



ADAPTATION FUND

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Adaptation Fund Board
Project and Programme Review Committee
Thirty-eighth Meeting
Bonn, Germany, 19-23 October 2026

PROPOSAL FOR MALAYSIA



ADAPTATION FUND

ADAPTATION FUND BOARD SECRETARIAT
TECHNICAL REVIEW OF PROJECT PROPOSAL FOR
"STRENGTHENING RESILIENCE AND ADAPTIVE CAPACITY BY PILOTING NATURE BASED
SOLUTIONS FOR WATER MANAGEMENT IN MALAYSIA"

Project Title	Strengthening Resilience and Adaptive Capacity by Piloting Nature Based Solutions for Water Management in Malaysia
Project ID	AF00000501
Category	Regular size project (over \$1 million)
Type	Single country project
Stage	Fully-developed project
Country	Malaysia
Implementing Entity	UNDP
Financing Requested	USD 10,000,000.00
Reviewer	Justice Issah Surugu Musah

Co-reviewer(s)

IE Contact Person

Aishath Azza,Joana Troyano,Lina Madadha,Mahlet Ambachew,Mariam Zafar,Missale Woldegiorgis,Nancy Bennet,Radhika Dave,Robin Merlier,Siriboon Ketphichai,Wirunpat Meebungprav

Secretariat's Overall Comment

The proposal is technically sound and generally meets the Adaptation Fund review criteria. It presents a strong climate adaptation rationale, aligns with national adaptation and sustainable development frameworks, demonstrates consistency with the Adaptation Fund Strategic Results Framework, and includes comprehensive environmental, social, gender, consultation, learning, and monitoring arrangements. The project combines ecosystem-based adaptation and Nature-based Solutions (NbS) across peatland, watershed, and urban landscapes and is supported by robust safeguard instruments, stakeholder engagement processes, and knowledge management mechanisms.

The below issues should be addressed by the Implementing Entity/Government for resubmission:

The proposal should provide justification for the significant allocation of resources to enabling and analytical activities, including studies, assessments, technical assistance, consultancy services, climate information systems, and knowledge products, relative to the scale of direct on-the-ground adaptation interventions.

The cost-effectiveness and full cost of adaptation rationale would benefit from a clearer explanation of how investments in soft interventions will translate into measurable adaptation and resilience outcomes and represent the most effective use of Adaptation Fund resources.

The monitoring framework should explicitly include safeguard-related milestones and indicators, including the preparation and implementation of site-specific ESMPs, completion of hydrological, biodiversity, and community health and safety assessments, and tracking of ESMF mitigation measures throughout implementation.

The proposal should clearly indicate where the costs associated with safeguard implementation, including site-specific assessments, ESMP preparation, and safeguard monitoring, are budgeted.

While the proposal adequately identifies related initiatives and demonstrates complementarity, it could provide additional detail on implementation-level coordination mechanisms, information-sharing arrangements, and roles and responsibilities to further strengthen assurance against potential overlap during implementation.

Additional transparency on Project Execution Costs is needed in the detail budget note to strengthen the financial justification by clearly presenting the breakdown of project management expenditures and the activities covered by those costs.

Country Eligibility

Is the country party to the Kyoto Protocol or the Paris Agreement?

Response: Yes

Secretariat: Yes its a party and currently has NBS project funded by the AF under implementation

Is the country a developing country particularly vulnerable to the adverse effects of climate change?

Response: Yes

Secretariat: N/A

Project Eligibility

Has the designated government authority for the Adaptation Fund endorsed the project/programme?

Response: Yes

Secretariat: Yes

Does the length of the proposal amount to no more than One hundred (100) pages for the fully-developed project document, and one hundred (100) pages for its annexes?

Response: Cleared

Secretariat: The full proposal is 101 total pages

Does the project / programme support concrete adaptation actions to assist the country in addressing adaptive capacity to the adverse effects of climate change and build in climate resilience?

Response: Cleared

Secretariat: Yes. The project supports concrete adaptation actions that will assist Malaysia in addressing climate change impacts, strengthening adaptive capacity, and building climate resilience. The proposal goes beyond business-as-usual development interventions by directly targeting identified climate risks, particularly increasing urban temperatures, urban heat island effects, extreme rainfall, stormwater runoff, flooding, and associated health and social vulnerabilities through a package of nature-based and community-based adaptation

Does the project / programme provide economic, social and environmental benefits, particularly to vulnerable communities, including gender considerations, while avoiding or mitigating negative impacts, in compliance with the Environmental and Social Policy and Gender Policy of the Fund?

Response: Cleared

Secretariat: Yes. The project provides clear economic, social, and environmental benefits to vulnerable communities, incorporates strong gender and social inclusion measures, and includes safeguards to avoid or mitigate potential negative impacts in accordance with the Adaptation Fund Environmental and Social Policy (ESP) and Gender Policy.

Is the project / programme cost effective?

Response: Not Cleared

Secretariat: Partially meets the criterion. Further justification of cost-effectiveness and the allocation of resources between soft and tangible adaptation investments is recommended.

While the proposal presents a rationale for combining climate intelligence, institutional strengthening, capacity development, and on-the-ground adaptation measures, a significant proportion of project resources is allocated to enabling and "soft" activities, including technical assessments, baseline studies, hydrological and biodiversity analyses, vulnerability assessments, consultants, monitoring systems, training programmes, knowledge products, guidance documents, toolkits, institutional uptake frameworks, and scaling strategies. Components 1 and 3 together account for approximately USD 3.3 million, or about 40% of the total project activity budget.

The proposal should provide a stronger justification for why such substantial resources are required for assessments, technical assistance, consultancy services, planning tools, and institutional processes, particularly given the relatively limited scale of direct physical interventions (1,000 ha of peatland restoration, 800 ha of watershed management, and 71 ha of urban NbS interventions).

In particular, the proposal should demonstrate:

Why existing climate information systems, studies, assessments, and technical guidance are insufficient and why additional assessments and analytical work are necessary.

How investments in climate intelligence, frameworks, toolkits, studies, and institutional strengthening will translate into measurable adaptation outcomes and resilience benefits.

Why the current balance between enabling activities and tangible adaptation investments represents the most cost-effective use of Adaptation Fund resources.

Whether some resources allocated to consultancy, assessments, planning, capacity development, and knowledge management could be redirected to expand direct adaptation interventions and increase the scale of tangible benefits on the ground.

Is the project / programme consistent with national or sub-national sustainable development strategies, national or sub-national development plans, poverty reduction strategies, national communications and adaptation programs of action and other relevant instruments?

Response: Cleared

Secretariat: Yes. The project is generally consistent with Malaysia's national policies. The proposal identifies the key national policies, climate strategies, adaptation plans, and relevant sectoral frameworks and demonstrates alignment between project activities and the objectives of these instruments

Does the project / programme meet the relevant national technical standards, where applicable, in compliance with the Environmental and Social Policy of the Fund?

Response: Not Cleared

Secretariat: While the proposal includes adequate safeguard instruments through the ESMF, SEP, GAP and GRM, the monitoring framework could be strengthened by explicitly incorporating safeguard implementation milestones and indicators. This could include monitoring of the preparation and implementation of site-specific ESMPs, completion of hydrological, biodiversity and community health and safety assessments prior to physical works, implementation of mitigation measures identified in the ESMF, and periodic reporting on safeguard compliance throughout project implementation. Also, the proposal should clearly indicate where the costs for site-specific ESMPs, hydrological assessments, biodiversity assessments, community health and safety assessments, and safeguard compliance monitoring are budgeted, to ensure adequate resources are available for full implementation of the Environmental and Social Management Framework.

Is there duplication of project / programme with other funding sources?

Response: Not Cleared

Secretariat: The proposal identifies relevant ongoing and planned initiatives and generally demonstrates complementarity rather than duplication. However, the arrangements for coordination during implementation could be described in greater detail, particularly for initiatives operating in the same landscapes. Additional information on coordination mechanisms, information-sharing arrangements, and delineation of responsibilities would strengthen assurance that complementarity is maintained throughout implementation.

Does the project / programme have a learning and knowledge management component to capture and feedback lessons?

Response: Cleared

Secretariat: The proposal includes a well-defined knowledge management and learning component that supports the generation, documentation, dissemination, and application of lessons learned. Through knowledge products, learning events, monitoring systems, and a dedicated knowledge-sharing platform, the project will facilitate the systematic capture and analysis of adaptation experiences and contribute to national and local learning on climate-resilient ecosystem management and Nature-based Solutions. The knowledge management approach is also designed to support replication, scaling and long-term institutional uptake of successful interventions.

Has a consultative process taken place, and has it involved all key stakeholders, and vulnerable groups, including gender considerations in compliance with the Environmental and Social Policy and Gender Policy of the Fund?

Response: Pending

Secretariat: Yes- The proposal demonstrates a comprehensive and gender-responsive consultation process involving key stakeholders, including vulnerable groups. Consultation findings are reflected in project design, safeguard issues were considered during stakeholder engagement, and implementation arrangements provide mechanisms for continued stakeholder participation through the SEP, GRM, and community-based engagement structures. The proposal is supported by dedicated consultation, safeguard, and gender documentation.

Is the requested financing justified on the basis of full cost of adaptation reasoning?

Response: Pending

Secretariat: While the proposal establishes a clear climate change rationale and demonstrates that the proposed interventions contribute to adaptation objectives, further justification is recommended regarding the allocation of significant resources to enabling and soft activities, including technical assessments, studies, climate information systems, consultancy support, frameworks, guidance products, capacity building and knowledge management. The proposal should explain more clearly why these expenditures constitute essential adaptation costs, how they directly contribute to resilience outcomes, and why they are required in addition to existing national systems, programmes and institutional capacities. The proposal should also demonstrate that the balance between enabling activities and direct on-the-ground adaptation investments represents the most appropriate use of Adaptation Fund resources for achieving the intended adaptation benefits. And where possible reallocate some of the budget to on the ground interventions in cases where existing studies/assessments could be used.

Is the project / program aligned with AF's results framework?

Response: Pending

Secretariat: Yes. The project is aligned with the Adaptation Fund (AF) Strategic Results Framework

Response: Cleared

Secretariat: N/A

Has the sustainability of the project/programme outcomes been taken into account when designing the project?

Response: Cleared

Secretariat: Yes

Resource Availability

Is the requested project / programme funding within the cap of the country?

Response: Cleared

Secretariat: Yes

Is the Implementing Entity Management Fee at or below 8.5 per cent of the total project/programme budget before the fee?

Response: Cleared

Secretariat: Yes

Are the Project/Programme Execution Costs at or below 9.5 per cent of the total project/programme budget (including the fee)?

Response: Cleared

Secretariat: Yes

Eligibility of IE

Is the project/programme submitted through an eligible Implementing Entity that has been accredited by the Board?

Response: Cleared

Secretariat: N/A

Implementation Arrangements

Is there adequate arrangement for project / programme management, in compliance with the Gender Policy of the Fund?

Response: Cleared

Secretariat: Yes

Are there measures for financial and project/programme risk management?

Response: Cleared

Secretariat: Yes. The proposal includes a dedicated risk management section and identifies the major risks that could affect implementation. It assesses the likelihood and impact of each risk, assigns ownership, and proposes mitigation measures and monitoring arrangements

Are there measures in place for the management of for environmental and social risks, in line with the Environmental and Social Policy and Gender Policy of the Fund?

Response: Cleared

Secretariat: yes, there is evidence that measures are in place for the management of environmental and social risks in line with the Adaptation Fund ESP and Gender Policy.

Is a budget on the Implementing Entity Management Fee use included?

Response: Cleared

Secretariat: N/A

Is an explanation and a breakdown of the execution costs included?

