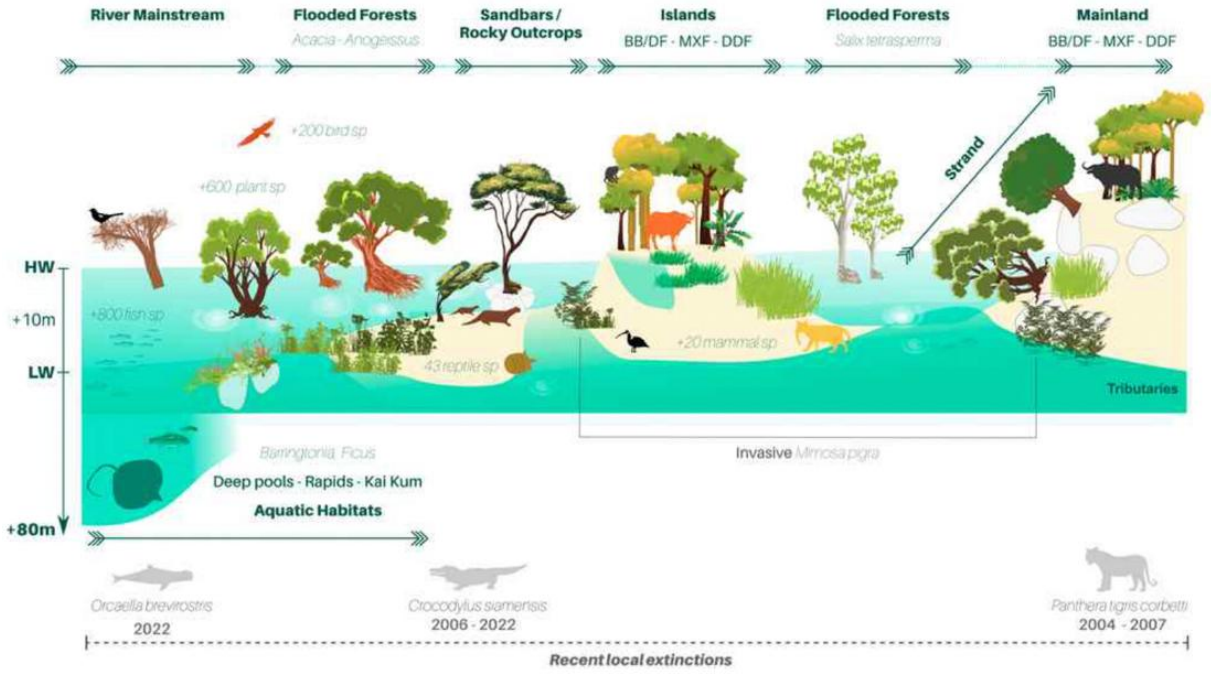
- In the highlands of Vietnam, efforts to stabilise slopes with vegetation were unsuccessful when **non-native species with shallow roots could not hold soil** on steep, eroded slopes effectively. In both cases, lack of regular maintenance and follow-up monitoring allowed invasive species to overtake stabilisation plantings, undermining project goals.[49]

Lessons learned highlight the importance of thoroughly understanding floodplain dynamics, engaging local communities from project inception, and mitigating external impacts like upstream water diversions. Improved success can be achieved by balancing environmental restoration with agricultural needs, promoting local stewardship, and ensuring that NbS projects in floodplains are adaptable to changing hydrological conditions in the Southeast Asian context.

[48] ADPC report on the *Landslide Mitigation Demonstration Project* in Baguio, Philippines.
[49] *Optimising Partnerships for Biodiversity Conservation in Vietnam* by Wallace et al.

P4: Ineffective Floodplain Restoration

- **Stung Treng Ramsar Site** (Cambodia) suffers from the challenges endured by floodplain ecosystems because of **upstream dam operations**. These activities **alter natural flooding cycles**, critical for supporting unique flooded forests and biodiversity.[50] For instance, unnatural water releases during dry periods prevent the seasonal exposure necessary for vegetation and wildlife, leading to habitat loss and impacting communities that rely on fishing and tourism. This case underscored the need to account for upstream hydrology, particularly when competing water needs affect local NbS objectives.[51]



Climate Change Vulnerability Assessment Stung Treng Ramsar Site, Cambodia. Source: IUCN (report)

[50] **"Stung Treng Ramsar Site in Cambodia: Integrating Fisheries Management and Wetlands Conservation (Phase II)"** by the Critical Ecosystem Partnership Fund (CEPF)

[51] https://rainforestjournalismfund.org/projects/when-flooded-forest-drowning

The primary lessons for creating effective, flood-responsive riverine landscapes, especially from the challenges observed in Cambodia floodplain restoration efforts, revolve around several key factors:

- *Hydrological Alignment: Understanding and respecting natural water flows, seasonal flood cycles, and upstream water management is crucial. Disruptions, such as those from upstream dam operations, can lead to either drying out or overwhelming floodplain areas, undermining restoration efforts. Integrating these natural cycles into project planning can improve the resilience and functionality of NbS projects.*
- *Community and Stakeholder Engagement: Involving local communities, especially agricultural and indigenous groups, is essential to project success. When agricultural interests were overlooked, resistance to NbS measures arose.*
- *Ecological Suitability: Choosing appropriate plant and vegetation types for the specific landscape and hydrology ensures better survival and effectiveness. Native, flood-tolerant species, for instance, are better suited to riverine and floodplain environments.*
- *Long-term Monitoring and Maintenance: Continuous assessment and intervention help address challenges like invasive species encroachment, vegetation health, and changing hydrological conditions.*

Change Vulnerability Assessment Stung Treng Ramsar Site, Cambodia.
Source: IUCN (report)

P5: Urban Greening and Wetland Conservation Failures

- Urban greening and wetland conservation projects in Bangkok have seen varied results, with some initiatives struggling to meet long-term sustainability goals due to urban pressures. Notably in Bangkok, projects intended to create **urban wetlands** and **pocket parks** aimed at cooling the city and managing stormwater have faced challenges. Key obstacles included the **high cost of urban land**, the **competitive demands for** space in dense city centres, and the **absence of robust legal protections** to prevent encroachment on green spaces. Over time, restored wetlands were often neglected or converted back to build spaces, limiting the environmental benefits they were initially designed to deliver

- In Jakarta, initiatives to restore green spaces and conserve urban wetlands aimed to alleviate urban flooding and heat. However, local complexities and **lack of maintenance by** communities meant that these green spaces sometimes deteriorated, leading to ineffective water management and **limited biodiversity enhancement.** The city's 'Building with Nature' initiative tried to include community input, but without long-term maintenance and awareness programs, green spaces were often degraded by encroachment or pollution, diminishing their effectiveness as nature-based solutions.

Aerial view of Tebet Eco garden in South Jakarta.
Source: Syafiq Basri Assegaf

Increasing the chances of success of urban greening and wetland conservation projects requires to approach these initiatives with an understanding of local urban dynamics and to incorporate community participation throughout the project lifecycle. Securing long-term legal protection and integrating urban green spaces into zoning policies can also mitigate the risk of encroachment. Building partnerships between urban planners, local government, and communities fosters accountability, while ongoing maintenance plans help sustain ecological benefits. These insights contribute to shaping 'climate-sensitive landscape categories', ensuring that urban greening projects can adapt to local needs and remain resilient in rapidly urbanising regions of Southeast Asia.

These few examples illustrate best the complex interaction between NbS projects and site conditions, local communities and broader landscape-based approaches needed in effective water management, scalable and long-term positive impacts on ecosystems, renaturation, community involvement and prosperity. It also highlights the need for adapted governance between communities, regions, countries and the private sector to facilitate their cooperation and reach sustainable results.

6. Best Practices of NbS-related Projects in Cambodia, Indonesia, Lao PDR, Philippines, Thailand, Vietnam

This section provides an overview of some of the active and completed projects related to Nature-based Solutions (NbS) that are found relevant to represent the issues and solutions in the six key countries: Cambodia, Indonesia, Lao People's Democratic Republic, the Philippines, Thailand, and Vietnam. Each of these states faces distinct environmental challenges, including deforestation, biodiversity loss, climate vulnerability, and rural poverty, which are increasingly affected by the impacts of climate change. Methods related to NbS have emerged as an approach to address these issues, integrating ecosystem restoration, sustainable land use, and climate adaptation strategies. By identifying key projects and initiatives related to NbS, this review highlights the various approaches each country takes to address the challenges posed by climate change.

The assessment for each of the projects are following the 2020 IUCN Global Standard for NbS. The eight criteria serve as a tool to assess how well each project aligns with the NbS framework. These criteria evaluate the degree to which each project integrates essential elements of NbS. In assessing each project, the criteria can help determine how effectively projects consider larger ecological, social, and economic contexts, manage trade-offs, and implement adaptive management practices. It is important to note that each project does not go through all eight of the Global Standard NbS criteria but instead discuss those are the most relevant for the project.

This includes how well NbS principles and objectives are strategically integrated into each of the project designs and the contribution of the project to the broader implementation of NbS. The review seeks to highlight the transformative potential of NbS in achieving long-term ecological and socio-economic benefits by exploring how NbS is incorporated into project frameworks and implementation. For the completed projects where evaluation reports are accessible, a project evaluation and analysis of project performance are included in the review, as well as the implementation progress of these initiatives and whether they met their intended objectives.

While this is not a full-scale list of all relevant projects, it serves as a representative sample of the issues and solutions emerging in each country by offering insights into how these nations leverage NbS. Through this analysis, readers can better understand the directions each state is pursuing in its effort to combat climate change impacts using nature-based approaches. By examining these projects, this review can help illustrate how NbS is being integrated into national and regional responses to climate change, as well as the progress made toward building a more sustainable and climate-resilient future in the region.

The beginning of each country's section will feature an overview of the key challenges faced in that country will and a summary of the focus areas of the projects being implemented to address those challenges.

Cambodia

Cambodia faces challenges related to rapid deforestation, driven by unsustainable agricultural practices, illegal logging, and the impacts of climate change which threatens biodiversity and exacerbates rural poverty. Communities, particularly those living near protected areas, are increasingly reliant on forest resources for their livelihoods, leading to further environmental degradation. Erratic rainfall patterns, coupled with reliance on single-crop agriculture, have resulted in declining agricultural productivity, which increases food insecurity and vulnerability to climate impacts.

In response, various projects in Cambodia focus on diverse fields such as ecosystem restoration, sustainable agricultural practices, community capacity building, and biodiversity conservation. These initiatives aim to enhance climate resilience among rural communities by promoting sustainable land use, improving water management, and increasing awareness of eco-friendly practices. Through these efforts, projects seek to create a balance between environmental conservation and community well-being with the goal of enhancing food security, protecting critical ecosystems, and ensuring sustainable livelihoods. By addressing both ecological and socio-economic challenges, these projects contribute to a more resilient future for Cambodia's rural populations.

Enhancing Climate Change Resilience of Rural Communities Living in Protected Areas of Cambodia[52]

Project details

Project title	Enhancing Climate Change Resilience of Rural Communities Living in Protected Areas of Cambodia
Funder	The Adaptation Fund
Implementing entity	United Nations Environment Programme (UNEP)
Executing entity	Cambodia's Ministry of Environment
Start date	May 21, 2013
Completion date	December 2021
Total project cost	USD 4,799,991.97
Project location	Cambodia

Problem description

Rural communities in Cambodia, particularly those surrounding five Community Protected Areas (CPAs), are facing declining agricultural productivity due to increasingly erratic rainfall caused by climate change. This variability is leading to more frequent and severe droughts and floods, damaging crops, infrastructure, and the ability of farmers to transport goods to market. As a result, many farmers are turning to forest ecosystems for food and income, exacerbating deforestation and soil erosion, and further reducing the resilience of these agricultural communities. The heavy reliance on rain-fed agriculture, compounded by poverty and the dependence on a single crop (rice), leaves these communities particularly vulnerable to climate change impacts. Addressing these issues requires strategies that both increase food security and reduce soil erosion, while simultaneously promoting sustainable forest management to mitigate further environmental degradation.