Response: Not Cleared

Secretariat: The proposal includes Project Execution Costs; however, unlike the Implementing Entity Fee, it is not clear whether a detailed breakdown of the execution costs is provided. The proposal should include a more detailed budget note describing the main execution cost categories (e.g. staffing, monitoring and evaluation, reporting, stakeholder consultations, travel, communications, office support and other project management expenditures) to facilitate assessment of the reasonableness and eligibility of the proposed costs.

Is a detailed budget including budget notes included?

Response: Not Cleared

Secretariat: No budget note on the execution cost. Include budget note/detail of the execution cost uses just like that of the IE fees.

Are arrangements for monitoring and evaluation clearly defined, including budgeted M&E plans and sex-disaggregated data, targets and indicators, in compliance with the Gender Policy of the Fund?

Response: Cleared

Secretariat: Yes. The proposal appears to meet this criterion and includes a structured Monitoring and Evaluation (M&E) framework that incorporates gender-responsive monitoring, safeguards monitoring, and key evaluation milestones.

Does the M&E Framework include a break-down of how implementing entity IE fees will be utilized in the supervision of the M&E function?

Response: Cleared

Secretariat: Yes

Does the project/programme's results framework align with the AF's results framework? Does it include at least one core outcome indicator from the Fund's results framework?

Response: Pending

Secretariat: Yes. The proposal demonstrates alignment with multiple Adaptation Fund outcomes and includes a project Results Framework with 2 core indicators, targets, beneficiary estimates.

Response: Cleared

Secretariat: N/A

Is a disbursement schedule with time-bound milestones included?

Response: Cleared

Secretariat: Yes



FULLY DEVELOPED PROPOSAL FOR SINGLE COUNTRY

PART I: PROJECT/PROGRAMME INFORMATION

Title of Project/Programme: Enhancing the Adaptation and Climate Resilience of Urban and Natural Forests in Malaysia

Country: Malaysia

Thematic Focal Area: Nature Based Solutions, Flood/ Heat Management & Freshwater security

Type of Implementing Entity: Multilateral Implementing Entity

Implementing Entity: United Nations Development Programme Malaysia, Singapore and Brunei Darussalam

Executing Entities: Forest Research Institute Malaysia (FRIM)

Amount of Financing Requested: \$10,000,000 (in U.S Dollars Equivalent)

Project Formulation Grant Request: Yes ☒ No ☐

Amount of Requested financing for PFG: \$150,000 (in U.S Dollars Equivalent)

Letter of Endorsement (LOE) signed: Yes ☒ No ☐

NOTE: LOEs should be signed by the Designated Authority (DA). The signatory DA must be on file with the Adaptation Fund. To find the DA currently on file check this page: <https://www.adaptation-fund.org/apply-funding/designated-authorities>

Stage of Submission:

☒ This proposal has been submitted before including at a different stage (concept, fully-developed proposal)

☐ This is the first submission ever of the proposal at any stage

In case of a resubmission, please indicate the last submission date:

Concept note submissions: First submission: 6 Jan 2026, 1st technical review: 6 Feb 2026, 2nd technical review 3 March 2026, 3rd Technical review 2026: 13 March 2026

Please note that fully-developed proposal documents should not exceed 100 pages for the main document, and 100 pages for the annexes.

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List of acronyms

AF	Adaptation Fund	MADA	Muda Agricultural Development Authority
CFIL	Climate Finance Innovation Lab	MASH	Malaysian Adaptation Sharing Hub
CSO	Civil Society Organisation	METMalaysia	Malaysian Meteorological Department
DID/ JPS	Department of Irrigation and Drainage	MPKP	Kubang Pasu Municipal Council
DOE	Department of Environment	MSMA	Urban Stormwater Management Manual
DOSM	Department of Statistics Malaysia	MyNAP	Malaysia National Adaptation Plan
EbA	Ecosystem-based Adaptation	MYSA	Malaysian Space Agency
EE	Executing Entity	NADMA	National Disaster Management Agency
EIA	Environmental Impact Assessment	NAHRIM	National Water Research Institute Malaysia
ESMF	Environmental and Social Management Framework	NbS	Nature-based Solutions
ESMP	Environmental and Social Management Plans	NC4	Fourth National Communication
ESP	Environmental and Social Policy	NRES	Ministry of Natural Resources and Environmental Sustainability
FE	Final Evaluation	OHS	Occupational Health and Safety
FPIC	Free, Prior, and Informed Consent	PFG	Project Formulation Grant
FRIM	Forest Research Institute Malaysia	PLANMalaysia	Department of Town and Country Planning
GAP	Gender Action Plan	PMU	Project Management Unit
GBV	Gender-based Violence	PPR	Project Performance Report
GEC	Global Environment Centre	PSEA	Prevention of Sexual Exploitation and Abuse
GESI	Gender Equality and Social Inclusion	PSEAH	Protection from Sexual Exploitation, Abuse and Harassment
GIS	Geographic Information System	RCP	Representative Concentration Pathway
GRM	Grievance Redress Mechanism	RP	Responsible Party
IC-FIS	Integrated Climate- Forest Intelligence System	SADA	Syarikat Air Darul Aman Sdn Bhd (Kedah State Water Company)
IE	Implementing Entity	SEP	Stakeholder Engagement Plan
IPCC	Intergovernmental Panel on Climate Change	SES	Social and Environmental Standards
JPBM	Fire and Rescue Department (Bomba)	SESA	Strategic Environmental and Social Assessment
JMG	Mineral and Geoscience Department	SESP	Social and Environmental Screening Procedure
JPSM	Forestry Department of Peninsular Malaysia	TWG	Technical Working Group
KEMAS	Community Development Department	UNDP	United Nations Development Programme
KLSFR	Kuala Langat Selatan Forest Reserve	UNFCCC	United Nations Framework Convention on Climate Change
LSANK	Kedah State Water Resources Board	WWF	World Wide Fund for Nature

I. Project Background and Context

A. National Context and Project Landscapes

Geography, Development and Economic context

Malaysia is a rapidly urbanizing upper-middle-income country with a population of approximately 34.2 million people and a diversified economy that has evolved from an agriculture-based system into a major manufacturing and services hub.¹ Continued economic growth, urbanization and infrastructure development have contributed significantly to national development and poverty reduction, while increasing demand for water resources, land and ecosystem services.¹

Malaysia is one of the world's most biologically diverse countries, with extensive forests, river basins, wetlands and peatland ecosystems that provide essential ecosystem services, including water regulation, flood attenuation, biodiversity conservation and carbon storage.² These ecosystems support domestic water supply, agricultural production, industrial development and the functioning of major urban and economic centres.

Balancing economic development with environmental sustainability is becoming increasingly challenging as urban expansion, infrastructure development and land-use change continue to place pressure on environmentally sensitive landscapes³. Development within flood-prone areas, water-source catchments and peatland ecosystems has increased exposure to hydrological instability and climate-related risks affecting communities, infrastructure and productive sectors. Maintaining the integrity of critical watersheds, peatlands and river systems is therefore increasingly important for sustaining long-term water security, agricultural productivity and climate resilience.

Climate-related disasters already impose significant costs on Malaysia. The Department of Statistics Malaysia (DOSM) estimates that floods caused RM 7.9 billion (USD 1.87 billion) in damages between 2021 and 2023⁴. The World Bank's Country Climate and Development Report warns that climate change could cost Malaysia up to 8.3% of GDP by 2050, and that by 2100 up to a third of Malaysian towns and cities could be at risk of flash floods⁵. Beyond direct disaster losses, increasing climate variability is placing growing pressure on water resources, agricultural production and infrastructure systems that underpin national economic development. Water-security challenges affecting major irrigation systems and water-supply reservoirs have highlighted the increasing economic importance of maintaining resilient watersheds, wetlands and other natural systems that support water regulation and reduce climate-related risks. These impacts place growing demands on public expenditure for emergency response, infrastructure and disaster recovery.

Climate risks increasingly threaten sectors important for Malaysia's long-term development objectives, including water resources, agriculture, food security, infrastructure and urban development. Agriculture could see production value decline by up to 18% by mid-century, with cascading effects on food security and rural livelihoods.⁵ As climate variability intensifies, strengthening the resilience of natural systems that regulate water, reduce flood risks and support livelihoods is becoming an increasingly important component of sustainable economic development and climate adaptation.

Social Vulnerability and Gendered Climate Impacts

Climate change impacts are unevenly distributed and disproportionately affect low-income households, women, youth, persons with disabilities and other vulnerable groups with more limited adaptive capacity

¹ Sources: Department of Statistics Malaysia (DOSM) (2025). <https://www.dosm.gov.my>

² Ministry of Natural Resources and Environmental Sustainability (NRES), 2022. Malaysia's Fourth National Communication to UNFCCC. https://unfccc.int/sites/default/files/resource/NRES_NC4_To%20UNFCCC_2024%20v1.0.pdf

³ Climate Adaptation and Resilience in Malaysia: Policy, Practice and Pathways. 2026. <https://www.iseas.edu.sg>

⁴ Statistics on Flood Damages in Malaysia 2021-2023 (DOSM). <https://www.dosm.gov.my>

⁵ World Bank Malaysia Country Climate and Development Report 2021. <https://openknowledge.worldbank.org/handle/10986/36554>

and fewer financial resources to absorb and recover from climate shocks⁶. Climate vulnerability is also gender-differentiated, influencing exposure, adaptive capacity, access to information and participation in adaptation planning and decision-making⁷. Existing inequalities in labour-force participation, income security and unpaid care responsibilities influence women's adaptive capacity and recovery potential following disasters. Women's participation in the formal labour force in Malaysia remains significantly lower than men's (56.5% compared to 83%), reducing access to financial resources and economic resilience during periods of crisis⁷. Evidence suggests that climate shocks and floods can further disrupt livelihoods, particularly for low-income households with limited savings or social protections⁷.

Women in Malaysia also undertake substantially higher levels of unpaid domestic and care work, contributing to time poverty and limiting participation in paid employment, training and decision-making processes⁸. Flood events frequently increase household recovery burdens, including cleaning, caregiving and water-related responsibilities, which disproportionately affect women and female-headed households. Water insecurity can further intensify these burdens, particularly in rural and agricultural areas where households may face seasonal water shortages or climate-related service disruptions.⁸

In peatland, forest-edge and climate-sensitive agricultural landscapes, women and lower-income households may also face differentiated exposure to haze pollution, livelihood disruption, reduced access to natural resources, and constraints on mobility and participation during climate-related emergencies. These impacts may be particularly significant where livelihoods are linked to ecosystem services, informal economic activities or natural-resource-based production systems. Climate change therefore acts as a threat multiplier, amplifying existing inequalities related to environmental exposure, income security, access to resources and adaptive capacity.⁶

Project Landscapes

The project focuses on three priority adaptation landscapes in the state of Selangor and Kedah. Each landscape addresses a distinct adaptation challenge and has been selected to demonstrate the implementation of Nature-based Solutions (NbS) with potential for learning, replication and scaling. Together, the three landscapes address complementary adaptation priorities related to peatland resilience, watershed management and flood risk reduction across nationally important ecosystems and production landscapes. The project combines site-based demonstration with state-level planning and institutional strengthening to support wider replication and future investment.

The selected landscapes are strategically important because of their contribution to water regulation, agricultural production, peatland resilience and flood management, supporting water services, economic activities and settlements that collectively affect millions of people across Peninsular Malaysia. The project spans two nationally important states: Selangor, one of Malaysia's principal economic and urban centres, and Kedah, Malaysia's primary rice-producing state, where climate resilience underpins national food security, water security and flood management.

Peatland: Kuala Langat Selatan Forest Reserve (KLSFR), Selangor (approx. 2.78 N, 101.68 E)

Malaysia has approximately 2.8 million hectares of tropical peatlands, about 6% of the world's tropical peatland area and 12% of the global peat carbon pool.⁹ The project focuses on Kuala Langat Selatan Forest Reserve (KLSFR), a degraded peatland landscape in the southern Selangor peatland complex. Kuala Langat District covers approximately 85,776 ha and has an estimated population of 362,300 people¹⁰. Located near major population centres, industrial corridors and Kuala Lumpur International Airport (KLIA), the landscape contributes to groundwater regulation, fire-risk reduction and ecosystem

⁶ IPCC. Climate Change 2022: Impacts, Adaptation and Vulnerability. <https://www.ipcc.ch/report/ar6/wg2/>

⁷ World Bank Malaysia Country Climate and Development Report 2021. <https://openknowledge.worldbank.org/handle/10986/36554>

⁸ UNDP 2020. Gender and Climate Change in Malaysia. <https://www.undp.org/malaysia>

⁹ Frontiers in Ecology and the Environment 10, 2012, p. 124. *Two decades of destruction in Southeast Asia's peat swamp forests.* <https://doi.org/10.1890/100236>

¹⁰ DOSM. District Statistics 2023. <https://www.dosm.gov.my>

resilience in one of the most densely populated and economically significant regions of Malaysia.¹¹

KLSFR has been prioritized due to its degraded hydrological condition, recurring peat-fire incidents, extensive legacy drainage networks, continued pressures from surrounding land-use, and limited existing water-retention efforts. Approximately 55% of the reserve is at high fire risk, while the Selangor Forestry Department's Integrated Management Plan (2025–2034) identifies part of KLSFR as a priority restoration zone, highlighting its strategic importance for peatland rehabilitation. The reserve also contains a Virgin Jungle Reserve and High Conservation Value Area, with an estimated 7.7 million tonnes of below-ground carbon, underscoring its ecological significance. Selangor peat-fires have the potential to generate haze impacts affecting large urban populations, transport infrastructure and economic activities, highlighting the broader regional importance of maintaining peatland hydrological integrity¹¹. Maintaining peatland hydrological integrity is therefore important not only for ecosystem resilience but also for reducing peat-fire and haze risks that may affect nearby communities, transport infrastructure, economic activities and regional connectivity. Experience and lessons generated at KLSFR are also expected to inform peatland restoration and climate adaptation efforts across Malaysia's wider peatland estate.

Ulu Muda Watershed, Kedah (6.13 N, 100.82 E)

Part of the Greater Ulu Muda Forest Complex, covering approximately 163,000 ha in northern Peninsular Malaysia. The landscape comprises a network of forest reserves and protected areas that provide critical ecosystem services, biodiversity values and freshwater resources.³

The landscape functions as one of Malaysia's most important water-catchment systems, supporting downstream irrigation, water supply and ecosystem services across Kedah, Penang and Perlis. The watershed supplies water to the Muda Agricultural Development Authority (MADA) irrigation scheme and contributes to raw-water supply for multiple water-treatment facilities serving both agricultural and domestic users. The broader system provides water services relied upon by an estimated 4.2 million people and supports one of Malaysia's most important rice-production systems, contributing significantly to national food security.¹²

The strategic importance of Ulu Muda extends well beyond the watershed. Catchment conditions influence water availability, water quality, reservoir performance and irrigation reliability across northern Peninsular Malaysia. The watershed combines national significance for water security and food production with opportunities to demonstrate climate-adaptive watershed management in a largely intact forest landscape that supports multiple downstream users and sectors. The importance of maintaining healthy watershed functions has been reinforced by increasing attention to reservoir water levels, water-security pressures and the long-term resilience of water supplies supporting domestic use, irrigation and agricultural production across northern Peninsular Malaysia. Lessons generated through integrated watershed management are expected to inform future management of other forested catchments that support Malaysia's strategic water resources. The project therefore focuses on Ulu Muda as a nationally significant water-security landscape where strengthened watershed functions can generate adaptation benefits across a large downstream service area.

Urban and Peri-Urban NbS: Kubang Pasu Demonstration Landscape, Kedah (6.43 N, 100.42 E)

Kedah, Malaysia's primary rice-producing state, faces increasing climate risks associated with more frequent and intense rainfall events, localized flooding, prolonged inundation, rising temperatures and increasing pressure on urban drainage systems. These hazards increasingly affect interconnected urban, peri-urban and agricultural landscapes across the state, placing growing pressure on flood

¹¹ Selangor State Forestry Department (2025). Integrated Management Plan for South Selangor Peat Swamp Forest (IMP-SSPSF) 2025–2034. Selangor State Forestry Department

¹² Muda Agricultural Development Authority (MADA) Annual Report 2023. <https://www.mada.gov.my>

management systems, water resources, critical infrastructure and ecosystem functions.

Kubang Pasu is a strategically important district in northern Kedah with an estimated population of 237,759 people.¹⁰ It contains an extensive network of retention ponds, drainage corridors, wetlands and associated infrastructure that perform important stormwater-management, flood-regulation and water-retention functions. These interconnected assets also provide a strong foundation for demonstrating how existing municipal infrastructure can support climate adaptation through NbS. It also includes major agricultural areas linked to the MADA irrigation system and the Bukit Kayu Hitam trade and transport corridor connecting Malaysia and Thailand. The district experiences recurrent flooding that affects settlements, agricultural production, transport connectivity and local economic activities. Recent flood events have highlighted increasing pressures on municipal drainage systems, particularly during periods of intense rainfall and prolonged inundation¹³.

Within Kedah, Kubang Pasu was selected as the demonstration landscape because it combines recurrent flood exposure with an extensive network of retention-pond, wetlands and drainage corridors, which provide strong opportunities for demonstrating NbS within an existing urban stormwater system. The district is also undergoing rapid urban and industrial development associated with the Bukit Kayu Hitam Special Border Economic Zone and northern growth corridor, increasing the importance of integrating climate resilience into future urban planning. Strong municipal leadership through the Kubang Pasu Municipal Council (MPKP) and its Smart City initiative provides an enabling environment for testing, refining and demonstrating scalable approaches that can inform replication across Kedah and other rapidly developing urban areas in Malaysia.

Broader Coverage Across Peninsular Malaysia

While physical Ecosystem-based Adaptation (EbA) and NbS interventions are concentrated in the states of Selangor and Kedah, the project is designed to generate knowledge, climate-risk information and practical implementation experience that can inform adaptation planning and decision-making across Malaysia. This includes methods for assessing climate risks, systems for monitoring water and ecosystems, and ways to integrate NbS into state planning and key agencies. Priority areas for replication will be identified to support scaling beyond the initial project sites.



Kedah:
Output 2.2 Ulu Muda watershed
Output 2.3 Kedah urban areas

Selangor:
Output 2.1 Kuala Langat Selatan Forest Reserve

Peninsular Malaysia:
Component 1: Strengthening Institutional Governance and Evidence-Based Decision-Support Systems

B. Problem Statement and Non-Climatic Barriers

¹³ National Disaster Management Agency (NADMA). (2024). Flood Incident Report: Kedah 2023-2024.

While Malaysia has established a comprehensive policy framework for climate action and adaptation, several institutional, technical and socio-economic barriers continue to constrain the transition from localized adaptation initiatives to coordinated and scalable climate resilience efforts. These barriers limit the ability of institutions and stakeholders to anticipate climate risks, manage interconnected landscapes and sustain adaptation investments over time. They also reduce the effectiveness of adaptation efforts across peatland, watershed and flood-prone landscapes where climate pressures interact with existing environmental and socio-economic vulnerabilities.¹⁴

Systemic Institutional and Technical Barriers

- Policy, Institutional and Jurisdictional Fragmentation** Malaysia's governance framework for forests, water resources, agriculture, drainage and urban development spans multiple agencies and administrative levels. Land-use planning, watershed management, irrigation, forestry, drainage and municipal development are implemented under different institutional mandates across federal, state and local jurisdictions³. While these arrangements provide sector-specific expertise, coordination challenges, uneven technical capacity and fragmented information-sharing can constrain integrated landscape management and slow the adoption and scaling of adaptation approaches across sectors and jurisdictions.¹⁴
- Growing Stress on Water, Flood-Management and Urban Systems** Climate variability, extreme weather events and rapid urbanization are placing increasing pressure on Malaysia's water resources, drainage systems and urban infrastructure. With approximately 77% of Malaysia's population living in cities (expected to reach 85-90% by 2050), urban expansion has significantly intensified climate risks.⁵ Expansion of impervious surfaces has reduced natural infiltration and flood-buffering functions in many urban and peri-urban areas, increasing exposure to flash flooding, drainage overload and localized heat stress. The World Bank Country Climate and Development Report highlights growing flood exposure and climate-related risks across Malaysian cities and economic corridors.⁵ These trends increase the need for approaches that complement conventional infrastructure with measures that strengthen ecosystem functions and improve resilience across the wider landscape.
- Knowledge Gaps in Tropical EbA and NbS Implementation** Despite increasing interest in EbA and NbS, there remains limited operational evidence and applied technical guidance regarding their long-term performance under tropical conditions. Many adaptation models and design assumptions have been developed in non-tropical environments and may not fully reflect Malaysia's rainfall intensity, hydrological dynamics, peatland conditions and ecological processes.¹⁵ As a result, government agencies and practitioners often face uncertainty regarding design standards, maintenance requirements, performance monitoring and long-term effectiveness, limiting confidence in wider adoption and replication.
- Landscape Degradation and Hydrological Instability** The resilience of critical peatland and watersheds is increasingly affected by erosion, sedimentation and hydrological disturbance. In Ulu Muda watershed erosion and sediment transport contribute to sedimentation pressures affecting reservoirs, irrigation systems, agricultural productivity, water-treatment requirements and downstream water management. In peatland landscapes, drainage-related hydrological changes can accelerate groundwater decline, peat drying and fire susceptibility, increasing environmental, economic and haze-related risks. These pressures reduce the capacity of natural systems to regulate water flows and buffer climate-related shocks.¹⁴
- Fragmented Information Systems and Predictive Planning Capacity** Climate-related planning and operational management remain constrained by fragmented datasets, institutional information silos and limited integration between ecological monitoring, hydrological observations and climate projections.³ While important climate and hydrological information exist across multiple agencies, integrated systems that support predictive risk assessment, adaptive management and long-term planning remain limited. Basin-scale analyses linking future climate

¹⁴ Climate Adaptation and Resilience in Malaysia: Policy, Practice and Pathways. ISEAS 2026. <https://www.iseas.edu.sg>

¹⁵ International Journal of Wildland Fire. 2025. *Adapting fire danger indices for tropical peatlands: A case study from Malaysia*.

conditions with hydrological processes, sediment dynamics and ecosystem responses are often fragmented across institutions and landscapes, reducing the ability of decision-makers to anticipate future risks and prioritize adaptation investments.¹⁴