[52]Terminal Evaluation report of the project can be found here: https://wedocs.unep.org/bitstream/handle/20.500.11822/40420/khm_mie_food_2011-1_unep_afb_spcc_cambodia%20af.pdf (UNEP, 2022)

Scope of project

The project aims to strengthen the resilience of communities living around five CPAs and downstream areas to the impacts of climate change, particularly erratic rainfall. The project seeks to achieve this by promoting eco-agriculture interventions, improving institutional capacity, and raising awareness. The project wants to enhance both ecosystem health, such as reducing soil erosion and improving water flow, and human welfare, including increasing household income and reducing climate vulnerability. It also seeks to generate and scale up technical knowledge to inform national climate change policies and promote sustainable agriculture practices beyond the initial project areas.

Activities and impact

- The project supported the planting of a total of 947,690 indigenous trees, or equivalent to around 2,370 ha of forest planting. The project also provided 518,542 fruit trees for planting in *chamkar*[53] and home-garden plots.
- Restoration of degraded forest has been implemented on 72.3 ha. In some areas improvement was visible, but there are also plots with poor tree growth due to the planting of species inappropriate to the soil type and/or because of poor subsequent care and maintenance. Water supply shortages were identified as a significant challenge for the CPA communities. To address this, the project implemented an extensive water supply program which included the installation of spring capture systems, wells, ponds, and household rainwater harvesting systems.
- Three community nurseries were established to provide seedlings. The project supported the construction of four Road Rest Area buildings as well as a wildlife viewing facility at one site.
- The project enhanced and diversified home gardens by providing training and distribution of equipment and planting materials to 1,193 households. As a result, most of these households have sustained their gardening efforts, leading to an increase in the quantity and the variety of available food, as well as cash income for some households.

Budget[54]

Total Project Cost	**USD 4,799,991.97**
Project Component 1: Conducting biophysical, ecological, and socioeconomic research to develop restoration protocols for eco-agriculture interventions	USD 440,883.33
Project Component 2: Using the information generated under Component 1 to implement on-the-ground forest restoration (i.e. establish multi-use forests) and conservation agriculture interventions in the targeted sites	USD 3,362,357.43
Project Component 3: Institutional capacity, awareness raising and upscaling of eco-agriculture interventions	USD 278,884.4
Project Execution Cost (Management, Monitoring and Evaluation)	USD 329,743.81
Project Cycle Management Fee (UNEP)	USD 388,123

[53] *Chamkar* is a term in Cambodia referring to agricultural or agroforestry plots, often used for small-scale farming or cultivation of crops

[54] Actual project spending. To access the planned project budget please see: https://www.adaptation-fund.org/project/enhancing-climate-resilience-of-rural-communities-living-in-protected-areas-of-cambodia/ (AF, 2012).

Project evaluation

The project demonstrated moderate success in achieving its goals of increasing food supply and reducing soil erosion in communities surrounding five CPAs in Cambodia. It contributed to stabilising and protecting forest cover, though its long-term conservation is still uncertain. The mixed strategy of tree planting, including *chamkar* and home gardens, increased tree cover and enhanced climate change resilience, particularly through water supply interventions and diversified crop production, improved food security. However, the project's impact on forest conservation was modest, with livelihood interventions not directly incentivising forest preservation. While the project exceeded its tree-planting targets, the overall adoption of eco-agriculture was limited. Community involvement was strong, but understanding of the project's broader purpose was fragmented.

The Southern Cardamom Reducing Emissions from Deforestation and Forest Degradation Project, Cambodia[55]

Project details

Project title	The Southern Cardamom REDD+ Project (SCRP)
Funders	Wildlife Alliance, Barbara Delano Foundation & Royal Government of Cambodia
Implementing and executing entity	Royal Government of Cambodia, Ministry of Environment (MoE)
Start date	January 1, 2015
Completion date	December 31, 2044
Total project cost	USD 5,150,000 annually
Project location	Cambodia; Koh Kong Province

Problem description

The southwestern highlands of Cambodia, Koh Kong province, are characterised by hilly evergreen forests that are increasingly threatened by deforestation that is largely driven by unsustainable agricultural practices, like slash-and-burn farming and shifting cultivation. These methods lead to severe soil degradation, loss of biodiversity, and a reduction in forest cover. Additionally, the region faces significant socio-economic challenges, including poverty, food insecurity, and inadequate public health services, exacerbated by rapid population growth and limited access to resources. The project zone, with its diverse topography and ecosystems, including critical watersheds and mangrove forests, is under threat from illegal logging, hunting, and inadequate land use planning.

Scope of project

The primary aim of the SCRP is to mitigate deforestation and forest degradation while enhancing local livelihoods and conserving biodiversity in the Cardamom Mountains Rainforest Ecoregion. By protecting 445,339 hectares of forest, it seeks to reduce greenhouse gas emissions by approximately 3.58 million tonnes of CO2 equivalent annually, aligning with Cambodia's Reducing Emissions from Deforestation and Forest Degradation (REDD+) goals. Additionally, the project enhances local livelihoods through sustainable practices, such as conservation agriculture, eco-tourism, and education, fostering a balance between ecological conservation and socio-economic development. The initiative also supports biodiversity conservation, ensuring critical habitats for 52 IUCN threatened species are preserved, and aims to improve local healthcare, education, and community well-being. The goal is to create a sustainable balance between conservation and development, ensuring long-term ecological and community benefits.

[55] Project description by Wildlife Works can be found here: https://www.ecosoul.io/wp-content/uploads/2020/11/Cardamom-Project-Description.pdf (Wildlife Works, 2018).

Activities and impact

- The SCRP project aims to train local communities in sustainable agricultural practices, focusing on soil health, zero-tillage techniques, water retention, reducing land degradation, and increasing crop yields.
- It seeks to develop community-based eco-tourism infrastructure (e.g., guesthouses, trails, campsites), expected to create new job opportunities while promoting conservation.
- Improved health facilities, including enhanced rainwater collection systems and sanitation in schools, aim to improve healthcare access for over 16,000 people in remote areas.
- Micro-finance initiatives provide access to capital for small enterprises or family businesses, helping reduce illegal logging and farming cultivation by offering sustainable income alternatives such as micro-loans, micro insurance, and other small and medium enterprise development practices providing more sustainable and valuable alternatives to current destructive forest practices.
- The project also strengthens land tenure security through participatory land-use planning, helping to prevent deforestation by ensuring secure land rights for local farmers.

Keo Seima REDD+, Protecting tropical forests and generating carbon credits in Cambodia[56]

Project details

Project title	Reduced Emissions from Deforestation and Degradation in Keo Seima Wildlife Sanctuary
Most prominent funders	Asian Development Bank, Eleanor Briggs, JICA, MacArthur Foundation, USAID, WCS Strategic Investment Fund & Winrock International
Implementing and executing entities	Royal Government of Cambodia, National Council for Sustainable Development, MoE & Wildlife Conservation Society
Start date	January 1, 2010
Completion date	December 31, 2069
Total project cost	USD 6,450,420
Project location	Cambodia; Mondilkiri Province

Problem description

The Keo Seima Wildlife Sanctuary covers 292,690 hectares in eastern Cambodia. This area is vital for numerous globally threatened species but faces significant threats from deforestation, illegal logging, and unsustainable resource extraction. The Sanctuary's rich biodiversity, including species like the Asian elephant and Yellow-cheeked Crested Gibbon, is at risk. Local communities also struggle with inadequate legal protection, limited land tenure security, and unsustainable livelihoods that further exacerbate deforestation. Despite its ecological importance, the sanctuary is under severe pressure which endangers the rich biodiversity and the livelihoods of local communities which depend on the forest for their cultural identity and subsistence.

[56] Project description by Wildlife Conservation Society for the Ministry of Environment of the Royal Government of Cambodia is named "Keo Seima Wildlife Sanctuary, Cambodia v7.1" from November 11 2015. (WCS Cambodia, 2015).

Scope of project

The Seima REDD+ Project aims to achieve a dual objective: conserving and restoring biodiversity values while protecting the livelihoods of local communities within the Keo Seima Wildlife Sanctuary. By addressing both environmental and socio-economic challenges, the project seeks to mitigate deforestation, enhance legal protections, and support sustainable development. Focusing on climate benefits, the project targets a reduction of 14 million tCO_2 equivalent in greenhouse gas emissions over the next decade through avoided deforestation. It also aims to secure forest areas that are crucial for the survival of approximately 12,500 people residing in over 2,500 households across 20 villages. This includes strengthening tenure rights and enhancing local livelihoods by supporting alternative income-generating activities, such as ecotourism and sustainable agricultural practices.

Activities and impact

- The project aims to create a legal and planning framework which includes the approval and implementation of critical management plans and legal documents, and support for indigenous land titling and land-use planning.
- Community and infrastructure development will be advanced through the provision of alternative livelihoods, skill development, and the construction of infrastructure such as bridges, water systems, and market gardens.
- Conservation efforts will prevent the destruction of nearly 30,000 hectares of critical ecosystems, safeguarding habitats for endangered species such as the Asian elephant and Yellow-cheeked Crested Gibbon.
- Biodiversity benefits will include the protection of forest landscapes crucial for over 2,500 households and the persistence of important species and ecosystems.

Climate and financial benefits will be realised through the generation of significant carbon credits and the allocation of carbon revenue to support community investment priorities.

Indonesia

Indonesia faces significant challenges related to environmental degradation, particularly in coastal and forest ecosystems. Issues such as coastal erosion and flooding are exacerbated by the loss of mangroves, unsustainable land use practices, illegal logging, and the impacts of climate change. These challenges threaten not only biodiversity but also the livelihoods of local communities that depend on these ecosystems for their well-being.

To address these pressing issues, projects related to NbS are being implemented across Indonesia. These initiatives span in several fields, including coastal management, sustainable aquaculture, land management, and community forest conservation. They aim to restore degraded ecosystems, enhance biodiversity, and improve the resilience of local communities against climate impacts. The projects work towards restoring coastal ecosystems by rehabilitating mangroves and employing innovative structures to mitigate erosion and flooding. In forested areas, efforts are directed at securing land tenure rights for local communities, promoting sustainable forest management, and reducing greenhouse gas emissions through carbon credit systems. By integrating ecosystem-based approaches into local and national planning, these initiatives not only aim to enhance environmental resilience but also seek to empower local communities, promote sustainable livelihoods, and facilitate innovative financing mechanisms. Ultimately, these projects reflect a commitment to fostering a more sustainable and resilient future for Indonesia's diverse ecosystems and the communities that rely on them.

Building with Nature Program in Indonesia[57]

Project details

Project title	Building with Nature in Indonesia
Funders	Dutch Sustainable Water Fund, German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety as part of the International Climate Initiative, Dutch Postcode Lottery, Partners for Resilience, Waterloo Foundation, Otter Foundation, Topconsortia for Knowledge and Innovation and Mangroves for the Future
Implementing entity	Wetlands International & EcoShape
Executing entity	Indonesian Ministry of Marine Affairs and Fisheries, Indonesian Ministry of Public Works and Housing
Start date	September 2015
Completion date	June 2021
Total project cost	EUR 8,000,000
Project location	Indonesia; Demak District, Northern Java

Problem description

Indonesia's coastal areas have faced severe erosion and flooding, primarily due to the loss of mangroves which have been replaced by aquaculture ponds. Factors contributing to the crisis include excessive groundwater extraction causing land subsidence, disruption of sediment and water flows by river engineering and poorly designed sea walls, and the impacts of climate change. The result has been the consumption of rice fields and aquaculture ponds, significant production losses, and displacement of communities. Approximately 70,000 people and 6,000 hectares of aquaculture ponds are at risk of future sea invasions if current trends continue.

[57] Information is sourced from the publication "Building with Nature in Indonesia 2015-2021" by Tonneijck, van der Goot & Pearce (2022).