Socio-Economic and Capacity Barriers

- Socio-Economic Vulnerability** Socio-economic conditions influence the ability of households and communities to prepare for, adopt and sustain adaptation measures. Within the project landscapes, many households depend directly on climate-sensitive natural resources and sectors, including irrigated rice cultivation, forestry, ecosystem services and local water resources. Recurrent flooding, drought, peat fires and environmental degradation can disrupt livelihoods, reduce household income and incur recovery costs, while limited financial resources and competing livelihood priorities constrain the capacity of households and communities to invest in long-term adaptation. These challenges are particularly relevant in flood-prone urban and peri-urban communities in Kubang Pasu, agricultural communities dependent on reliable water supplies downstream of the Ulu Muda watershed, and communities affected by peat fires and haze in the Kuala Langat landscape. Strengthening local adaptive capacity therefore requires adaptation approaches that are technically appropriate, economically accessible and responsive to local livelihood contexts.
- Gender-Differentiated Vulnerability** Women, Indigenous Peoples, youth, persons with disabilities and other vulnerable groups often face barriers to accessing information, participating in climate planning and decision-making, and benefiting equitably from adaptation investments. Climate-related risks disproportionately affect low-income households, women, youth, persons with disabilities and other vulnerable groups with fewer resources available to prepare for, cope with and recover from climate-related shocks. Women remain underrepresented in many formal water-governance and climate-planning structures despite often carrying significant responsibilities related to household water management, caregiving and post-disaster recovery.⁷ Vulnerable households in peatland, watershed and climate-sensitive agricultural landscapes may also face heightened exposure to flooding, haze events, water insecurity and environmental degradation. Addressing these challenges requires strengthened gender-responsive planning, inclusive participation mechanisms and safeguards-sensitive engagement approaches.⁶ Capacities such as empowering women to lead nurseries that will feed into the NbS intervention in Kubang Pasu and the Ulu Muda upstream area will be introduced under Component 2. Women and youth will also be engaged and trained in monitoring risks pertaining to heat, flood, fire and water security risks through citizen science programme and trainings.
- Capacity and Financing Constraints for Scaling Adaptation** Scaling adaptation requires sustained technical capacity, institutional learning and long-term financing. While Malaysia has made substantial investments in climate resilience, the scale of future adaptation needs remains significant. Recent government assessments estimate that approximately RM 392 billion (~USD 83 billion) may be required for flood mitigation and climate-resilience investments through 2100.¹⁶ At the same time, institutions responsible for implementing adaptation measures often face constraints related to climate risk assessment and planning, technical design, implementation and monitoring of NbS, cross-sector coordination, long-term monitoring and maintenance, and access to sustainable financing mechanisms. These constraints can limit the pace at which innovative adaptation approaches are adopted, institutionalized, maintained and replicated beyond individual project cycles, highlighting the need for strengthened institutional capacity, operational coordination, long-term stewardship and sustainable financing to support climate-resilient development.¹⁴

Baseline Adaptation Context

Under the current scenario, climate adaptation efforts are expected to continue through a combination

¹⁶ Department of Irrigation and Drainage (DID/JPS). 2024. National Flood Mitigation and Climate Resilience Investment Requirements 2024-2100.

of sector-specific programmes, conventional infrastructure investments and routine management activities.¹⁴ While these measures provide important services and localized benefits, they are not designed to address the interconnected climate risks affecting peatland, watershed and flood-prone landscapes.¹⁴

In peatland areas, management is expected to remain focused primarily on fire monitoring, suppression and routine land-management activities. Limited resources are available for hydrological management, water-retention measures, integrated monitoring systems and other measures that address the underlying drivers of peat-fire vulnerability. As climate variability increases, degraded peatlands may remain vulnerable to groundwater decline, peat drying and recurrent fire risk.¹¹

In the Ulu Muda watershed, existing investments are likely to continue focusing on reservoir operations, water infrastructure and routine watershed management. While these investments support water supply and irrigation services, inadequate financing is available for climate-adaptive watershed management, erosion control, sediment management, assisted natural regeneration and enrichment planting that address upstream drivers of sedimentation, declining water quality and hydrological instability.

In urban and peri-urban areas, local authorities are expected to continue relying primarily on conventional drainage and retention systems designed around historical hydrological conditions. As rainfall intensity, runoff patterns and urban development pressures increase, these systems may face growing challenges in managing flood risks and maintaining service performance. Opportunities to enhance existing assets through NbS and ecological retrofitting are likely to remain limited under current financing arrangements.

At the institutional level, climate, hydrological and ecosystem information will continue to be generated by multiple agencies, but the integration of these datasets into practical planning and management tools is expected to remain uneven. This may constrain the ability of institutions to undertake forward-looking risk assessments, prioritize investments and respond proactively to evolving climate conditions.¹⁴ Community participation in adaptation is also likely to remain limited to short-term consultation and awareness activities. Existing programmes provide comparatively little support for long-term stewardship systems, community monitoring initiatives, citizen-science programmes, community nurseries or other mechanisms that can help sustain adaptation investments beyond individual projects.

Taken together, these constraints suggest that adaptation efforts will continue to address immediate risks and operational needs but may be insufficient to support the coordinated, landscape-scale adaptation required to respond to increasing climate variability and long-term climate change.¹⁴

C. Climate Rationale

Malaysia is experiencing increasing climate-related hazards that are directly relevant to the project's peatland, watershed and urban landscapes. These include more frequent and intense flooding, changing rainfall patterns, prolonged droughts, increasing temperatures, hydrological instability and associated ecosystem degradation. Together, these trends increase risks to water security, agriculture, urban infrastructure and ecosystem services, reinforcing the need for integrated adaptation approaches that combine climate information, ecosystem management and NbS.

Climate impacts and hazards

Climate change is altering Malaysia's hydrological systems, ecosystems, and settlements through a projected temperature increase of up to 2.0°C and a 16.9% rise in rainfall volatility by mid-century.¹⁷ Because 97% of the nation's water supply relies heavily on surface runoff and river systems, these shifts

¹⁷ Malaysian Meteorological Department (METMalaysia), 2023. Climate Change Scenarios for Malaysia 2021-2100. <https://www.met.gov.my>

drive cascading socio-economic and environmental impacts—manifesting as depleted water storage, reservoir sedimentation, and degraded water quality. To build long-term adaptive capacity, this project deploys NbS addressing five climate-related hazards directly relevant to the target landscapes:

- **Intensifying Flooding and Extreme Rainfall** Flooding has become one of Malaysia's most significant climate-related hazards, contributing to increasing economic losses, infrastructure disruption and displacement. Approximately 10.1% of Malaysia's land area (around 33,000 km²) is classified as flood-prone.¹⁸ Climate projections indicate that rising temperatures are likely to increase atmospheric moisture-holding capacity, contributing to more intense rainfall events and increasing flood risk. The National Water Research Institute of Malaysia (NAHRIM) projects that flooded areas are expected to increase by up to 18.2% in Peninsular Malaysia, while extreme rainfall intensity is projected to increase by 16% to 20%.¹⁹ These trends are increasingly reflected in recurring and multi-wave flood events affecting the same communities multiple times during a single monsoon season.
- **Drought and Water Stress** Droughts, prolonged dry periods and increasing temperatures are placing growing pressure on Malaysia's water resources, peatlands and climate-sensitive ecosystems. In peatland landscapes, declining groundwater levels increase peat drying and fire susceptibility, while prolonged dry periods reduce ecosystem resilience and water-regulation functions. FRIM analysis in Selangor indicates that peat-fire risk increases significantly when groundwater levels decline beyond approximately 40–50 cm below the peat surface, creating conditions favourable for persistent smouldering peat fires.²⁰
- **Peat Drying and Fire Risk** Human-induced drainage lowers water tables and renders naturally waterlogged peatlands highly susceptible to smouldering underground fires. Climate projections of prolonged droughts and higher temperatures amplify this risk, turning carbon-rich peat swamp forests into massive greenhouse gas emitters and becoming the primary driver of severe regional smoke haze, recurrent public health crises, affecting airport and school operations. In peatland landscapes, declining groundwater levels increase peat drying and fire susceptibility, directly threatening dense human settlements, critical highway networks, and heavy infrastructure. FRIM analysis indicates that peat-fire risk increases significantly when groundwater levels fall below approximately 40–50 cm beneath the peat surface, creating conditions that favour persistent smouldering fires during extended dry periods.¹¹
- **Increasing Temperatures and Heat Stress** Projections indicate that mean surface temperatures across Malaysia will rise by 1.2°C to 1.5°C by mid-century¹⁹, dramatically amplifying ambient heat stress. Because the nation's water security is 97% reliant on surface water systems, this thermal escalation directly threatens critical hydrological assets and sensitive ecosystems. Elevated ambient temperatures accelerate evapotranspiration rates, rapidly depleting surface storage reserves and lowering river baseflows during dry seasons. Thermally stressed water bodies suffer from reduced dissolved oxygen levels and accelerated algal blooms, severely compromising raw water quality and escalating treatment costs. Furthermore, heat stress disrupts riverine and forest ecosystems, causing canopy dieback and reducing the natural water-retention capacity of watersheds.

Hydrological Variability, Soil Erosion and Siltation Pressures Climate-driven shifts in monsoon patterns are accelerating extreme hydrological variability across Malaysia's river basins. Regional climate downscaling by NAHRIM projects that annual rainfall volumes will increase by 9% to 25% by 2100.¹⁹ Crucially, this volume expansion is driven by a 30% surge in extreme rainfall intensity rather than evenly distributed rainy days, shifting the baseline toward rapid, high-velocity surface runoff over vulnerable watersheds. This intensified runoff triggers severe land degradation, localized riverbank destabilization, and accelerated topsoil erosion. The resulting siltation pressures create a cascading crisis for water security: eroded sediment chokes natural river channels, drastically reduces natural flood-carrying capacities, and causes massive siltation in critical reservoirs. Increased turbidity and

¹⁸ National Disaster Management Agency (NADMA), 2021. National Flood Risk Assessment Report.

¹⁹ National Water Research Institute of Malaysia (NAHRIM), 2024. Climate Change Projections for Malaysia: Rainfall and Flood Analysis. <https://www.nahrim.gov.my>

²⁰ Ministry of Natural Resources and Environmental Sustainability (NRES), 2022. Water Resource Management Report.

suspended solids severely degrade raw water quality, spiking municipal water treatment costs and accelerating infrastructure wear.

The implications of these hazards differ across the three project landscapes owing to differences in ecosystem characteristics, hydrological processes, socio-economic conditions and exposed assets as summarized in the table below:

Table: Summary of climate hazards, vulnerabilities and adaptation rationale for the project

Project landscape	Main climate hazards & trends	Key vulnerabilities	Main exposed people, assets & sectors	Adaptation rationale
Kuala Langat Selatan Forest Reserve (Selangor)	- Rising temperatures and prolonged dry periods - Groundwater decline - Peat drying and increased peat-fire risk	- Degraded peat hydrology - Peat oxidation and fire susceptibility - Loss of ecosystem functions, carbon storage and biodiversity	- Nearby communities - Greater Kuala Lumpur - KLIA and transport corridors - Peatland ecosystem services	Peatland hydrological restoration and rewetting to reduce peat-fire risk and strengthen ecosystem resilience
Ulu Muda Watershed (Kedah)	- Increasing rainfall intensity - Greater runoff - Drought periods - Erosion and sedimentation	- Watershed degradation - Reservoir sedimentation - Reduced water storage and water quality	4.2 million water users downstream - MADA irrigation scheme - Domestic water supply - Agriculture	Watershed restoration, enrichment planting and erosion control to strengthen water security and reduce sedimentation
Kubang Pasu / Urban & Peri-urban Kedah	- More intense rainfall - Flooding - Higher temperatures and urban heat Increasing frequency and intensity of extreme rainfall; recurrent flooding and prolonged inundation; increasing temperature and urban heat stress; pressure on drainage systems	- Drainage & stormwater system overload - Flood-prone settlements - Reduced infiltration & increasing runoff - Urban infrastructure and agricultural areas	- Communities & settlements - Businesses and Bukit Kayu Hitam economic corridor - Roads and public infrastructure - Paddy production and agricultural livelihoods - Transport and logistic networks	NBS for flood attenuation, urban cooling and improved water regulation, supported by state-wide NbS planning. Transformation of retention ponds and drainage assets into multifunctional NbS to reduce flood risks, improve water regulation, urban cooling, and biodiversity, and demonstrate a replicable blue-green infrastructure model for climate-resilient municipal development.

Vulnerability assessment

The impacts of climate hazards in Malaysia are not evenly distributed across geographic areas, economic sectors and population groups. Vulnerability is particularly concentrated in climate-sensitive urban areas, peatland and watershed landscapes, irrigated agricultural systems, and among communities with more limited adaptive capacity and financial resilience.⁵ The principal climate vulnerabilities associated with each project landscape are also summarised in the table above.

- Urban Exposure and Infrastructure Vulnerability** Approximately 75% of Malaysia's population resides in urban areas, where exposure to flash flooding, drainage-system overload and urban heat stress is increasing.⁵ Rapid urbanization, expansion of impermeable surfaces and loss of natural drainage functions have increased runoff intensity and reduced flood-buffering capacity across many urban and peri-urban areas. Urban heat-island effects commonly increase local temperatures by 2–3°C above surrounding areas, further increasing exposure to heat-related impacts.¹⁴ As a result, extreme rainfall events increasingly lead to localized flooding, infrastructure disruption, economic losses and prolonged recovery periods in densely populated settlements.¹⁴

- **Climate-Sensitive Ecosystems and Dependent Communities** Peatland and watershed ecosystems are particularly vulnerable because climate change compounds existing pressures associated with drainage, erosion, land-use change and urban expansion. Reduced ecosystem resilience affects water regulation, flood attenuation, sediment control, biodiversity conservation and other ecosystem services that support communities, agriculture and economic activities. Environmental degradation reduces the capacity of these systems to buffer climate impacts and support the communities that depend upon them.
- **Water Security, Agricultural Livelihoods and Food Security** Malaysia's agricultural production and water security are closely linked to climate-sensitive watershed systems and reliable water availability. Approximately 97% of Malaysia's national water supply is derived from surface-water systems, making water security highly dependent on rainfall patterns, watershed condition and reservoir performance.⁵ Increasing temperatures, rainfall variability, erosion and sedimentation place growing pressure on reservoirs, irrigation infrastructure and downstream water users. Between 2018 and 2022, flood and extreme-weather events affected approximately 19,672 hectares of rice-production areas, illustrating the increasing vulnerability of climate-sensitive agricultural systems.²¹
- **Economic Vulnerability** Climate-related disasters are generating increasing economic losses across infrastructure, agriculture, businesses and households. Between 2021 and 2023, flood-related losses alone were estimated at approximately RM 7.9 billion (USD 1.87 billion).⁵ Within the project landscapes, these economic impacts are reflected through recurrent flood damage to urban infrastructure and businesses in Kubang Pasu, increasing pressure on water-dependent agricultural production linked to the Ulu Muda watershed, and the economic consequences of peat fires, haze events and ecosystem degradation in Kuala Langat. Increasing climate variability is expected to place additional pressure on public expenditure associated with emergency response, recovery, infrastructure rehabilitation and disaster-risk management, while also affecting productivity and local livelihoods.⁵
- **Community and Livelihood Vulnerability** Climate-related impacts are not experienced uniformly across affected populations. Within the project landscapes, climate-related impacts are not experienced uniformly across affected populations. In the Kuala Langat landscape, peat fires and haze events may affect public health, livelihoods and access to natural resources. In the Ulu Muda landscape, communities and downstream economies depend on reliable watershed functions that support domestic water supply and irrigated agriculture. In Kubang Pasu, recurrent flooding affects households, businesses and agricultural production, disrupting livelihoods and increasing recovery costs. These socio-economic conditions influence exposure to flooding, water insecurity, haze events and environmental degradation and reinforce the need for inclusive, community-based adaptation approaches.⁶

Climate trends and projections

The need for long-term adaptation action in Malaysia is supported by observed climate trends and projected increases in temperatures, rainfall variability, extreme rainfall intensity, drought risk and hydrological variability. Evidence from the METMalaysia, Malaysia's Fourth National Communication (NC4) to the United Nations Framework Convention on Climate Change (UNFCCC) and the IPCC Sixth Assessment Report (AR6) indicates that Malaysia is already experiencing a warming climate accompanied by increasing climate variability and more frequent extreme weather events.³

Observed records indicate warming trends of approximately 0.13°C-0.24°C per decade across different parts of Malaysia since the 1980s.¹⁷ Crucially, historical records from MetMalaysia indicate that this warming is asymmetric: surface minimum temperatures (nighttime lows) are escalating nearly twice as fast as maximum temperatures, rising by up to 0.32°C per decade compared to 0.22°C per decade for daytime highs. This lack of nocturnal cooling prevents thermal recovery across watersheds, driving elevated overnight evapotranspiration and locking surface water systems into continuous, 24-hour ecological stress. While regional downscaling by NAHRIM projects a mean maritime temperature rise

²¹ Ministry of Agriculture and Food Security, 2023. Agricultural Statistics. <https://www.mafs.gov.my>

of 1.7°C to 2.1°C by 2100, this baseline increase interacts destructively with localized Urban Heat Island effects to spike city temperatures by an additional 2°C to 8°C. This combined thermal stress accelerates evaporation over surface water assets, triggering severe ecological flow deficits. National climate projections indicate that average temperatures will continue to increase through mid-century under both medium-emission (RCP4.5) and high-emission (RCP8.5) scenarios, while changes in rainfall patterns are expected to contribute to more intense rainfall events, increasing hydrological variability and greater seasonal water stress.³

These trends are expected to place increasing pressure on water resources, agricultural systems, peatland and watershed ecosystems, urban drainage infrastructure and climate-sensitive communities. Projected impacts are likely to vary across regions and landscapes. Northern Peninsular Malaysia is projected to experience increasing dry-season variability, water stress and hydrological instability affecting reservoirs, irrigation systems and watershed functions, while urbanized areas may face increasing flood exposure, drainage-system pressure and urban heat stress associated with intensified rainfall, rising temperatures and expanding impermeable surfaces.¹⁹

Table: Summary of observed climate trends, projections and relevance for the project landscapes

Climate hazard	Observed trends	Future climate projections	Relevance to project landscapes
Rising temperatures and heat stress	Increasing temperatures have been observed across Malaysia at rates of approximately 0.13–0.24°C per decade since the 1980s. ¹⁷	In medium (RCP4.5) and high-emission (RCP8.5) scenarios, mean temperatures projected to increase by 1.1–1.5°C by 2050 and 1.7–2.1°C by 2100. ¹⁹ Rising temperatures are to increase evapotranspiration, water demand and heat stress, while contributing to more intense rainfall via higher atmospheric moisture. ^{17 19}	Increasing temperatures will exacerbate peat drying and wildfire risk in Kuala Langat, increase evapotranspiration and irrigation demand in Ulu Muda, and intensify urban heat stress and climate impacts in Kubang Pasu. ^{3 14}
Extreme rainfall and flooding	Increasing frequency and intensity of heavy rainfall events have been observed across Peninsular Malaysia, contributing to recurrent flooding, infrastructure disruption and economic losses. ¹⁸	Under the medium (RCP4.5) and high-emission (RCP8.5) scenarios, NAHRIM projects extreme rainfall intensity will increase by 16–20% in Peninsular Malaysia, while flood-prone areas may increase by up to 18.2% by 2100. ¹⁹	More intense rainfall will increase flood risk in Kubang Pasu, accelerate runoff, erosion and sediment transport in the Ulu Muda watershed, and contribute to greater hydrological variability across project landscapes. ^{3 14}
Drought and water stress	More pronounced dry periods and increasing seasonal rainfall variability have been observed across Peninsular Malaysia, particularly during El Niño periods. ¹⁸	Under both RCP4.5 and RCP8.5 scenarios, climate projections indicate greater dry-season variability and increasing water stress by the 2050s, placing growing pressure on reservoirs, irrigation systems and water resources. ^{3 19}	Increasing drought and water stress will reduce water available for irrigation and domestic supply in Ulu Muda, while prolonged dry periods amplify risks to groundwater decline and ecosystem stress in Kuala Langat. ^{3 14}
Peat drying and fire risk	Recurrent peat fires and declining groundwater levels observed in drained peatland landscapes, particularly in dry periods. FRIM monitoring indicates that peat-fire risk increases significantly if groundwater levels fall below ~40–50 cm beneath the peat surface. ¹¹	Higher temperatures and prolonged droughts are expected to increase peat drying, oxidation and fire susceptibility under both RCP4.5 and RCP8.5 scenarios, increasing greenhouse gas emissions and the likelihood of severe haze events by 2050–2100. ^{17 19}	This hazard is particularly relevant to Kuala Langat, where restoring peat hydrology is essential to reduce wildfire risk, protect ecosystem functions and reduce haze impacts affecting nearby communities, transport infrastructure and economic activities. ^{11 14}

Hydrological variability, erosion and sedimentation	Increasing rainfall variability and more intense runoff are contributing to erosion, sediment transport and reservoir sedimentation in Malaysian watersheds. ¹⁹	Under RCP4.5 and RCP8.5 scenarios, NAHRIM projects increasing rainfall variability, more intense runoff and greater hydrological instability by 2050–2100, increasing erosion, sediment mobilisation and pressure on reservoirs and water-management systems. ¹⁹	In Ulu Muda, erosion and sedimentation threaten reservoir performance, downstream irrigation, water supply and long-term watershed resilience, while also contributing to flood management challenges in Kubang Pasu. ^{14 24 25}
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The following sections describe the climate risks, vulnerabilities and projected climate changes affecting each project landscape, and present the climate rationale for the proposed adaptation interventions.

Site-Specific Climate Risks, Vulnerabilities and Adaptation Rationale

Peatland Landscape (Selangor)

The Selangor peatland landscape is increasingly vulnerable to prolonged dry periods, hydrological disturbance and peat-fire risk associated with pronounced seasonal rainfall variability, rising temperatures and groundwater decline. The landscape experiences a tropical monsoon climate, with rainfall concentrated during the Northeast Monsoon and substantially drier conditions during the Southwest Monsoon and El Niño years. In intact peatlands, groundwater levels fluctuate seasonally while remaining close to the peat surface. However, in Kuala Langat Selatan Forest Reserve (KLSFR), an extensive legacy drainage network amplifies these seasonal fluctuations, resulting in substantially lower groundwater levels and increased peat drying during dry periods.

FRIM monitoring and peatland studies indicate that peat-fire susceptibility increases substantially when groundwater-table levels decline beyond 40–50 cm below the peat surface during extended dry periods, increasing peat drying, oxidation and the risk of persistent peat fires. Research using IoT-based monitoring systems at the Raja Musa Forest Reserve in Selangor has demonstrated that groundwater level is a critical predictor of peatland fire risk, with correlations above 0.84 between monitored data and METMalaysia observations, and a correlation of 0.91 between calculated Duff Moisture Code using proposed models and actual fire occurrence data²². Historical drought periods, including the 2019 El Niño event, recorded substantial groundwater decline in the Selangor peatland landscape, illustrating the sensitivity of these ecosystems to prolonged dry conditions and hydrological disturbance.¹⁴

Projected increases in temperature and seasonal rainfall variability are expected to increase the frequency and duration of groundwater drawdown during dry periods, even where annual rainfall increases overall, as a greater proportion of precipitation is projected to occur in more intense rainfall events. These changes are expected to increase peat drying and oxidation, affecting ecosystem resilience, carbon-storage functions, biodiversity and water-regulation services. Studies on tropical peat compaction in Selangor indicate that peatland degradation significantly alters physicochemical properties and carbon emissions, with CO₂ emissions from degraded secondary forest peat measured at 275.4 mg m⁻² hr⁻¹, reducing to 182.0 mg m⁻² hr⁻¹ under compaction conditions²³. Peatland degradation and fire events can also contribute to haze exposure, reduced water quality and broader environmental-health impacts affecting nearby settlements, transport infrastructure and economic activities. The landscape is located within the wider Greater Kuala Lumpur region and in proximity to Kuala Lumpur International Airport (KLIA), increasing the significance of preventing recurrent peat-fire and haze events that may affect public health, economic activity and regional connectivity.

²² Environmental Monitoring and Assessment, 195, 2023. *IoT-based groundwater monitoring for peatland fire risk prediction in Selangor, Malaysia*. <https://doi.org/10.1007/s10661-023-11234-5>

²³ Soil Science Society of America Journal 88, p. 15-28, 2024. *Effect of compaction on tropical peat properties and CO₂ emissions in Selangor, Malaysia*. <https://doi.org/10.1002/saj2.20532>

These risks highlight the importance of maintaining peatland hydrological integrity and groundwater conditions under increasingly variable climatic conditions. The proposed intervention focuses on peatland hydrological stabilization and rewetting measures to maintain peat moisture conditions, reduce fire susceptibility and improve resilience to prolonged dry periods and climate variability.