Scope of project

The Building with Nature project aims to address the crisis by restoring mangrove forests and revitalising aquaculture through an integrated approach. This approach involved using semi-permeable structures to stabilise coastlines, enhancing conditions for mangrove regrowth, and applying sustainable aquaculture practices. The goal was to mitigate erosion and flooding, support local livelihoods, and provide a resilient, sustainable coastal environment. The project also sought to share lessons and develop guidelines for broader application in Indonesia and other vulnerable regions.

Activities and impact

- Constructed 9 km of semi-permeable brushwood structures to stabilise the coastline and encourage sediment accumulation.
- Rehabilitated 464 hectares of mangroves and improved protection for an additional 60 hectares.
- Increased aquaculture productivity by 3 times, benefiting local farmers and communities.
- Enabled the implementation of nine village development plans and influenced national policies, reaching around 10,000 people directly and potentially 70,000 if subsidence is mitigated.
- Facilitated the adoption of best aquaculture practices on over 400 hectares, leading to enhanced income and productivity.

NbS for Land and Seascapes in Indonesia[58]

Project details

Project title	Land- and Seascape Solutions for Indonesia
Funders	International Climate Initiative (IKI) of the German Federal Ministry for the Environment & Nature Conservation, Building and Nuclear Safety (BMUV), Government of Germany
Implementing entity	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ)
Executing entities	Indonesian Biodiversity Foundation, International Centre for Research in Agroforestry & SNV Netherlands Development Organisation - Indonesia
Start date	May 2022
Completion date	December 31, 2028
Total project cost	EUR 15,000,000[59]
Project location	Indonesia; Bangka Belitung Province, Central Sulawesi Province & Central Java Province

Problem description

Indonesia's ecosystems face serious threats due to inadequate landscape management and unsustainable land use practices, accelerating environmental degradation. Increasing deforestation and frequent hydrometeorological disasters intensify biodiversity loss, raise greenhouse gas emissions, and heighten climate vulnerability. Despite its rich biodiversity, Indonesia's ecosystems are becoming more fragile and local communities reliant on these ecosystems are increasingly vulnerable to the impacts of climate change.

[58] Information for the project is sourced from the project description by IKI and GIZ.
Project description by IKI: https://www.international-climate-initiative.com/en/project/nature-based-solutions-for-land-and-seascapes-in-indonesia-lasso-22-iv-117-idn-g-lasso/ (IKI, 2024a).
Project description by GIZ: https://www.giz.de/en/worldwide/151925.html (GIZ, 2024).
[59] As of September 26, 2024, a budget for the project has not been published.

Scope of project

The project aims to mitigate the degradation of land and seascapes across 600,000 hectares in Indonesia, promoting ecosystem resilience and fostering climate-resilient livelihoods. By incorporating green and blue economy principles into national, sub-national, and local planning, the project will empower local stakeholders that is particularly farmers, youth, women, and indigenous groups, to engage in sustainable practices. Through impact investment, innovative financing, and capacity-building initiatives, the project supports the development of national policies and fosters sustainable economic opportunities.

Activities and impact

- Support the sustainable management of 600,000 hectares of land and seascapes.
- Develop national policies that integrate ecosystem approaches into spatial and development planning.
- Establish planning laboratories for land and seascape management in pilot areas across three provinces.
- Promote sustainable business models, such as ecotourism and integrated waste management.
- Facilitate access to innovative financing and public-private-community partnerships for ecosystem-based livelihood development.

REDD+ Ketapang Community Carbon Pools[60]

Project details

Project title	Ketapang Community Carbon Pools (KCCP)
Funders	David and Lucile Packard Foundation; Australian Aid; Climate and Land Use Alliance; European Union (EU); USAID Orangutan Conservation Service Program & UK Foreign and Commonwealth Office
Implementing entity	Fauna and Flora International (FFI), Indonesia
Executing entities	Dian Tama, Titian, Rimbawan Muda Indonesia, Lembaga Alam Tropika Indonesia, Alam Sehat Lestari, Yayasan Palung, People Resources and Conservation Foundation & the University of Indonesia
Start date	2008
Completion date	Ongoing[61]
Total project cost	USD 600,000
Project location	Indonesia; Ketapang District, West Kalimantan

Problem description

The forest landscape in Ketapang, West Kalimantan, has been experiencing severe threats due to illegal and unsustainable logging, conversion to oil palm plantations, and mining activities. Despite being rich in biodiversity, particularly for the endangered Bornean orangutan, these forests are primarily managed under customary law by local Dayak and Malay communities but are formally categorised as state forest land. This legal ambiguity creates tensions over land rights, hindering effective forest management and conservation efforts. With a significant annual deforestation rate of 74,590 hectares, these pressures not only threaten the ecosystem but also jeopardise the livelihoods of the local communities who rely on these forests for sustenance and income.

[60] Information for the project is sourced from the 2014 case book "REDD+ on the ground: A case book of subnational initiatives across the globe," published by CIFOR and edited by Sills, Atmadja, de Sassi, Duchelle, Kweka, Resosudarmo & Sunderlin.
[61] There is no fixed end date indicated, as KCCP is a community-based initiative that evolves with time and the changing landscape.

Scope of project

The primary aim of KCCP is to conserve critical habitats for the Bornean orangutan while reducing greenhouse gas emissions through sustainable forest management. This initiative seeks to secure community tenure rights by establishing *hutan desa*[62] (HD) status for seven villages, encompassing 104,162 hectares of forest. By integrating a top-down policy approach (REDD+) with a bottom-up community management strategy, the project aims to empower local communities, enhance governance, and create a sustainable framework for carbon credit generation to fund conservation activities. This approach does not only address environmental concerns but also aims to reduce poverty and improve community development.

Activities and impact

- The project aiming to secure *hutan desa* tenure status for seven villages, covering a total area of 104,162 hectares.
- Reduce Greenhouse Gas (GHG) emissions by promoting sustainable forest management practices among local communities.
- Engage local communities in conservation efforts, focusing on protecting the habitat of the Bornean orangutan.
- Facilitate community-based REDD+ initiatives to ensure effective governance and legal recognition of community rights.
- Strengthen local livelihoods through sustainable agricultural practices and the preservation of forest resources.

Project evaluation

The KCCP initiative has been facing challenges that impact its effectiveness in implementing REDD+. One primary challenge is land tenure uncertainty. The government's issuance of licenses for forest land use often conflicts with community claims, creating ambiguity regarding land rights. This situation diminishes the incentives for communities to protect their forests, which is vital for the success of REDD+. Another challenge has been the protracted process of obtaining *hutan desa* tenure as the steps required for securing *hutan desa* rights are intricate and time-consuming, often taking years to complete. As of October 2014, none of the intervention villages had secured management rights, leaving community members doubtful about receiving benefits from REDD+. Meanwhile, external pressures, particularly from oil palm companies offering financial incentives, threaten to erode community support for REDD+ initiatives, highlighting the need for a more expedient process in awarding *hutan desa* status to villages.

Despite these challenges, KCCP exemplifies a creative integration of REDD+ and local rights initiatives. However, the top-down national REDD+ policies do not align effectively with the bottom-up approach of the *hutan desa* framework. The complex and lengthy process of obtaining HD licenses poses barriers to the successful implementation of REDD+. This situation highlights the critical need for organisations like FFI to play an important role in facilitating effective communication between communities and different levels of government.

[62] *Hutan Desa* refers to a community-based forest management scheme in Indonesia, where local villages are granted legal rights to manage and protect state forest land for sustainable use and conservation.

Lao People's Democratic Republic

In the Lao People's Democratic Republic (Lao PDR), the challenges associated with NbS are significant, primarily stemming from its vulnerability to climate change impacts. As a Landlocked Developed Country (LDC), Laos experiences extreme weather events, rising temperatures, and erratic precipitation, which exacerbate health risks and damage infrastructure, particularly in rural areas. The increasing frequency of floods and climate-sensitive diseases poses considerable threats to public health, water supply, and sanitation systems.

To address these pressing issues, various projects are being developed across multiple sectors, focusing on health resilience, urban flood management, and wetland restoration. These initiatives aim to strengthen the health system's climate resilience, improve water, sanitation, and hygiene (WASH) services, and enhance community capacities to manage climate-related health risks. In urban areas, projects are shifting from traditional grey infrastructure to ecosystem-based adaptation (EbA) approaches, promoting the restoration of wetlands and urban ecosystems to mitigate flooding and improve urban planning. The overarching goals of these projects include reducing vulnerability to climate change, enhancing ecosystem services, promoting sustainable economic growth, and ultimately building resilient communities capable of adapting to ongoing environmental changes.

Strengthening Climate Resilience of the Lao PDR Health System[63]

Project details

Project title	Strengthening Climate Resilience of the Lao People's Democratic Republic Health System
Funders	Green Climate Fund (GCF), Government of Lao PDR, World Health Organization (WHO) & an individual donor
Implementing entities	Save the Children International (SCI), Government of Lao PDR, & WHO
Executing entities	Government of Lao PDR, Ministry of Health, & SCI Laos
Project lifetime	15 years (Approval date: October 25, 2023)
Total project cost	USD 28,174,178
Project location	Lao PDR

Problem description

As a landlocked LDC in Southeast Asia, Lao PDR faces significant vulnerability due to climate change, exacerbating existing health risks. Rising temperatures and increasingly variable precipitation patterns are leading to a higher incidence of climate-sensitive diseases such as dengue and diarrheal illnesses. The health sector is directly impacted by more frequent extreme weather events that damage infrastructure, including WASH services, especially in rural underserved regions. Despite national strategies aimed at climate resilience, Lao PDR lacks the financial resources and infrastructure to adapt its health system to the increasing challenges posed by climate change.

Scope of project

The project aims to enhance the climate resilience of Lao PDR's health system by strengthening governance, improving access to climate data, upgrading infrastructure, and building community capacities to manage climate-related health risks. This will be achieved through climate-resilient health strategies, enhanced WASH services, improved health monitoring, and empowering rural communities to respond effectively to climate risks which will benefit 2,322,593 people through policy reforms and capacity-building efforts.

[63] The primary information for this project is available on the project website of GCF and a project descriptive document by Save the Children. For additional details on the budget and description outputs, the 2023 Funding Proposal by GCF, titled "SAP030: Strengthening Climate Resilience of the Lao People's Democratic Republic (PDR) Health System," has been referenced (GCF, 2023f). Project website of GCF: https://www.greenclimate.fund/project/sap030 (GCF, 2023g). Project descriptive document by Save the Children: https://resourcecentre.savethechildren.net/pdf/GCF-Lao-Solutions-Showcase-Case-Study_FINAL.pdf/ (Save the Children, 2023).

Activities and impact

- Improve infrastructure in 79 health facilities to enhance climate resilience and reduce greenhouse gas emissions.
- Strengthen climate-related governance in 25 vulnerable rural districts to manage disease outbreaks and health risks.
- Build capacity for 250 communities to respond to early warnings and manage climate-related health risks.
- Upgrade WASH infrastructure and improve access to climate data for better health service delivery.

Budget[64]

Overview of financiers:

Name of Institution	Amount
GCF	USD 24,978,084
Government of Lao PDR	USD 1,483,594
WHO	USD 1,312,500
Individual donor[65]	USD 400,000
Total funding	**USD 28,174,178**

Description of financial elements of the project:

Sub-component	Amount
Output 1.1 Health strategies, policies, and guidelines are informed by climate change information	USD 1,584,687
Output 2.1 Climate-resilient health data system is strengthened	USD 2,246,114
Output 2.2 Utilisation of the climate-resilient health data system is strengthened	USD 3,097,203
Output 3.1 Improved health worker competence and capacity to address health effects of climate change	USD 2,695,734
Output 3.2 Rural health facility infrastructure is climate-resilient and energy efficient	USD 12,166,457
Output 4.1 Improved knowledge of climate change impacts on health and increased community participation capacity in defining health and climate change priorities and gaps	USD 3,854,373
Monitoring and Evaluation (M&E)	USD 1,240,000
Project management	USD 1,289,610
Total cost	**USD 28,174,178**

Building resilience of urban populations with ecosystem-based solutions in Lao PDR[66]

[64] The overview of financial elements is to be found in GCF's Funding Proposal from 2023 (GCF, 2023f). Since this is a financial proposal, the figures presented are budgeted rather than final amounts.
[65] In the Funding Proposal, the identity of the donor is unknown.
[66] The primary information for this project is available on the project website of GCF and their produced Funding Proposal from 2019, titled "SAP009: Building resilience of urban populations with ecosystem-based solutions in Lao PDR," has been referenced (GCF, 2019a). Project website of GCF: https://www.greenclimate.fund/project/sap009 (GCF, 2019b).