Ulu Muda Watershed (Kedah)

Ulu Muda is highly sensitive to changing rainfall intensity, hydrological variability and erosion processes because its forested upper catchments regulate runoff, sediment transport and downstream water supply. Increasing rainfall intensity and more variable precipitation patterns are expected to increase surface runoff, soil erosion and sediment transport within upper catchments, affecting downstream reservoirs, irrigation infrastructure, water-treatment requirements and agricultural water management.

The watershed forms a critical component of the regional water-resource system supporting domestic water supply, irrigation and agricultural production across the states of Kedah, Penang and Perlis. The broader watershed system provides water services relied upon by an estimated 4.2 million people and supports the MADA irrigation scheme, one of Malaysia's most important rice-production systems and a key contributor to national food security. Recent reports of declining water levels in the Muda and Pedu reservoirs have highlighted growing concerns regarding water availability, irrigation reliability and the resilience of downstream water users during prolonged dry periods.

NAHRIM projects increases in annual rainfall (9–25%) and extreme rainfall intensity (16–20%) across Peninsular Malaysia under future climate scenarios, together with increasing temperatures. These changes are expected to increase runoff variability, soil erosion and the frequency of extreme precipitation events affecting northern Peninsular Malaysia, particularly within steep forested catchments and downstream reservoir systems.²⁴ These changes are expected to increase soil erosion, sediment mobilisation and watershed degradation, particularly within vulnerable slopes, riparian areas and disturbed catchment zones. Logging in the Ulu Muda upper catchments results in high rates of sedimentation and movement of forest debris into rivers, threatening reservoir lifespan and the ability of forests to regulate water flow.²⁵ Sedimentation studies in the Muda catchment area have shown that bedload sediment thickness can reach up to 0.75 metres in some locations, with reservoirs containing fine sediments (silt and clay sizes <63 µm) that affect water-storage capacity.²⁶ Increased sedimentation threatens downstream reservoirs, irrigation infrastructure and water-treatment systems, including the Muda Dam and MADA irrigation network, while increasing operational costs for water-service providers.

At the same time, increasing temperature, rainfall variability and drought risk may place additional pressure on reservoir storage, irrigation reliability, irrigation efficiency and agricultural productivity. Ongoing erosion and sediment transport within upper catchments may contribute to sedimentation pressures affecting reservoir capacity, water-treatment requirements and overall water-management efficiency. These interacting pressures have the potential to increase competition among domestic, agricultural and other water users under future climate conditions.

Given the strategic role of the Ulu Muda watershed in supporting regional water security, domestic water supply and national food production, maintaining watershed functions that regulate runoff, reduce erosion and sediment transport, sustain reservoir performance and protect downstream water quality is therefore an important climate adaptation priority for northern Peninsular Malaysia.

The proposed intervention focuses on climate-adaptive watershed management, enrichment planting, assisted natural regeneration, erosion-control and sediment-management measures designed to

²⁴ National Water Research Institute of Malaysia (NAHRIM), 2024. Climate Change Projections for Malaysia: Rainfall and Flood Analysis. <https://www.nahrim.gov.my>

²⁵ WWF-Malaysia, 2024. Ulu Muda Forest Complex: A Critical Water Catchment for National Food Security. <https://www.wwf.org.my>

²⁶ Malaysian Institute for Nuclear Technology Research, 2000. Sedimentation Studies in the Muda Catchment Area.

strengthen watershed resilience and reduce climate-related risks and pressures on downstream water systems, downstream water users, agricultural production and water-dependent livelihoods under future climate conditions.

Urban and Peri-Urban Landscapes (Kedah)

Kedah, Malaysia's primary rice-producing state, is experiencing increasing climate risks associated with more frequent and intense rainfall events, localized flooding, prolonged inundation, rising temperatures and increasing pressure on urban drainage systems. These climate hazards affect urban centres, peri-urban settlements, agricultural landscapes and critical infrastructure across the state, highlighting growing challenges for flood management, water regulation and climate resilience. Between 2023 and 2025, approximately 90 recurrent flood hotspots were identified across Kedah, with significant concentrations occurring in districts including Kubang Pasu, Kota Setar, Pendang, Baling and Langkawi, illustrating the widespread nature of flood risks across the state.¹⁴

Flood losses during the Northeast Monsoon 2024/2025 were estimated at RM136.7 million (approximately USD 32.8 million), including RM97.8 million (approximately USD 23.5 million) in agricultural losses, highlighting the increasing vulnerability of communities, infrastructure and economic sectors to climate variability and extreme weather events. According to the Special Survey on the Impact of the 2024/2025 Northeast Monsoon Floods, Kubang Pasu district recorded total flood losses of RM2.1 million (approximately USD 0.5 million), comprising RM2.1 million (approximately USD 0.5 million) in residential damages, RM28,800 (approximately USD 6,900) in vehicle losses, and RM39,600 (approximately USD 9,500) in business premises damages.²⁷

Within Kedah, Kubang Pasu is particularly exposed to compound flood risks associated with intense rainfall events, upstream runoff accumulation, drainage-system overload and localized waterlogging, while rising temperatures contribute to increasing urban heat exposure. Recurrent and multi-wave flood events have affected settlements, agricultural areas, public infrastructure, transport connectivity and local economic activities. Repeated inundation within short recovery periods may reduce infiltration capacity, increase runoff accumulation and prolong localized drainage stress, placing additional pressure on vulnerable populations and municipal infrastructure.

Under the medium-emission (RCP4.5) and high-emission (RCP8.5) scenarios, NAHRIM projects temperature increases of 1.7°C to 2.1°C by 2100, alongside a 9% to 25% increase in rainfall. The intensity of extreme rainfall is projected to increase by 16% to 20% in Peninsular Malaysia, and flooded areas are expected to increase by up to 18.2%.¹⁹ These projections suggest that flood frequency, drainage pressure, urban heat exposure and infrastructure risks are likely to increase under future climate scenarios. Low-lying agricultural and settlement areas may face increasing challenges associated with repeated inundation, delayed recovery periods and cumulative impacts on livelihoods, public amenities and local infrastructure systems. Given Kedah's importance for national food production and its role as a major agricultural and transport corridor in northern Peninsular Malaysia¹², increasing flood frequency and drainage stress have implications extending beyond individual districts to regional economic resilience, food security and connectivity.¹⁶

Urban retention ponds, wetlands, drainage corridors and associated blue-green infrastructure represent important components of Kedah's flood-management system. Beyond their conventional drainage functions, these assets provide opportunities to enhance flood attenuation, water regulation, biodiversity, urban cooling and other ecosystem services when managed to maintain and strengthen their ecological functions. Strengthening the resilience and multifunctionality of these interconnected urban and peri-urban landscapes is therefore an important climate adaptation priority for Kedah under increasingly variable future climate conditions.

²⁷ Department of Statistics Malaysia (DOSM), 2025. Special Survey on the Impact of the 2024/2025 Northeast Monsoon Floods.

Adaptation and Climate Resilience Pathways

To address the identified climate risks and vulnerabilities, the project applies an integrated adaptation approach that combines improved climate information, ecosystem-based adaptation measures, adaptive water management and locally embedded stewardship mechanisms. Building on lessons from previous adaptation initiatives in Malaysia, including the Adaptation Fund (AF) Penang Nature-based Climate Adaptation Programme,²⁸ the project seeks to strengthen resilience by addressing both the underlying drivers of climate vulnerability and the institutional conditions for sustained adaptation.

Pathway 1: Strengthened Climate Intelligence, Governance and Scaling Capacity

Reliable climate information and decision-support systems are fundamental to effective adaptation planning. The project strengthens the availability and practical application of climate, hydrological and ecosystem information through the Integrated Climate–Forest Intelligence System (ICFIS), Climate Vulnerability Atlas and associated planning tools.

These systems are intended to improve the availability and use of climate-risk information across sectors and administrative levels, supporting more informed planning, prioritization and management decisions. The pathway also strengthens institutional coordination, operational guidance and knowledge-sharing processes needed to support wider uptake and scaling of adaptation approaches within national and sub-national planning systems.

Pathway 2: Improved Ecosystem, Hydrological and Water-System Resilience

Reducing climate risk in the target landscapes requires interventions that address the underlying drivers of hydrological instability, ecosystem degradation and flood vulnerability. The project supports targeted interventions designed to improve hydrological stability, strengthen ecosystem functions and reduce climate-related flood, erosion, sedimentation, drought, urban heat and peat-fire risks.

Measures include peatland rewetting and hydrological stabilization, climate-adaptive watershed management, enrichment planting, assisted natural regeneration, erosion- and sediment-management interventions, and enhancement of selected urban retention ponds using NbS approaches. Together, these interventions intend to improve water regulation, reduce climate-related risks and strengthen the resilience of landscapes that support water security, agricultural production and local livelihoods.

Pathway 3: Strengthened Local Capacity, Livelihoods and Inclusive Adaptation

Long-term adaptation outcomes depend not only on infrastructure and ecosystem investments but also on the capacity of institutions and communities to sustain them over time. The project supports community stewardship mechanisms, community nurseries, Eco-Warden and citizen scientist programmes, climate-resilience awareness activities and inclusive participation processes involving women, youth and other vulnerable groups.

Activities are designed to increase local engagement in ecosystem stewardship and monitoring, increase awareness of climate risks and adaptation options, and support participation in climate-related planning and management processes. The pathway also promotes learning and knowledge exchange to support replication and adaptation of successful approaches beyond the project sites.

Project Objective

The Project Objective is to strengthen the climate resilience and adaptive capacity of vulnerable communities and national/sub-national institutions in Malaysia through the integration of evidence-based policy frameworks, the implementation of Ecosystem-based Adaptation (EbA) and integrated Nature-Based Solutions (NbS) for enhanced water security, and targeted capacity building and gender-responsive livelihood empowerment.

²⁸ Adaptation Fund (AF). Penang Nature-based Climate Adaptation Programme: <https://www.adaptation-fund.org/project/nature-based-climate-adaptation-programme-for-the-urban-areas-of-penang-island-2/>

Project/Programme Components and Financing

Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount (US\$)
Component 1: Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning	1.1: Integrated Climate-Forest Intelligence System (ICFIS) Developed and Operationalized.	Outcome 1: Institutions apply climate intelligence, vulnerability information and adaptation evidence in planning, investment and decision-making processes.	380,000
	1.2: Forest-Climate Vulnerability Atlas Developed and Applied.		433,964
	1.3: Institutionalization, Operational Guidance and Scaling Frameworks Developed.		1,300,050
Component 2: Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience	2.1: Climate-Resilient Peatland Rewetting, Fire Resilience and Monitoring Systems Operationalized.	Outcome 2: Ecosystems and climate-resilient infrastructure provide strengthened hydrological, buffering and adaptation functions	1,507,000
	2.2: Climate-Adaptive Watershed Management through Nature-based Solutions implemented in the Ulu Muda Watershed.		1,764,000
	2.3: Urban and Peri-Urban Nature-based Solutions for Flood and Heat Resilience Implemented.		1,755,000
Component 3: Institutionalizing Capacity, Stewardship and Sustainable NbS Management	3.1: Inclusive Community Participation, Capacity and Livelihoods Strengthened.	Outcome 3: Communities and institutions strengthen climate resilience through inclusive participation, enhanced capacities and application of adaptation knowledge	758,000
	3.2: Technical Capacity for Climate Intelligence, NbS Management and Project Implementation Strengthened.		258,014
	3.3: Knowledge Management, Learning and Dissemination Systems Operationalized.		185,000
	Total component cost		8,341,014
	Project Execution cost		875,576
	Total Project Cost		9,216,590
	Project Cycle Management Fee charged by the Implementing Entity		783,410
	Amount of Financing Requested		10,000,000

Projected Calendar and milestones

Milestones	Expected Dates
Start of Project/Programme Implementation	1 February 2027
Mid-term Review (if planned)	1 August 2029
Project/Programme Closing	31 January 2032
Terminal Evaluation	1 May 2032

Theory of Change

The Theory of Change is based on the premise that climate resilience can be strengthened when decision-makers have access to reliable climate and environmental information, landscapes are managed to maintain critical ecosystem and water-regulation functions, and communities and institutions have the capacity to sustain adaptation actions over time.