Problem description

Cities in Laos are increasingly vulnerable to severe flooding due to the rising frequency and intensity of extreme rainfall events driven by climate change. Current flood management approaches in these rapidly urbanising areas rely heavily on grey infrastructure, which has proven insufficient to mitigate the impacts of pluvial flooding. Urban expansion without comprehensive planning has exacerbated the problem, with inadequate infrastructure and the loss of natural areas critical for water retention. As a result, floods cause significant economic and social losses, including damage to infrastructure, loss of livestock, and increased water-borne diseases.

Project details

Project title	Building Resilience of Urban Populations with Ecosystem-Based Solutions in Lao PDR
Funders	GCF & Ministry of Natural Resources and Environment (MoNRE), Government of Lao PDR
Implementing entity	UNEP
Executing entity	MoNRE, Government of Lao PDR
Start date	June 8, 2020
Completion date	June 8, 2025
Total project cost	USD 11,500,000
Project location	Lao PDR; Vientiane, Paksan, Savannakhet & Pakse

Scope of project

The project aims to transform urban flood management in Laos by shifting from traditional grey infrastructure solutions to an EbA approach. This integrated flood management strategy will reduce the vulnerability of urban populations to the impacts of climate change while enhancing local ecosystem services. Through the implementation of EbA in urban areas of Lao PDR, the project seeks to build government capacity, promote sustainable financing options, and establish a scalable model for flood management. The overall goal is to ensure urban areas develop in a climate-resilient manner, benefiting from green spaces and natural water management systems.

Activities and impact

- The project aims to reduce flood-related damages by implementing EbA measures, such as restoring wetlands and urban streams, benefiting over 40% of the population in urban areas.
- Strengthen technical capacity and create city-level integrated flood management strategies for Vientiane, Paksan, Savannakhet, and Pakse.
- Mitigate future flood damage, projected to exceed USD 250,000,000 annually, by introducing sustainable flood management systems that enhance climate resilience, reduce infrastructure damage, and lower the risk of water-borne diseases, as extreme rainfall events are expected to increase fivefold in the coming decades.
- Develop champions in government for EbA, mainstreaming these solutions into urban planning and budgeting, aligning with the National Adaptation Plan process.

Budget

Overview of financiers:

Name of Institution	**Amount**
GCF	USD 10,000,000
MoNRE	USD 1,500,000
Total funding	**USD 11,500,000**

Description of financial elements of the project:

Sub-component	Amount
Output 1.1 Strengthening of institutional capacity for integrated flood risk management and implementation of urban ecosystems-based adaptation and males and females with increased awareness of climate threats	USD 2,660,025
Output 1.2 Integrated Climate-resilient Flood Management Strategies and urban EbA guidelines developed for Vientiane, Paksan, Savannakhet and Pakse, and effective Flood Risk Management Committees as coordination mechanisms	USD 4,305,862
Output 2.1 Area of wetland restored contributing to flood reduction and sustainable management of the Nong Peung wetland in Paksan	USD 1,631,128
Output 2.2 Area of urban streams restored contributing to flood reduction and sustainable management of urban streams in Savannakhet and Pakse	USD 1,579,901
Output 2.3 Area of permeable paving solutions installed in public areas contributing to flood reduction in Vientiane, Paksan, Savannakhet and Pakse	USD 1,223,084
Project Management Cost	USD 500,000
Total cost	**USD 11,500,000**

Wetland Restoration for Sustainable Urban Adaptation in Lao PDR[67]

Project details

Project title	Nature-Based Solution for Urban Adaptation (NATURA) in Lao PDR, Phase 1
Funder	Ministry of Foreign Affairs and Trade of New Zealand
Implementing entity	Global Green Growth Institute (GGGI)
Executing entity	Government of Lao PDR (in collaboration with local stakeholders)
Start date	July 26, 2024
Completion date	Not announced
Total project cost	USD 6,500,000[68]
Project location	Lao PDR; Nong Loup Ian Wetland, Vientiane

Problem description

Vientiane, the capital of Lao PDR, faces significant challenges due to rapid urban expansion, population growth, and increasing climate change impacts. Wetlands, which previously provided natural flood mitigation, are being lost, leading to more frequent and severe flood events during the monsoon season. Floods affect 30-40% of some local communities annually, causing damage to homes and infrastructure. The intensity of monsoon storms has increased, amplifying the risks to vulnerable populations. Without intervention, these challenges will exacerbate, threatening both livelihoods and biodiversity in urban areas.

Scope of project

The NATURA project aims to reduce the impact of flooding on urban communities by restoring and enhancing wetland ecosystems. The project specifically targets the restoration of the Nong Loup Ian wetland to improve urban flood resilience, support 140,000 people directly over two phases, and promote sustainable development in Vientiane. By integrating NbS into urban planning, the project contributes to climate adaptation, biodiversity preservation, and community livelihoods while promoting inclusive economic growth.

[67] The information for this project is sourced from the GGGI website from the project launched: https://gggi.org/government-of-lao-pdr-government-of-new-zealand-and-gggi-launch-new-urban-wetland-restoration-program-in-vientiane-capital/ (GGGI, 2024).
[68] These are the funding allocated for Phase 1 of the project

Activities and impact

- Restore Nong Loup Ian wetland to improve flood management and resilience in Vientiane, directly benefitting 140,000 people through flood risk reduction.
- Enhance biodiversity conservation by incorporating ecosystem restoration into national and local planning.
- Provide green jobs and livelihood opportunities for the local community.
- Implement sustainable urban planning and capacity-building initiatives to foster climate resilience and awareness.

Philippines

In the Philippines, numerous challenges are associated with implementing NbS due to widespread environmental degradation, particularly in forest ecosystems. Approximately 60% of the country's original forest cover has been lost, severely impacting biodiversity, rural livelihoods, and the nation's ability to mitigate climate change. The majority of remaining forest is classified as degraded, which exacerbates poverty and food insecurity among rural communities reliant on these natural resources.

To address these issues, projects focus on reforestation, sustainable forest management, agroforestry, and climate-resilient agricultural practices. These initiatives aim to restore degraded ecosystems while simultaneously improving the socio-economic conditions of local communities. For instance, projects related to reforestation and sustainable land management seek to enhance forest cover and biodiversity, while promoting sustainable livelihoods through community engagement in forest restoration activities. Other efforts aim to increase agricultural resilience by supporting farmers in adopting climate-resilient practices, improving access to climate information, and developing local capacities to withstand climate-related impacts.

The National Greening Program in the Philippines[69]

Project details

Project title	National Greening Program (NGP)
Funder	Government of the Philippines
Implementing entity	Department of Environment and Natural Resources (DENR)
Executing entities	DENR in collaboration with the National Convergence Initiative, Department of Agriculture (DA), Department of Agrarian Reform, and other various stakeholders
Start date	Calendar year (CY) 2011
Completion date	CY 2016. (Extended to CY 2028[70])
Total project cost	PHP 47,224,57,000[71]
Project location	Philippines

Problem description

By 2010, the Philippines had lost approximately 60% of its original forest cover, leaving only 6.84 million hectares of the 15.8 million hectares classified as forestland, which placed enormous pressure on the country's biodiversity, rural livelihoods, and ability to mitigate climate change. With the vast majority of the remaining forest classified as degraded open forest (67.2%), there has been an urgent need for reforestation and better forest management to reverse deforestation and prevent further environmental degradation. The socio-economic conditions of rural communities, which are heavily dependent on these lands, worsened as access to natural resources dwindled, driving poverty and food insecurity.

Scope of project

The NGP's central aim is to restore the Philippines' degraded forest cover while simultaneously addressing the socio-economic needs of rural and upland communities. The program intends to achieve this by reforesting degraded, denuded, and unproductive forestlands, promoting sustainable forest management practices, and supporting agroforestry initiatives. Additionally, the NGP aims to contribute to the country's efforts to combat climate change by enhancing carbon sequestration through tree planting. Beyond environmental restoration, the program also seeks to reduce rural poverty by providing

[69] Based on the Performance Audit Report of NGP from 2019. Published by Commission on Audit, Republic of the Philippines (Commission on Audit, 2019).

[70] The NGP was initially set to run from 2011 to 2016, however, it has been extended by the new title Enhanced National Greening Program (Executive Order 193 of 2015) running from 2016 to 2028. See the sub-chapter "Enhanced National Greening Program" below.

[71] As of September 18, 2024, the currency exchange rate from Philippine pesos to euros results in PHP 47,224,575,000 being equivalent to EUR 761,480.28.

livelihood opportunities to the beneficiaries in forest-related activities, such as seedling production, site preparation, and maintenance. Although initially focused on reforesting 1.5 million hectares by 2016, the program's extension to 2028 aims to cover an additional 7.1 million hectares, reflecting a long-term strategy to enhance forest ecosystems, improve biodiversity, and stabilise rural livelihoods.

Activities and impact

- The NGP achieved a net increase in forest cover of 177,441 hectares from 2010 to 2015. The largest gains have been seen in open forest areas, accounting for 90,044 hectares. However, despite this progress, the program only managed to reach 13.92% of its initial target of reforesting 1,500,000 hectares, indicating significant shortfalls between planned outcomes and actual results.
- Additionally, the closed forest cover in the Philippines has seen a natural increase of 94,329 hectares, largely due to the logging moratorium that has been implemented during this period. The moratorium helped protect existing forests from further deforestation, allowing for natural regrowth in several regions.
- To support the program's reforestation efforts, 11 mechanised nurseries were established, with an annual maintenance cost of PHP 55,000,000. These nurseries made seedling production more efficient. However, their limited geographic spread meant that not all People's Organisations (POs) were able to take advantage of the mechanised facilities, leading to disparities in access to seedlings.
- The program also aims to support local communities through agroforestry initiatives. Proceeds from these plantations have been designated for the benefit of local communities, and these groups are also prioritised in social protection programs like the Conditional Cash Transfer. This dual focus on agroforestry and social protection helped in both advancing reforestation and reducing poverty in rural areas.

Budget

Annual budget

Total project cost (2011 – 2019)	**PHP 47,224,575,000**
2011	PHP 1,380,729,000
2012	PHP 2,682,232,000
2013	PHP 5,811,737,000
2014	PHP 6,204,680,000
2015	PHP 8,167,805,000
2016	PHP 8,161,811,000
2017	PHP 7,060,707,000
2018	PHP 5,152,437,000
2019	PHP 2,602,437,000

Budget allocation per major component (2011 – 2019)

Particulars	**Amounts**
Survey, Mapping and Planning	PHP 1,402,976,850
Seedling Production	PHP 15,987,775,192
Site Preparation and Plantation Establishment	PHP 8,132,272,000
Maintenance and Protection	PHP 11,352,654,000
Others Activities	PHP 4,291,251,000
Project Management and Supervision	PHP 6,057,645,958
Total	**PHP 47,224,575,000**

Project evaluation

The NGP has encountered significant challenges in implementation, primarily due to mismatches between ambitious targets and the capacity of local implementing agencies and stakeholders. Despite the target to reforest 1.5 million hectares by 2016, the results were far below expectations, with only 177,441 hectares of forest cover regained by 2015. The program struggled with inefficiencies in survey, mapping, and planning, as well as in managing on-the-ground logistics. Furthermore, the inclusion of difficult-to-access areas and unorganised POs resulted in low seedling survival rates, which further diminished the effectiveness of reforestation efforts. Despite these challenges, the NGP made measurable progress in reforestation, particularly in areas where effective community participation and appropriate planning were in place. The involvement of local communities in forest restoration provided critical socio-economic benefits, and the groundwork has been laid for further progress as the program continues toward its extended 2028 goals.

Enhanced National Greening Program[72]

The Enhanced National Greening Program (ENGP) is an extension and expansion of the original NGP initiated in the Philippines. Despite the NGP having been falling short of its reforestation targets, reaching only 13.92% of its goal of 1.5 million hectares by 2015, the ENGP was introduced (through Executive Order No. 193 in 2015) with even more ambitious goals. This expanded program, running from 2016 to 2028, aims to rehabilitate an additional 7.1 million hectares of unproductive, denuded, and degraded forestlands. It continues to build on the goals of the original NGP but with a broader scope and extended timeline.

The ENGP focuses on several key objectives:

- The program aims to rehabilitate 1.2 million hectares of degraded forestlands by 2022 while focusing on the maintenance and protection of existing forests.
- The program aims to ensure the sustainable management of natural resources, enhance carbon sequestration, and mitigate climate change through expanded forest cover.
- It seeks to reduce poverty, improve food security, and increase economic activity in upland areas, while also promoting public awareness and environmental consciousness.
- The ENGP aims to consolidate and harmonise greening efforts among government agencies, civil society, and the private sector.

Despite the ENGP's ambitious goals to rehabilitate 7.1 million hectares of degraded forestlands by 2028, concerns emerge regarding the program's lack of transparency and implementation strategy. There is a lack of outlining the specific strategies and resources required to accomplish these objectives. The absence of a clear, published budget for the program leaves uncertainty about the allocation of funds and the feasibility of the planned interventions which raises doubts about the program's ability to meet its extensive targets.

[72] As there is no public implementation nor project description report available, the official ENGP website has been used as primary source: https://fmb.denr.gov.ph/ngp/ (Republic of the Philippines, n.d.).

Adapting Philippine Agriculture to Climate Change[73]

Project details

Project title	Adapting Philippine Agriculture to Climate Change (APA)
Funders	GCF; DA, Government of the Philippines
Implementing entity	Food and Agriculture Organisation of the United Nations
Executing entities	DA, Government of the Philippines; Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) & the Bureau of Treasury, Republic of the Philippines
Start date	January 15, 2024
Completion date	January 15, 2031
Total project cost	USD 39,300,000
Project location	Philippines; Provinces of North East Luzon, Cordillera, Eastern Seaboard & Western and Central Mindanao.

Problem description

The Philippines is one of the most climate-vulnerable nations globally as it ranks 4th on the Long-Term Climate Risk Index (2000-2019). Over 70% of its population is at risk due to frequent and severe climate-related disasters, such as tropical cyclones, droughts, floods, and unpredictable rainfall. These events increasingly threaten rural and agricultural systems, heightening food insecurity, poverty, and vulnerability in farming communities. Climate projections show that future weather patterns will worsen, with drier dry seasons and more intense rainfall during wet seasons, particularly in the northern and central regions. Farmers, especially smallholders, lack the resilience to withstand these growing risks, leading to significant crop damage, loss of income, and increased poverty.

Scope of project

The APA project aims to enhance the resilience of rural men and women, particularly those dependent on agriculture, to climate change impacts. The project focuses on transforming the agricultural system toward climate resilience by improving farmers' capacities to adopt Climate-Resilient Agricultural (CRA) practices, fostering CRA enterprises, and strengthening government and private sector systems to support widespread CRA adoption.

Activities and impact

- The APA project will directly benefit 1,250,000 million poor farming household members, of which 50% are women, by increasing awareness of climate risks and promoting the adoption of climate-resilient technologies. The project's indirect benefits will extend to 5 million people in the targeted areas through improved climate information systems and enhanced institutional capacity.
- Over 20 years, the project will reduce an estimated 4,380,000 million tonnes CO2e through the widespread application of CRA practices and improved land use.
- Institutional capacities will be strengthened to provide CRA services, benefiting both public and private sector stakeholders, while CRA practices will be mainstreamed into national and local programs.
- The project will also help improve household incomes and food security by supporting the development of CRA enterprises, creating economic co-benefits for rural communities.

[73] The primary information for this project is available from project documents and websites from GCF and USDA. For additional details on the budget and description outputs, the 2023 Funding Proposal by GCF, titled "Funding Proposal. FP201: Adapting Philippine Agriculture to Climate Change (APA)," has been referenced (GCF, 2023d). Project website of GCF: https://www.greenclimate.fund/project/fp201 (GCF, 2023b). Link to USDA project document: https://fas.usda.gov/data/philippines-adapting-philippine-agriculture-climate-change (Mojica-Sevilla, 2023).

Budget[74]

Overview of financiers:

Name of Institution	Amount
GFC	USD 26,270,000
DA, Government of Philippines	USD 8,260,000
PAGASA	USD 4,715,000
Total funding	**USD 39,250,000**

Description of financial elements of the project:

Sub-component	Amount
Output 1.1 Strengthened capacity and coordination for Climate Information Services (CIS)	USD 7,430,000
Output 1.2 Develop capacity for localised CRA services	USD 2,960,000
Output 2.1 CRA enterprise investment plans prepared and implemented	USD 19,510,000
Output 3.1 CRA mainstreamed into national and Local government units programmes	USD 4,840,000
Output 3.2 Enabling financial mechanisms and value-chains for sustainable CRA adoption	USD 960,000
Project Management	USD 1,940,000
M&E	USD 1,620,000
Total cost	**USD 39,250,000**

Metro Manila Flood Management Project[75]

Project details

Project title	Metro Manila Flood Management Project
Funders	International Bank for Reconstruction and Development; World Bank (WB); Asian Infrastructure Investment Bank (AIIB) & Government of the Philippines
Implementing entities	Department of Public Works and Highways, Metro Manila Development Authority, National Housing Authority & Social Housing Finance Corporation
Executing entity	Republic of the Philippines
Start date	October 1, 2017
Completion date	May 31, 2024 (Loan ending: November 30, 2024)
Total project cost	USD 500,000,000
Project location	Philippines; Metro Manila

Problem description

The Republic of the Philippines faces significant challenges related to urban flooding, particularly in Metro Manila, where climate change exacerbates the frequency and severity of rainfall events. With a projected 12% increase in rainfall by 2050 and a sea level rise of approximately 24 cm, the urban drainage system is at risk of being overwhelmed. Approximately 3.5 million people reside in the most flood-prone areas, with 1.7 million directly affected by regular flooding. The existing drainage infrastructure is outdated and inadequate, damaging properties, infrastructure, and livelihoods, particularly impacting low-income households. As urbanisation continues, the need for effective flood management solutions becomes increasingly urgent.

[74] The overview of financial elements is to be found in GCF's Funding Proposal from 2023 (GCF, 2023d). Since this is a financial proposal, the figures presented are budgeted rather than final amounts.
[75] This information is drawn from the 2017 Project Document provided by AIIB.

Scope of project

The objective is to enhance flood management in critical areas of Metro Manila, aiming to improve the resilience of affected communities. This involves modernising drainage infrastructure, minimising solid waste accumulation in waterways, and providing better housing options for those displaced. The project targets approximately 56 drainage areas over an area of 11,100 hectares, directly benefiting around 1.7 million individuals. By focusing on efficient flood management and community engagement, the project seeks to reduce vulnerability to flooding and bolster socio-economic stability for the most at-risk populations.

Activities and impact

- Construct approximately 20 new pumping stations and modernise around 36 existing ones, improving flood drainage capacity in critical areas.
- Enhance solid waste management practices by increasing collection services and community awareness, contributing to cleaner waterways.
- Resettle about 2,500 households from flood-prone areas to better housing, providing access to essential services and community support.
- Implement a comprehensive monitoring and evaluation framework to track project progress and beneficiary satisfaction with reduced flooding risks.
- Equip local authorities with modern maintenance tools and capacity-building programs, ensuring sustainable operation of drainage systems and waste management initiatives.

Budget[76]

Overview of financiers:

Name of Institution	**Amount**
WB (Loan)[77]	USD 207,603,205
AIIB (Loan)[78]	USD 207,603,205
Government of the Philippines	USD 84,793,590
Total funding	**USD 500,000,000**

Description of financial elements of the project:

Project components	**Amount**
Modernising Drainage Areas	USD 375,200,000
Minimising Solid Waste in Waterways	USD 48,000,000
Participatory Housing and Resettlement	USD 55,750,000
Project Management and Coordinating	USD 20,000,000
Front-end Fee	USD 1,040,000
Total cost	**USD 500,000,000**

76 The overview of financial elements is to be found in AIIB's Project Document from 2017 (AIIB, 2017). Since this is a project descriptive report, the figures presented are budgeted rather than final amounts.
77 The loan is an International Bank for Reconstruction and Development loan 25-year term; level repayments, including a grace period of 14 years.
78 The loan is on a 25-year term; level repayments, including a grace period of 14 years.

Thailand

Thailand faces challenges related to climate change, particularly concerning water management and agriculture. The country experiences increased flooding and droughts, which threaten agricultural livelihoods, particularly in rural areas. Vulnerable communities, especially in river basins such as the Yom and Nan, are at risk, with the agricultural sector projected to suffer substantial economic losses.

Various projects across the country focus on enhancing climate resilience through NbS, emphasising improved water management, sustainable agriculture, and urban planning. These initiatives aim to implement climate-resilient agricultural practices, upgrade water management systems, and foster ecosystem restoration. They also seek to empower local communities by improving access to climate information, enhancing capacities for climate-informed planning, and providing financial support for sustainable practices. The overarching goal is to secure livelihoods, enhance food security, and mitigate the impacts of climate change, ultimately benefiting millions of people across Thailand.

Enhancing climate resilience in Thailand through effective water management and sustainable agriculture[79]

Project details

Project title	Enhancing climate resilience in Thailand through effective water management and sustainable agriculture
Funders	GCF, Royal Irrigation Department (Royal Thai Government) & Krungsri Bank
Implementing entity	United Nations Development Programme (UNDP)
Executing entity	Thai Ministry of Agriculture and Cooperatives
Start date	January 10, 2022
Completion date	Date: January 10, 2027
Total project cost	USD 33,911,000
Project location	Thailand; Yom and Nan sub-river basins, Greater Chao Phraya River Basin

Problem description

Thailand's vulnerability to climate change which is mostly characterised by increased floods and droughts, poses serious threats to water management and agricultural livelihoods, especially in rural areas. The Yom and Nan River basins are particularly prone to these risks as they can either directly or indirectly affect potentially 25 million people. The agricultural sector is the most affected in the area with projected losses of USD 24 to USD 94 billion by 2049. The need for integrated water management solutions, combining both EbA and traditional infrastructure, is critical to ensure climate resilience, especially for vulnerable communities in the Chao Phraya Basin.

79 The primary information for this project is available on the websites of GCF and UNDP. For additional details on the budget and description outputs, the 2021 Funding Proposal by GCF, titled "Funding Proposal. FP170: Enhancing climate resilience in Thailand through effective water management and sustainable agriculture," has been referenced (GCF, 2021b). Project website of GCF: https://www.greenclimate.fund/project/fp170 (GCF, 2021a). Project website of UNDP: https://www.adaptation-undp.org/projects/enhancing-climate-resilience-thailand-through-effective-water-management-and-sustainable (UNDP, n.d.-a)

Scope of project

This project aims to build resilience in the Yom and Nan River basins by improving water management and agricultural practices in response to climate-induced floods and droughts, benefitting 62,000 inhabitants. It will strengthen local capacities for climate-informed planning, enhance water infrastructure with integrated EbA measures, and support farmers in adapting to climate challenges. The project's broader goal is to secure livelihoods, enhance food security, and improve resilience in vulnerable rural communities in northern Thailand.