The project addresses increasing climate vulnerability associated with flooding, drought, peat drying, fire risk, erosion, sedimentation, water insecurity and urban climate pressures across peatland, watershed and urban landscapes. It also recognizes that fragmented information systems, uneven technical capacity, limited cross-sector coordination and insufficient long-term management arrangements can constrain effective adaptation implementation and scaling. The project therefore combines improved climate and vulnerability information, planning and coordination mechanisms in Component 1; implementation of EbA and NbS interventions that strengthen ecosystem and water-management functions in Component 2; and capacity development, stewardship mechanisms and knowledge-sharing in Component 3.

Together, these investments are expected to strengthen climate resilience by improving planning and decision-making, reducing climate-related risks across vulnerable landscapes, enhancing water security and supporting the long-term sustainability and replication of adaptation interventions.

Component	Logic Statement	Causal Link to Outcome	Key Assumptions
Component 1: Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning	IF climate-risk information and planning tools are operationalized and used by decision-makers, THEN national and sub-national institutions will be better equipped to assess climate risks, prioritize adaptation actions and support climate-informed planning and management.	LEADING TO strengthened integration of climate-risk information into planning, coordination and adaptation decision-making processes under Outcome 1.	Participating agencies support technical coordination, operational collaboration and data-sharing arrangements sufficient for implementation and long-term use of Component 1 systems and tools.
Component 2: Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience	IF ecosystem restoration, hydrological management and urban NbS measures are implemented and maintained, THEN ecosystem functions, water security and resilience to climate-related hazards will be strengthened across vulnerable landscapes.	LEADING TO improved hydrological resilience, reduced peat-fire vulnerability, strengthened watershed functions and enhanced flood resilience under Outcome 2.	EbA and NbS interventions remain effective and can be adaptively managed under changing climate conditions, and implementing agencies maintain support for long-term management and maintenance.
Component 3: Institutionalizing Capacity, Stewardship and Sustainable NbS Management	IF technical capacity, stewardship arrangements and knowledge-sharing mechanisms are strengthened, THEN communities, local stakeholders and institutions will be better positioned to support implementation, monitoring, management and long-term sustainability of adaptation interventions.	LEADING TO strengthened stewardship systems, improved sustainability of adaptation investments and increased participation of communities and institutions in adaptation implementation and maintenance under Outcome 3.	Community participation and support for EbA and NbS approaches can be strengthened through inclusive engagement, locally appropriate implementation models and demonstrated adaptation benefits.

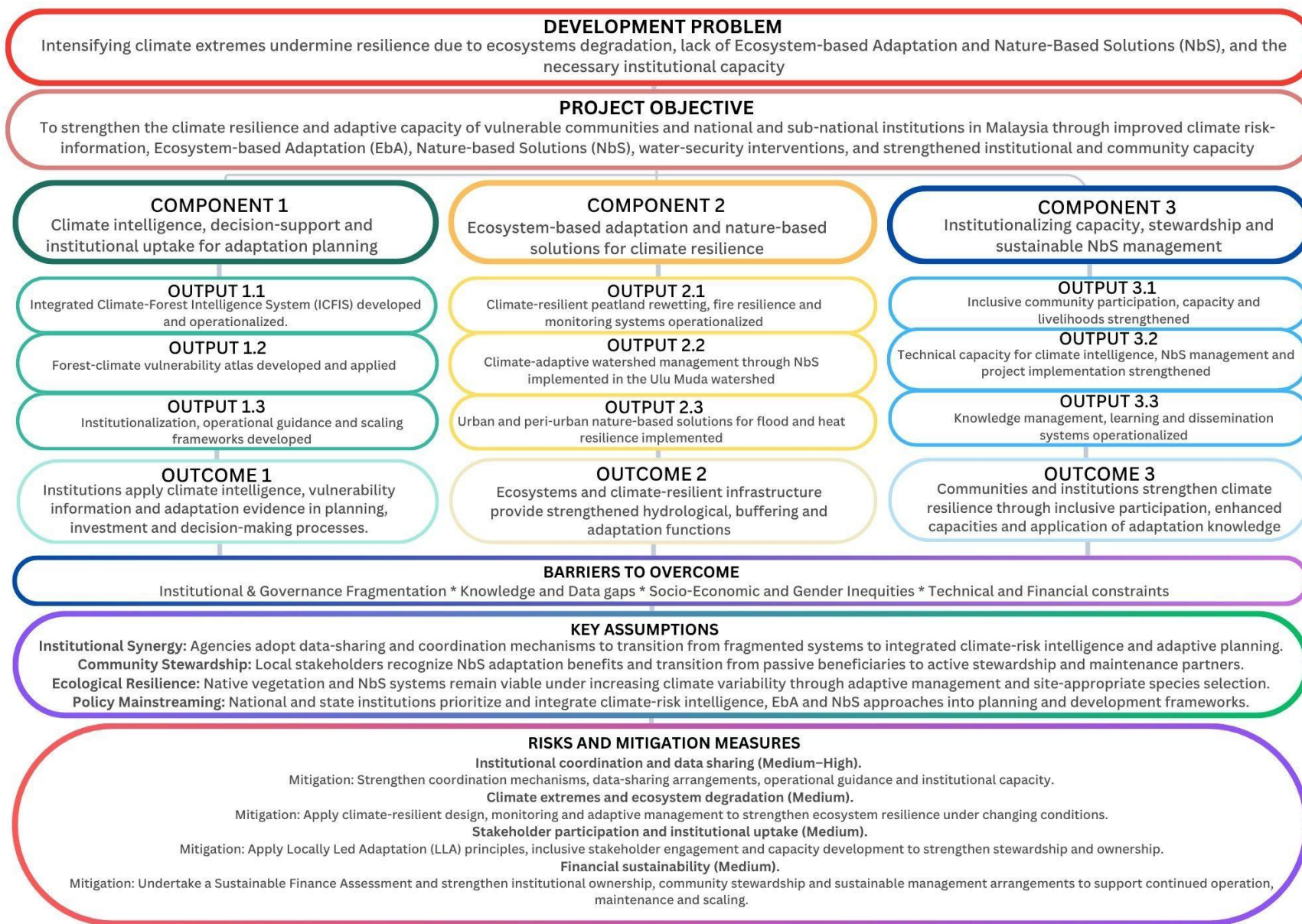
Key Assumptions, Risks and Mitigation Considerations

The Theory of Change assumes continued institutional collaboration, stakeholder participation and long-term commitment to integrating climate intelligence, EbA and NbS into planning, investment and management decisions. It further assumes that climate information, ecosystem restoration and strengthened local stewardship will collectively improve adaptation decision-making and resilience under increasingly variable climate conditions.

Critical Risks and Mitigation Measures

- **Institutional coordination and data sharing (Medium–High):** Fragmented mandates and limited information sharing may constrain climate-informed planning and implementation. **Mitigation:** Strengthen coordination mechanisms, data-sharing arrangements, operational guidance and institutional capacity under Component 1.
- **Climate extremes and ecosystem degradation (Medium):** Floods, droughts, peat fires and other climate hazards may affect intervention performance. **Mitigation:** Apply climate-resilient design, monitoring and adaptive management to strengthen ecosystem resilience under changing conditions.
- **Stakeholder participation and institutional uptake (Medium):** Limited community participation or institutional ownership may reduce long-term sustainability. **Mitigation:** Apply Locally Led Adaptation (LLA) principles, inclusive stakeholder engagement and capacity development to strengthen stewardship and ownership.
- **Financial sustainability (Medium):** Limited resources for operation and maintenance could reduce long-term sustainability. **Mitigation:** Undertake a Sustainable Finance Assessment and strengthen institutional ownership, community stewardship and sustainable management arrangements to support continued operation, maintenance and scaling.

Theory of change



PART II. PROJECT/PROGRAMME JUSTIFICATION

A. Description of programme components

The project is designed to strengthen Malaysia's long-term climate resilience by linking targeted EbA and NbS with stronger climate-risk intelligence, institutional uptake, adaptive management and community capacity. The project applies an integrated model in which field-level interventions generate evidence and operational lessons that inform planning tools, maintenance approaches and scaling pathways for wider replication.

The project is organized around three interconnected components that combine climate-risk intelligence, EbA, adaptive management and long-term institutional and community resilience. Together, the components support a systems-oriented adaptation approach linking forest-climate intelligence, field-level EbA/NbS implementation and sustainable operational uptake.

Component 1: Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning

Outcome 1: Institutions apply climate intelligence, vulnerability information and adaptation evidence in planning, investment and decision-making processes.

Alignment with the Adaptation Fund Results Framework: Component 1 contributes primarily to **AF Outcome 2 and Output 2.1** by strengthening the capacity of national and sub-national institutions to understand, manage and reduce climate-related risks. Through development and institutionalization of the ICFIS, the Forest-Climate Vulnerability Atlas, and associated planning and decision-support tools, the component enhances institutional capacities to apply climate-risk information, vulnerability assessments and adaptation evidence in planning, investment prioritization and climate-resilient decision-making across forest, peatland, watershed and urban landscapes.

Malaysia possesses substantial climate, hydrological, geospatial, remote-sensing and forest-related datasets across multiple institutions. However, these datasets are often managed across separate systems and are not yet systematically integrated into adaptation planning, restoration prioritization and climate-resilient landscape management processes.

Component 1 focuses on strengthening the generation, application and institutional uptake of climate intelligence and adaptation evidence to support climate-informed planning, investment prioritization and decision-making. It is structured around three complementary outputs:

- **Output 1.1: Integrated Climate-Forest Intelligence System (ICFIS) Developed and Operationalized.** This output establishes a climate-intelligence platform that integrates climate, hydrological, ecological, geospatial and remote-sensing information to support climate-risk assessment, vulnerability analysis, restoration prioritization and adaptation planning.
- **Output 1.2: Forest-Climate Vulnerability Atlas Developed and Applied.** This output translates climate-risk information into practical spatial products, vulnerability assessments and planning tools that support adaptation planning, restoration prioritization and climate-resilient landscape management by national and sub-national institutions.
- **Output 1.3: Institutionalization, Operational Guidance and Scaling Frameworks Developed.** This output supports long-term institutional uptake of climate intelligence tools and adaptation approaches through operational frameworks, technical guidance, NbS toolkits, sustainable finance analysis and scaling pathways that facilitate replication and future investment.

Together, the outputs establish a climate intelligence-to-action pathway that generates climate-risk information, translates evidence into planning and decision-support products, and embeds adaptation approaches within institutional systems, policies and investment processes.

Activities under Component 1 operate primarily at national and sub-national levels across Peninsular Malaysia, while testing, validation and learning are linked to the project intervention landscapes in Selangor and Kedah.

Output 1.1: Integrated Climate-Forest Intelligence System (ICFIS) Developed and Operationalized

This output will establish an ICFIS to strengthen climate-informed forest management, ecosystem restoration planning and adaptation decision-making in Malaysia. The output provides the analytical foundation for the project by strengthening the generation, integration and application of climate-risk information relevant to forest, peatland and watershed ecosystems.

The project will establish ICFIS as an integrated climate-risk assessment and analytical platform that consolidates and analyses climate, hydrological, ecological, geospatial, remote-sensing and field-monitoring information. Building on national Climate Risk and Vulnerability Assessment approaches and ongoing MyNAP processes, ICFIS will support analysis of climate hazards, exposure, vulnerability and adaptive capacity across forest, peatland and watershed landscapes.