Activities and impact

- Implement climate-resilient agricultural practices to safeguard farmers against droughts and floods.
- Strengthen climate and risk-informed planning through enhanced climate information and coordination across sectors.
- Upgrade 13 water management schemes in the Yom-Nan River basin and improve two critical water infrastructure systems.
- Increase farmers' access to climate information, markets, and finance for sustainable agriculture.
- Integrate EbA measures into national water management policies, benefiting 25,000,000 people indirectly.

Budget[80]

Overview of financiers:

Name of Institution	Amount
GCF	USD 17,534,000
Royal Irrigation Department	USD 16,264,000
Krungsri Bank	USD 113,000
Total	**USD 33,911,000**

Description of financial elements of the project:

Sub-component	Amount
1. Enhance climate and risk-informed planning in the water and agricultural sectors through improved climate information and cross-sectoral coordination	USD 3,215,000
2. Improve water management through strengthened infrastructure complemented by EbA measures, for greater resilience to climate change impacts	USD 23,125,000
3. Reduce volatility of agriculture livelihoods in drought and flood-prone areas through strengthened extension support and local planning, investment in on-farm adaptation measures and greater access to finance	USD 5,978,000
Project Management	USD 1,593,000
Total	**USD 33,911,000**

80 The overview of financial elements can be found in the project's Funding Proposal from 2021 (GCF, 2021b). Since this is a financial proposal, the figures presented are budgeted rather than final amounts.

Thai Rice: Strengthening Climate-Smart Rice Farming[81]

Project details

Project title	Thai Rice: Strengthening Climate-Smart Rice Farming
Funders	GCF; Rice Department (RD) of the Ministry of Agriculture and Cooperatives (MoAC), Government of Thailand; Bank for Agriculture and Agricultural Cooperatives (BAAC); Office of Natural Resources and Environmental Policy and Planning (ONEP) of MoNRE, Government of Thailand; International Rice Research Institute (IRRI); Federal Ministry of Economic Cooperation and Development (BMZ), Government of Germany; Ebro Foods; MARS; Olam Group & PepsiCo
Implementing entity	GIZ
Executing entities	RD of MoAC, Government of Thailand; BAAC; ONEP of MoNRE, Government of Thailand & IRRI
Start date	October 25, 2024 (date of approval)
Completion date	January 19, 2029
Total project cost	EUR 118,080,000
Project location	Thailand

Problem description

Rice is Thailand's most critical food crop, covering about half of its agricultural land and employing 18 million smallholder farmers who are among the poorest occupational groups. They face significant vulnerabilities due to climate change which disrupts water availability and increases temperatures. Concurrently, rice farming contributes approximately 2.5% of global GHG emissions, with Thailand ranking as the fourth-largest methane emitter in the rice sector. Although nearly 80% of farmers recognise shifting rainfall patterns, their limited capacity for adaptation due to low incomes, small farm size, and inadequate access to resources hinders effective responses to climate change. Women farmers, who play a pivotal role in agriculture, encounter additional barriers to accessing technology and support.

Scope of project

The Thai Rice Project aims to empower rice farmers, including women, to adapt to climate change while reducing GHG emissions. By promoting climate-smart farming practices and technologies, the project seeks to enhance farmers' incomes and food security while fostering a more resilient agricultural sector benefitting 1,000,000 inhabitants. The project aims in total to reduce 12,560,000 tonnes of CO_2 equivalent.

Activities and impact

- Build the capacity of 253,400 smallholder farmers to implement climate-smart technologies and practices, improving food security and livelihoods.
- Enhance access to finance for climate-smart agricultural services and technologies, and strengthen institutional and market environments for sustainable rice farming.

[81] The primary information for this project is available on the websites of GCF and GIZ. For additional details on the budget and description outputs, the 2023 Funding Proposal by GCF, titled "Funding Proposal. FP214: Thai Rice: Strengthening Climate-Smart Rice Farming," has been referenced (GCF, 2023e). Project website of GCF: https://www.greenclimate.fund/project/fp214 (GCF, 2023c). Project description by GIZ: https://www.thai-german-cooperation.info/en_US/green-climate-fund-to-invest-38-million-eur-to-strengthen-climate-smart-rice-farming-in-thailand/ (GIZ, 2023).

- Train service providers to deliver climate-smart farming solutions, ensuring a sustainable supply chain.
- Establish the T-VER Rice Scheme, which will generate economic value from emission reductions, targeting a total of 12,560,000 tonnes of CO2 equivalent avoided over 15 years.

Budget[82]

Overview of financiers:

Name of Institution	Amount
GCF	EUR 38,170,000
RD of MoAC, Government of Thailand	EUR 36,000,000
BAAC (Loans)	EUR 30,000,000
IRRI	EUR 6,240,000
BMZ, Government of Germany	EUR 2,040,000
ONEP of MoNRE, Government of Thailand	EUR 1,620,000
Ebro Foods	EUR 1,000,000
MARS	EUR 1,000,000
Olam Group	EUR 1,000,000
PepsiCo	EUR 1,000,000
Total funding	**EUR 118,080,000**

Description of financial elements of the project:

Sub-component	Amount
Outcome 1: Climate-smart farmers' incomes and food security are increased despite adverse climate change	EUR 61,020,000
Outcome 2: The climate resilience of rice farming is enhanced and GHG emissions are substantially reduced through the adoption of climate-smart technologies	EUR 33,220,000
Outcome 3: Government policies and funds are geared towards climate-smart rice	EUR 16,870,000
M&E	EUR 1,890,000
Project Management	EUR 4,070,000
Contingency	EUR 1,000,000
Total cost	**EUR 118,080,000**

Urban Resilience Building and Nature: Innovating Urban Planning for Resiliency with Nature-based Solutions and Climate Risk Models in Thailand[83]

Project details

Project title	Urban Resilience Building and Nature
Funder	IKI of BMUV, Government of Germany

[82] The overview of financial elements is to be found in GCF's Funding Proposal from 2023 (GCF, 2023e). Since this is a financial proposal, the figures presented are budgeted rather than final amounts.

83 The primary information for this project can be found on the websites of IUCN and IKI. As of September 24, 2024, no detailed project description document has been published. Project description by IUCN: https://iucn.org/news/202301/increasing-resilience-cities-thailand-through-nature-based-solutions (IUCN, 2023).

Project description by IKI: https://www.international-climate-initiative.com/en/project/urban-urban-resilience-building-and-nature-innovating-urban-planning-for-resiliency-with-nature-based-solutions-and-climate-risk-models-in-thailand-22-ii-194-tha-a-urban/ (IKI, 2024c).

Implementing entity	IUCN
Executing entities	IUCN Thailand Country Programme, Asia Regional Office (ARO); Regional Community Forestry Training Center for Asia and the Pacific; Thailand Environment Institute & Urban Design and Development Center, Thailand
Start date	August 2022
Completion date	October 2028
Funding from IKI:	EUR 7,000,000[84]
Project location	Thailand. Pilot provinces: Chiang Rai & Surat Thani

Problem description

Thailand is among the countries most vulnerable to the impacts of climate change in urban areas where issues such as flooding, forest fires, and urban sprawl are exacerbated. The increasing frequency and severity of climate-related disasters threaten the social, economic, and environmental well-being of both urban and surrounding rural landscapes. The urban areas are at risk due to inadequate planning, lack of resilience measures, and growing environmental degradation.

Scope of project

The project's primary aim is to significantly enhance the social, economic, and environmental resilience of urban areas and surrounding landscapes in Thailand by promoting the large-scale adoption of NbS. It seeks to improve climate change adaptation in up to six local administrative organisations across two pilot provinces, Chiang Rai and Surat Thani. The initiative will develop replicable, cost-effective models for urban planning and ecosystem management that address spatially explicit climate risks, aiming for scalable solutions that can be expanded across Thailand.

Activities and impact

- Establish governance structures at national and provincial levels, including a Project Steering Committee and Provincial Advisory Committees to engage political stakeholders.
- Organise capacity-building events for national and provincial stakeholders to enhance understanding of NbS, urban resilience, and climate adaptation.
- Implement NbS measures in four sub-districts in Chiang Rai and seven in Surat Thani, covering over 35,000 hectares, focusing on wetland and forest restoration.
- Involve over 70 representatives from government agencies and stakeholders in ongoing discussions to strengthen coordination and ensure the project's success.

84 As of September 24, 2024, a budget for the project has not been published, with only the amount of funding from the IKI being confirmed. Additionally, an overview of the allocation of financial elements within the project has not been provided.

Vietnam

Vietnam faces significant challenges related to climate change, particularly in coastal areas where communities are vulnerable to flooding, storms, and rising sea levels. The country's extensive coastline and dense population make it susceptible to the impacts of climate hazards, increasing poverty and threatening livelihoods.

To address these issues, various projects have been initiated with NbS elements, such as restoring mangrove forests, improving housing resilience, and integrating climate considerations into local planning. These projects aim to enhance the adaptive capacity of vulnerable communities by implementing ecosystem-based adaptations, promoting sustainable agricultural practices, and improving early warning systems. They seek to mitigate the adverse effects of climate change by fostering environmental restoration, supporting local economies, and increasing awareness of climate risks. Through these initiatives, Vietnam is striving to build resilience in its communities while contributing to broader national and international climate adaptation goals.

Improving Resilience of Vulnerable Coastal Communities to Climate Change in Vietnam[85]

Project details

Project title	Improving Resilience of Vulnerable Coastal Communities to Climate Change in Viet Nam
Funders	GCF; Ministry of Construction, Government of Vietnam; Ministry of Agriculture and Rural Development, Government of Vietnam & UNDP
Implementing entity	UNDP
Executing entity	Ministry of Planning and Investment, Government of Vietnam
Start date	July 11, 2017
Completion date	July 10, 2022
Total project cost	USD 40,530,000
Project location	Vietnam; covering all 28 coastal provinces

Problem description

Vietnam's coastal communities are severely affected by climate change, particularly flooding and storms. Annually, about 60,000 homes are damaged or destroyed, making it difficult for vulnerable families to escape poverty. Climate change projections, which indicate a potential sea-level rise of up to 73 cm by 2100, pose a significant threat, potentially submerging large areas of land and heightening the risk of disasters. With over 50 million people projected to face these risks by 2040, the country's economic resilience is also at stake, particularly in cyclone-, flood-, and drought-prone areas. Despite efforts, the rural poor remain especially vulnerable and more robust, scalable interventions are needed to protect them from increasing climate hazards.

Scope of project

The project aims to increase the resilience of vulnerable coastal communities in Vietnam against the impacts of climate change. Through the regeneration of mangrove forests and the construction of storm- and flood-resilient housing, the project seeks to enhance the adaptive capacity of coastal communities, reduce economic losses from climate-related hazards, and safeguard livelihoods. It also aims to institutionalise climate and economic risk assessments to inform future planning and resilience strategies across 28 coastal provinces.

[85] The primary information for this project is available on the websites of GCF and UNDP. For additional details on the budget and description outputs, the 2017 Funding Proposal by GCF, titled "Funding Proposal. FP013: Improving the resilience of vulnerable coastal communities to climate change related impacts in Viet Nam" has been referenced (GCF, 2016b). Project website of GCF: https://www.greenclimate.fund/project/fp013#details (GCF, 2016a). Project website of UNDP: https://www.adaptation-undp.org/projects/improving-resilience-vulnerable-coastal-communities-climate-change-viet-nam (UNDP, n.d.-b).

Activities and impact

- Build 4,000 storm- and flood-resilient houses to benefit 20,000 highly disaster-exposed people in 100 communes.
- Regenerate 4,000 hectares of coastal mangroves to act as storm surge buffers and support coastal livelihoods.
- Provide enhanced access to climate, loss, and damage data for private and public sector use across 28 coastal provinces.
- Integrate community-based disaster risk management into local planning, benefiting over 32,000 people in vulnerable communes.
- Avoid an estimated 1.9 million tons of CO2 emissions through ecosystem restoration and resilience-building measures.

Budget[86]

Overview of financiers:

Name of Institution	Amount
Green Climate Fund	USD 29,523,000
Ministry of Construction, Government of Vietnam	USD 8,000,000
UNDP	USD 1,600,000
Ministry of Agriculture and Rural Development, Government of Vietnam	USD 1,407,000
Total	**USD 40,530,000**

Description of financial elements of the project:

Sub-component	Amount
Output1: Storm and flood resilient design features added to 4,000 new houses on safe sites, benefiting 20,000 poor and highly disaster exposed people in 100 communes	USD 20,152,000
Output 2: Regeneration of 4,000 hectares of costal mangrove storm surge buffer zones	USD 12,937,000
Output 3: Increased access to enhanced climate, loss and damage data for private and public sector application in all 28 coastal provinces of Vietnam	USD 7,441,000
Total	**USD 40,530,000**

[86] The overview of financial elements is to be found in GCF's Funding Proposal from 2016 (GCF, 2016b). Since this is a financial proposal, the figures presented are budgeted rather than final amounts.

Project evaluation[87]

Since its launch in 2017, the project has achieved substantial progress in enhancing resilience among Vietnam's most vulnerable and disaster-exposed populations. The initiative has reached over 98,000 individuals, with nearly half being women, providing them with critical support in the face of climate risks. The project has successfully met its original targets, as it has built and delivered 4,000 storm- and flood-resilient houses, benefiting around 20,000 people, with a notable 66.4% of the beneficiaries being women. Additionally, 4,003 hectares of mangroves have been planted and regenerated, supporting sustainable livelihoods and protecting 4,606 people from storm surges.

Moreover, the project has surpassed its goal of improved access to climate and disaster data, benefiting 62,717 individuals by enhancing the availability of critical information for risk management. The mangrove restoration efforts have also led to the avoidance of approximately 1.74 million tonnes of CO2 emissions, contributing significantly to Vietnam's climate change mitigation goals.

Climate Adaptation and Resilience in Thua Thien Hue Province (Phase 1)[88]

Project details

Project title	Climate Adaptation and Resilience in Thua Thien Hue Province
Funder	Luxembourg Government via the Luxembourg Climate and Energy Fund
Implementing entity	Luxembourg Development Cooperation Agency (LuxDev)
Executing entity	Thua Thien Hue Provincial People's Committee
Start date	July 1, 2018
Completion date	December 31, 2022 (extended from December 31, 2020 due to delays)
Total project cost	EUR 3,260,000 (Initial budget of EUR 2,300,000; Additional budget of EUR 961,000 due to extension)
Project location	Vietnam; Thua Thien Hue Province

Problem description

Vietnam, particularly the Thua Thien Hue Province, is highly vulnerable to climate change impacts such as sea level rise, saline intrusion, loss of land, and food insecurity. With a long coastline and a dense coastal population, the province faces significant threats from climate-related hazards. Despite national strategies and policies for climate change adaptation, local authorities and communities often lack the necessary funding, technologies, and competencies to implement effective resilience measures.

Scope of project

The project aimed to enhance climate resilience and adaptive capacity among communities in coastal and lagoon areas of Thua Thien Hue Province. By strengthening government and community capacities, the project sought to protect vulnerable populations and ecosystems from climate-related hazards. Specifically, the project focused on improving climate change awareness, introducing organic agriculture, and enhancing local infrastructure to better withstand environmental impacts. The ultimate goal has been to increase the resilience of 55,500 households while contributing to broader national climate adaptation strategies.

Activities and impact

- 63,334 individuals directly benefited from project interventions.
- Organic agriculture interventions reduced pesticide/herbicide use by 37,339 kg and generated EUR 380,000 in revenue.

[87] The metrics for evaluating the project are detailed in the Annual Performance Report for CY2022, published by the GCF on December 20, 2023 (GCF, 2023a).

[88] Based on the Final Evaluation Report by LuxDev from 2022, titled "Final Evaluation. VIE/433. Climate Adaptation and Resilience in Thua Thien Hue Province" (LuxDev, 2022). Additionally, information from LuxDev's project website has been used: https://luxdev.lu/en/activities/project/VIE/433 (LuxDev, 2018).

- 95.8% of secondary school students improved their knowledge and practices in climate change adaptation.
- 875 hectares of productive land were better protected against climate impacts through 14 sub-projects.
- Households suffering significant climate-related losses were reduced by 48.9%.

Project evaluation

The project was highly successful, achieving or surpassing all its 14 end-of-project targets. In the final evaluation report conducted by LuxDev, they rate different elements of the project on a scale from 1 to 6 (1, excellent results; 6, the project was unsuccessful). The overall rating which is the global rating measuring effectiveness is 1.9. The relevance (1.3) and coherence (1.6) ratings highlight its alignment with local needs and policy frameworks. While there were delays due to COVID-19, the institutional framework and participatory approach ensured the project's sustainability and efficiency. It is noted that future efforts should focus on scaling organic agriculture and sustaining lagoon fisheries management, with attention to financial mechanisms for long-term resilience.

Climate Adaptation and Resilience in Thua Thien Hue Province (Phase 2)[89]

Project details

Project title	Climate adaptation and resilience in Thua Thien Hue Province (CARe Hue)
Funder	GCF, Government of Luxembourg via Luxembourg International Climate Finance & Government of Vietnam
Implementing entity	LuxDev
Executing entity	Government of Vietnam
Start date	July 18, 2024 (approval date)
Completion date	Estimated 2029 (five-year project)
Total project cost	USD 10,000,000
Project location	Vietnam; Thua Thien Hue Province

Problem description

Thua Thien Hue Province is highly vulnerable to climate-related hazards, including storms, floods, droughts, and salinisation, which threaten local livelihoods and ecosystems. With a population of 1,130,000, the province faces significant climate challenges exacerbated by persistent heavy rainfall and inadequate climate adaptation mechanisms. The urgent need for improved climate resilience is critical as existing public funds are insufficient to address the escalating impacts of climate change.

Scope of project

The CARe Hue project aims to enhance climate resilience in Thua Thien Hue Province by implementing a comprehensive climate adaptation framework. This includes strengthening early warning systems (EWS), integrating climate considerations into socio-economic development plans, promoting EbA, and ensuring the sustainable management of 115,900 hectares of agricultural and forested land. The project seeks to benefit 306,000 direct and 406,000 indirect beneficiaries while making Thua Thien Hue Province a model province for climate change adaptation in Vietnam.

89 The primary information for this project is available on the websites of GCF and LuxDev. For additional details on the budget and description outputs, the 2024 Funding Proposal by GCF, titled "Funding Proposal: SAP040 - Climate Adaptation and Resilience in Thua Thien Hue Province, Vietnam (CARe Hue)," has been referenced (GCF, 2024c). Project website of GCF: https://www.greenclimate.fund/project/sap040 (GCF, 2024d).
Project description by LuxDev: https://luxdev.lu/fr/news/show/2024-07-19?fbclid=IwY2xjawFZwA9leHRuA2FlbQIxMAABHZpzzrIk727wAueidyjUe_NMEEe06tMPzDNSzQ1fq2hDkOPHQ2_R8z1qMw_aem_BKmrn-3Cf7O_Kvc9ubaZ4g (Renauld, 2024).

Activities and impact

- Improve the EWS to enhance local preparedness for climate hazards and responses.
- Integrate climate adaptation into the socio-economic development plans of 44 communes and strengthen monitoring capabilities. This includes developing tailored financial products with local banks to support climate-resilient agricultural practices.
- Scale up ecosystem-based adaptation interventions across 450 hectares to bolster the resilience of local communities.
- Implement and expand CRA models for 6,000 producers, enhancing local value chains.

Budget[90]

Overview of financiers:

Name of Institution	Amount
GCF	USD 8,650,000
Government of Luxembourg	USD 900,000
Government of Vietnam	USD 450,000
Total	**USD 10,000,000**

Description of financial elements of the project:

Sub-component	Amount
Output 1. Improved EWS in place to enable local people and governments at the provincial, district and commune level to better prepare for climate hazards and to respond to climate change impacts	USD 1,867,000
Output 2. Climate adaptation considerations are mainstreamed into 44 socio-economic development plannings and an effective climate change adaptation impact-based M&E system is in place	USD 743,000
Output 3. EbA strengthens the resilience of livelihoods and ecosystems to climate change	USD 2,469,000
Output 4.1. Producers, producer associations, and women's organisations have the capacities, and access to finance and markets to transition to climate-resilient practices	USD 2,831,000
Output 4.2. The capacities of local financial intermediaries are enhanced to effectively screen, finance and monitor climate-resilient investments	USD 848,000
Project Management	USD 1,239,000
Total	**USD 10,000,000**

Cost-benefit Assessment of Mitigation Options in Rice Production[91]

Project details

Project title	Cost-benefit Assessment of Mitigation Options in Rice Production: Data Compilation, Tools, and Training within the Vietnamese Context
Funder	Climate Technology Centre and Network (CTCN)
Implementing entity	IRRI
Executing entity	MoNRE, Government of Vietnam
Start date	August 2, 2019
Completion date	March 31, 2021 (extended from September 30, 2020)
Total project cost	USD 185,000
Project location	Vietnam; Red River Delta and Mekong River Delta

[90] The overview of financial elements is to be found in GCF's Funding Proposal from 2024 (GCF, 2024c). Since this is a financial proposal, the figures presented are budgeted rather than final amounts.
[91] The primary information for this project is found from the Closure Report by CTCN in 2022 titled: "Closure Report for CTCN Technical Assistance" (CTCN, 2022).

Problem description[92]

Rice production is a critical agricultural activity in Vietnam, but it significantly contributes to GHG emissions, particularly methane (CH4), through conventional farming practices as it takes about 1,400 litres of water to produce 1 kg of rice in an irrigated lowland production system. Adopting climate-smart agricultural technologies, such as alternate-wetting and drying (AWD), is essential to mitigate these emissions. However, challenges exist in quantifying the economic and environmental trade-offs of mitigation options, particularly in rice cultivation. There is a need for more accessible tools and methodologies to help stakeholders, from policymakers to farmers, make informed decisions to balance productivity and emission reduction targets while addressing the country's national climate commitments.

Scope of project

The project aims to enhance Vietnam's capacity to implement and scale up climate-smart practices in the rice sector, contributing to the country's Nationally Determined Contributions under the Paris Agreement. Specifically, it focuses on the development and dissemination of tools for Cost-Benefit Analysis (CBA) and Geographic Information System (GIS)-based mapping, enabling better decision-making for climate change mitigation in rice production. Through workshops, technical training, and stakeholder engagement, the project aims to enhance the understanding and application of climate-smart agricultural practices, improve the CBA of mitigation actions, and promote the adoption of GHG emission reduction technologies.

Activities and impact

- The project developed an interactive CBA tool, COMPARE, for assessing mitigation actions and guiding future projects and policies in the rice sector, enabling farmers to adopt more sustainable practices and transition from continuous flooding to climate-smart techniques.
- Created GIS-based maps and analysis tools to promote AWD and other climate-smart technologies in rice production, contributing to broader dissemination and implementation.
- The COMPARE tool projects scenarios that indicate the potential transformation of 1,700,000 hectares through various mitigation strategies, leading to a projected total reduction of approximately 6.38 million metric tons of CO2 equivalent emissions annually
- Trained 145 participants, including representatives from 13 government institutions, in using these tools to support mitigation investments.
- Farmers could see an increase in net revenue by adopting these practices, with potential additional earnings of up to USD 18.2 per hectare, depending on the method of transformation.
- The reduction of air pollution from rice straw burning is anticipated to improve health outcomes, with projected reductions of 62,359 tons of particulate matter (2.5 mm) over 10 years for the transformation of 1,000,000 hectares to straw management practices.

[92] The information in this sub-chapter is based from the UNEP 2022 report titled: "Nature-based Solutions to Emerging Water Management Challenges in the Asia-Pacific Region" (Bertule & Hansen, 2022, p. 32).

Across Borders

In the ASEAN region, multiple countries face environmental challenges to climate change, including rising temperatures, erratic rainfall, sea-level rise, and increased frequency of natural disasters. These issues pose risks to public health, economic stability, and ecological integrity. Key sectors such as agriculture, fisheries, and urban infrastructure are particularly vulnerable, leading to biodiversity loss and reduced access to vital resources. The reliance on fossil fuels and rapid urbanisation further intensifies greenhouse gas emissions, complicating efforts to achieve climate resilience and sustainability.

These issues are especially acute in countries where ecosystems like peatlands and wetlands are under threat. To address these challenges, projects are being implemented in various fields, including wetland and peatland restoration, sustainable agriculture, water management, and climate-responsive technology development. The goals of these projects extend beyond national borders focusing on building regional cooperation, sharing knowledge, and enhancing the capacity of local communities and governments to manage natural resources sustainably. For instance, initiatives like peatland management in the Mekong region and wetland restoration projects foster cross-border collaboration and peer learning through ASEAN platforms and Ramsar conventions. By building a regional innovation ecosystem, these initiatives not only contribute to mitigating climate change but also promote sustainable development and social equity in the region.

Collaborative R&DB Programme for Promoting the Innovation of Climate Technopreneurship[93]

Project details

Project title	Collaborative R&DB Programme for Promoting the Innovation of Climate Technopreneurship
Project countries	Cambodia, Indonesia, Lao PDR, Republic of the Philippines & Vietnam
Funders	GCF, Korea Development Bank (KDB), Limited Partners (LPs)[94]
Implementing and executing entities	KDB & GGGI
Project lifetime	30 years (Approval date: July 18, 2024)
Total project cost	USD 221,200,000
Project location	Southeast Asia

Problem description

The five ASEAN countries of Cambodia, Indonesia, Lao PDR, the Philippines, and Vietnam are highly vulnerable to the adverse impacts of climate change, such as extreme heat, changing precipitation patterns, sea-level rise, and cyclones. These nations face significant risks to human health, productivity, economies, and ecosystems. The region's reliance on fossil fuels and increasing urbanisation further exacerbate the issue, contributing to high GHG emissions. Current climate resilience and mitigation efforts are insufficient to meet the Paris Agreement targets, especially given the fast-paced economic growth in the region. The region urgently needs access to climate technologies to leapfrog towards low-carbon development and strengthen adaptation measures. However, existing barriers such as limited access to finance, inadequate technology, and poor business models are preventing effective climate solutions from scaling up.

[93]The primary information for this project is available on the project website of GCF. For additional details on the budget and description outputs, the 2024 Funding Proposal by GCF, titled “Funding Proposal: FP240: Collaborative R&DB Programme for Promoting the Innovation of Climate TechnopreneurshipS,” has been referenced (GCF, 2024b). Project website of GCF: https://www.greenclimate.fund/project/fp240 (GCF, 2024a).

[94] The Funding Proposal does not specify the identities of the LPs

Scope of project

The program aims to accelerate the development and deployment of climate technologies across the five ASEAN countries by fostering a regional innovation ecosystem. Through the establishment of a collaborative R&D and business platform, the program seeks to support climate technopreneurs, enhance technology transfer via joint ventures, and enable countries to shift from carbon-intensive pathways to low-carbon and climate-resilient economies. It focuses on facilitating partnerships between local and global innovators, providing financial support, and improving the regulatory and business environment to scale climate solutions.

Activities and impact

- Establish a USD 200,000,000 Climate Technopreneurship Fund to support technology transfer and commercialisation in the five target countries.
- Support 2,300,000 people by developing climate-responsive technology solutions in sectors like renewable energy, transportation, and agriculture.
- Reduce GHG emissions by 1,600,000 tonnes through the deployment of low-carbon technologies.
- Empower local entrepreneurs by providing access to global innovations, technical expertise, and business mentoring.
- Strengthen the regional innovation ecosystem, making it conducive for scaling and replicating technology-enabled climate solutions.

Budget[95]

Overview of financiers:

Name of Institution	**Amount**
LPs	USD 114,250,000
GCF	USD 104,471,000
NH Absolute Return Partners [96]	USD 2,000,000
GGGI	USD 393,900
KDB	USD 100,000
Total cost	**USD 221,214,900**

Description of financial elements of the project:

Sub-component	**Amount**
Component 1. Country Driven Acceleration Readiness	USD 6,171,000
Component 2. Global Acceleration for Collaborative R&D + Business	USD 9,500,000
Component 3. Climate Technopreneurship Fund	USD 200,000,000
Component 4. Technical Assistance	USD 4,553,100
Project Management Cost	USD 990,800
Total cost	**USD 221,214,900**

[95] The overview of financial elements is to be found in GCF's Funding Proposal from 2024 (GCF, 2024b). Since this is a financial proposal, the figures presented are budgeted rather than final amounts.
[96] NH Absolute Return Partners is the General Partner of the Climate Technopreneurship Fund

Sustainable Management of Peatland Ecosystems in Mekong Countries[97]

Project details

Project title	Sustainable Management of Peatland Ecosystems in Mekong Countries
Project countries	Cambodia, Lao PDR & Myanmar
Funders	Global Environment Facility (GEF), International Fund for Agricultural Development (IFAD), Governments of Cambodia Lao PDR & Myanmar, IUCN, Global Environment Centre & Forest Resource Environment Development and Conservation Association (FREDA)
Implementing entity	IUCN
Executing entities	MoE, Government of Cambodia; MoNRE, Government of Lao PDR & Ministry of Natural Resources and Environmental Conservation (MONREC), Government of Myanmar
Start date	January 1, 2016
Completion date	December 31, 2025
Total project cost	USD 13,367,511
Project location	Mekong River

Problem description

Peatland ecosystems in Cambodia, Lao PDR, and Myanmar are highly vulnerable due to a lack of proper recognition and sustainable management. Despite their crucial roles in biodiversity conservation, carbon storage, and livelihood support for local communities, these peatlands face degradation from unsustainable land use practices. Limited knowledge and documentation of peatland distribution in these countries further contribute to their vulnerability, leading to biodiversity loss, reduced carbon sequestration, and negative impacts on community livelihoods.

Scope of project

The project aims to sustainably manage peatland ecosystems in Cambodia, Lao PDR, and Myanmar, conserving biodiversity and reducing greenhouse gas emissions. It seeks to enhance understanding of peatland ecosystems, strengthen policy and legal frameworks, and promote sustainable peatland management practices that benefit local communities and the environment.

Activities and impact

- The project has been part of identifying over 14,000 hectares of new peatland areas in Cambodia and Lao PDR (77% of the aimed 18,000 ha target).
- Strengthened nine legal and regulatory frameworks, exceeding the target of two per country.
- Raised awareness among 300 stakeholders on the importance of peatland conservation.
- Implemented sustainable livelihood initiatives in peatland areas, with management plans operational in Lao PDR.
- Supported regional cooperation through ASEAN forums and shared best practices in peatland management.

[97] This information is drawn from the 2024 Project Implementation Report provided by IUCN and GEF (IUCN & GEF, 2024). Although the project is scheduled to conclude in 2025, the report also includes an interim evaluation of progress and outcomes to date.

Budget[98]

Overview of financiers:

Name of Institution	Amount
Sustainable Use of Peatland and Haze Mitigation in ASEAN Project	USD 3,500,000
GEF	USD 2,907,064
IFAD	USD 2,500,000
MONREC, Government of Myanmar	USD 1,629,999
MoNRE, Government of Lao PDR	USD 985,001
IUCN	USD 949,000
Global Environment Centre	USD 350,000
MoE, Government of Cambodia	USD 195,000
FREDA	USD 169,847
Ministry of Agriculture, Forestry and Fisheries, Government of Cambodia	USD 81,600
Total financing	**USD 13,267,511**

Project evaluation[99]

The Sustainable Management of Peatland Ecosystems in Mekong Countries project has made notable progress despite challenges, especially in Cambodia and Lao PDR. The project successfully conducted peatland inventories, identifying new areas with potential peat soils, though further site assessments are needed. Efforts are underway to mainstream peatland management into national policies, with progress toward National Action Plans for Peatlands in both countries. Peer learning has been a key aspect, facilitating knowledge exchange with countries that have advanced peatland management practices. Although Myanmar's activities remain suspended, the project's overall development is rated satisfactory, with several targets exceeded. Delays in some components necessitated a no-cost extension to September 2024.

Mekong WET: Building Resilience of Wetlands in the Lower Mekong Region through a Ramsar Regional Initiative[100]

Project details

Project title	Mekong WET: Building Resilience of Wetlands in the Lower Mekong Region through a Ramsar Regional Initiative
Project countries	Cambodia, Lao PDR, Thailand & Vietnam
Funder	IKI of BMUV
Implementing entity	IUCN of the ARO
Start date	January 1, 2017
Completion date	September, 2022
Total project cost	EUR 2,481,301[101]
Project location	Mekong region

[98] The financial figures are sourced from the 2018 Project Document by IUCN (IUCN, 2018). Since this is a project description, the figures presented are budgeted rather than final amounts

[99] The assessment is based on the Project Implementation Report from June 30, 2024 conducted by IUCN and GEF (IUCN & GEF, 2024). The assessment is therefore done before the project is set to end.

[100] The information for this project is available on the project websites of IUCN and IKI. As of September 25, 2024, there is no project evaluation report available evaluating on the progress of the project. Project description by IUCN: https://iucn.org/our-work/region/asia/our-work/water-and-wetlands/mekong-wet#:~:text=Funded%20by%20the%20International%20Climate,harnessing%20the%20benefits%20of%20wetlands (IUCN, n.d.). Project description by IKI: https://www.international-climate-initiative.com/en/project/strengthening-the-resilience-of-the-mekong-region-wetlands-by-means-of-a-ramsar-regional-initiative-16-ii-131-asien-a-mekong-wet/ (IKI, 2024b).

[101] As of September 25, 2024, there are no financial documents available detailing the financial aspects of the project

Problem description

The wetlands of the Lower Mekong region are experiencing significant decline due to human activities such as urban expansion, infrastructure development, deforestation, and agricultural expansion. These actions have severely impacted the wetlands' capacity to provide essential ecosystem services, leading to a decline in biodiversity and deteriorating water quality. Farmers have begun to feel the adverse effects of climate change, as the wetlands can no longer safeguard their livelihoods from threats like saltwater intrusion, landslides, and floods. This deterioration not only threatens the ecological balance but also jeopardises the survival of millions who depend on these wetlands for their livelihoods and well-being.

Scope of project

The project aims to establish an effective and replicable framework for ecosystem-based adaptation and mitigation in wetland areas across Cambodia, Lao PDR, Thailand, and Vietnam. The project seeks to enhance the resilience of wetlands to climate change by integrating their benefits into planning processes and strengthening transboundary collaboration among countries. Additionally, it focuses on improving the capacity of 150 wetland managers and over 300 community representatives, while also supporting countries in fulfilling their commitments to the Ramsar Convention and achieving Aichi Biodiversity Targets. Through these efforts, the initiative intends to safeguard the essential services provided by wetlands and ensure sustainable management of these critical ecosystems.

Activities and impact

- The project developing management plans for six out of 10 selected Ramsar sites, incorporating climate change adaptation strategies.
- Training 136 wetland professionals through the Mekong Wetland University Network to improve regional expertise.
- Sharing best practices and lessons learned with 18 Ramsar sites and potential new wetland sites across the region.
- Implementing 19 small grants focused on EbA in wetlands by civil society organisations and local governments.
- Established the Indo-Burma Ramsar Regional Initiative (IBRRI) to facilitate ongoing regional dialogue and cooperation for wetland management.

Disclaimer

It is essential to recognise that this review does not represent a complete list of all relevant projects in ASEAN region, rather, it offers an overview of selected key initiatives that are assessed to address relevant specific challenges and solutions within the region. The selection reflects broader challenges and opportunities in integrating climate resilience and sustainability through NbS efforts, aiming to include diverse perspectives from various stakeholders. Additionally, the review was conducted using information that was shared or publicly accessible and disclosed to the public.