The system will provide the analytical basis for identifying climate-risk hotspots, prioritizing adaptation investments, supporting implementation of Component 2 interventions, monitoring ecosystem conditions and assessing adaptation outcomes. Particular attention will be given to interoperability with existing national systems and strengthening coordination across institutions responsible for climate, forestry, water and land management.

Activity 1.1.1: ICFIS Scoping, Systems Assessment and Design

A comprehensive assessment will be undertaken during the inception phase to establish the technical, institutional and operational foundations for ICFIS and the Forest-Climate Vulnerability Atlas.

The activity combines systems mapping, climate-risk assessment and stakeholder consultations to identify priority climate hazards, vulnerable ecosystems, adaptation planning needs, decision-making processes and information gaps across the project intervention landscapes. The assessment will review available climate, hydrological, ecological, geospatial and socio-economic information and identify priority indicators, datasets and analytical methodologies required to support climate-risk assessment, adaptation planning and monitoring of adaptation outcomes.

The assessment will also review existing information systems and identify opportunities for interoperability, data harmonization and institutional coordination while avoiding duplication. Outputs will include a climate-risk assessment, systems assessment, interoperability framework and ICFIS roadmap. The assessment will also identify opportunities to incorporate gender-responsive and socially inclusive indicators where relevant, including information that supports understanding of differentiated climate vulnerabilities, exposure and adaptation priorities among women, men and vulnerable groups.

Activity 1.1.2: ICFIS Development and Integration

Based on the assessment findings, ICFIS will be developed through integration of priority datasets, analytical functions and climate-risk assessment methodologies.

The system will consolidate climate, hydrological, ecological, geospatial and remote-sensing information and generate analytical outputs supporting climate-risk assessment, vulnerability

analysis, restoration prioritization, adaptation planning and monitoring of ecosystem conditions and adaptation outcomes. Outputs may include climate-risk indicators, vulnerability assessments, adaptation-priority analyses and other decision-support products identified through Activity 1.1.1.

Activity 1.1.3: Validation and Operationalization

The system will be tested, validated and refined through application in project intervention landscapes and engagement with intended users.

Validation activities will assess the usefulness, functionality and applicability of ICFIS outputs for adaptation planning and decision-making and will include testing against observed conditions, stakeholder review and application within project intervention landscapes.

The activity will also support development of operational procedures, user guidance, hosting arrangements and sustainability mechanisms required for long-term operation, maintenance and updating of the system beyond the project period.

A mechanism for data sharing and coordination protocol among agencies will be developed under the guidance of NRES through the relevant Technical Working Group that will be established in Year 1.

Output 1.1 Milestones

- **Year 1** Climate-risk assessment, systems mapping, user-needs assessment and ICFIS design roadmap completed.
- **Year 2** Priority datasets consolidated and integrated; indicator framework and analytical methodologies finalized; prototype system developed.
- **Year 3** ICFIS operational and generating climate-risk assessment outputs for selected intervention landscapes.
- **Year 4** ICFIS refined through validation and user feedback; interoperability arrangements and operating procedures established.
- **Year 5** ICFIS fully operationalized and institutional arrangements for long-term hosting, maintenance and updating formalized by at least six institutions; technical guidance packages finalized.

Activity	Key Stakeholders	Targets and Beneficiaries
A.1.1.1 ICFIS Scoping, Systems Assessment and Design	FRIM, NRES, JPSM, State Forestry Departments, DID/JPS, NAHRIM, METMalaysia, MYSA, PLANMalaysia and relevant agencies	Target: Climate-risk assessment, systems assessment, interoperability framework and ICFIS roadmap completed and validated by key institutions. Beneficiaries: National and sub-national agencies involved in climate-risk assessment and adaptation planning.
A.1.1.2 ICFIS Development and Integration	FRIM, JPSM, DID/JPS, NAHRIM, METMalaysia, MYSA and relevant agencies	Target: ICFIS operationalized integrating climate, hydrological, ecological and geospatial datasets and generating climate-risk and vulnerability assessment products for forest, peatland and watershed landscapes Beneficiaries: Forest managers, planners and technical agencies supporting climate-resilient management of landscapes benefiting vulnerable communities under Component 2.
A.1.1.3 Validation and Operationalization	FRIM, JPSM, State Forestry Departments and relevant agencies	Target: ICFIS tested and applied in at least 3 intervention landscapes and institutional arrangements established for long-term operation and maintenance. Beneficiaries: National and sub-national institutions applying climate intelligence in planning and decision-making.

Output 1.2: Forest-Climate Vulnerability Atlas Developed and Applied

This output will develop a Forest-Climate Vulnerability Atlas to translate climate-risk information into practical spatial products supporting adaptation planning, restoration prioritization and climate-resilient landscape management.

Building on analytical outputs generated through ICFIS, the Atlas will provide a common evidence base for identifying climate-vulnerable landscapes, prioritizing adaptation investments and supporting implementation of forest, peatland and watershed adaptation strategies. The Atlas will serve as the decision-support interface for planners and decision-makers powered by the analytical engine of ICFIS.

The Atlas will consolidate relevant climate, ecological, hydrological and landscape information into accessible spatial products and planning tools that can be used by national and sub-national institutions. Particular attention will be given to supporting implementation of MyNAP, forest adaptation planning, ecosystem restoration and climate-resilient landscape management.

Activity 1.2.1: Atlas Scoping, Data Assessment and Design

A detailed assessment will identify priority datasets, indicators, analytical approaches and user requirements for the Atlas. The activity will review existing climate-risk assessments, vulnerability mapping products, forest inventories and geospatial information systems and identify opportunities to harmonize and consolidate information into practical adaptation-planning tools.

Activity 1.2.2: Atlas Development and Vulnerability Analysis

The Atlas will be developed using climate-risk outputs generated through ICFIS together with historical observations, climate projections, ecological information and hydrological datasets. It will generate spatial products supporting assessment of climate-related risks, ecosystem vulnerabilities, restoration priorities and adaptation investment opportunities across forest, peatland and watershed landscapes.

Atlas products may include climate exposure maps, drought-risk maps, extreme-rainfall risk maps, ecosystem vulnerability maps, restoration-priority maps and adaptation-priority maps identified through stakeholder consultations and the design process. Where data availability permits, vulnerability analyses will incorporate socio-economic and demographic dimensions relevant to adaptation planning, including information supporting identification of differentiated climate vulnerabilities affecting women, vulnerable groups and climate-sensitive livelihoods.

Activity 1.2.3: Forest Risk Planning Guidance and Protocols

Guidance and planning protocols will be developed to support application of Atlas products within forest management planning, restoration prioritization, adaptation planning and adaptation reporting processes. The activity will strengthen institutional capacity to apply climate-risk information and support integration of Atlas products into planning and decision-making processes at national and sub-national levels.

Output 1.2 Milestones

- **Year 1** Atlas framework, datasets, indicators and user requirements agreed and validated.
- **Year 2** Initial climate-risk and vulnerability datasets compiled; draft Atlas products developed.
- **Year 3** Atlas completed and tested in project intervention landscapes.
- **Year 4** Forest Risk Planning Guidance and Protocols prepared and piloted.
- **Year 5** Atlas finalized, operationalized and applied within planning and decision-making processes by at least six institutions; technical guidance packages finalized.

Activity	Key Stakeholders	Targets and Beneficiaries
A.1.2.1 Atlas Scoping, Data Assessment and Design	FRIM, JPSM, DID/JPS, NAHRIM, METMalaysia, MYSA	Target: Atlas framework, datasets, indicators and planning layers validated. Beneficiaries: Agencies contributing climate-risk and planning information.
A.1.2.2 Atlas Development and Vulnerability Analysis	FRIM, JPSM, State Forestry Departments and relevant agencies	Target: Forest-Climate Vulnerability Atlas developed, validated and applied by participating national and sub-national institutions to support climate-risk assessment, restoration prioritization and adaptation planning. Beneficiaries: National and sub-national institutions utilizing vulnerability information for adaptation planning and restoration prioritization.
A.1.2.3 Forest Risk Planning Guidance and Protocols	FRIM, JPSM, State Forestry Departments, NRES and relevant agencies	Target: Forest Risk Planning Guidance Package developed and piloted for integration of climate-risk information into planning, prioritization and adaptation reporting processes. Beneficiaries: Forest-sector planners, managers and technical agencies.

Output 1.3: Institutionalization, Operational Guidance and Scaling Frameworks Developed

This output supports the long-term institutionalization, operational application and scaling of climate-informed adaptation approaches developed through the project. It ensures that ICFIS and the Forest-Climate Vulnerability Atlas are embedded within planning and decision-making processes while translating implementation experience from Component 2 into practical guidance, toolkits and scaling frameworks. Building on project experience, the output will support replication, future investment and long-term sustainability of climate-resilient forest, peatland, watershed and urban NbS approaches. The framework will also support establishment or strengthening of an inter-institutional coordination mechanism to guide application of climate intelligence and adaptation planning across relevant agencies.

Activity 1.3.1: Forest-Sector Institutional Uptake Framework

A framework will be developed to support the long-term institutionalization, application and sustainability of ICFIS and the Forest-Climate Vulnerability Atlas.

The framework will establish institutional arrangements for hosting, managing, maintaining and updating ICFIS and Atlas products beyond the project period. It will define roles and responsibilities for participating institutions, data-sharing arrangements, quality assurance procedures and coordination mechanisms required to support long-term operation. The framework will also provide guidance on how climate-risk information generated through ICFIS and the Atlas can be integrated into forest-sector planning, restoration prioritization, adaptation investment planning and adaptation reporting processes.

Participating institutions may include the Ministry of Natural Resources and Environmental Sustainability (NRES), FRIM, NAHRIM, DID/JPS, Town and Country Planning Department (PLANMalaysia), JPSM, State Forestry Departments, METMalaysia, Malaysian Space Agency (MYSA) and other relevant agencies involved in climate-risk assessment, forest management, watershed management and adaptation planning. An institution will be considered to have adopted climate intelligence, vulnerability assessment and adaptation-planning tools when there is documented evidence that ICFIS products, Atlas products, vulnerability assessments, planning guidance or adaptation decision-support tools have been incorporated into planning, prioritization, implementation, monitoring or reporting processes.

Building on lessons generated through Component 2 interventions, the framework will further identify opportunities for scaling, replication and future investment in climate-resilient forest, peatland and watershed management.

Activity 1.3.2: Standard Operating Procedures, Operational Guidance and NbS Toolkits

Building on implementation experience under Outputs 2.1, 2.2 and 2.3, this activity will translate project evidence into practical SOPs, operational guidance and NbS toolkits to support wider application and replication.

Three technical guidance packages will be developed:

- Peatland Restoration and Fire Management Toolkit
- Watershed Restoration and Sediment Management Toolkit
- Urban Nature-based Solutions Toolkit

The materials will provide practical guidance for government agencies, local authorities and future adaptation programmes on planning, implementation, monitoring, operation and maintenance of climate-resilient NbS interventions. The Urban Nature-based Solutions Toolkit will draw directly on implementation experience, monitoring results and validation activities undertaken in Kubang Pasu and Alor Setar under Output 2.3. The guidance packages will incorporate lessons and recommendations generated through environmental and social assessments, biodiversity assessments, hydrological assessments, community health and safety assessments and monitoring systems established under Component 2. Where relevant, the toolkits will include guidance on safeguards screening, occupational health and safety, biodiversity protection, community engagement, accessibility considerations, inclusive participation and adaptive management approaches to support environmentally and socially sustainable implementation.

Activity 1.3.3: Sustainable Finance, Scaling and Replication Framework

In collaboration with UNDP under the Climate Finance Network (CFN) and Climate Action for Resilient Asia (CARA) initiatives, the project will explore opportunities to strengthen the long-term sustainability, replication and scaling of successful adaptation interventions developed under the project.

At the beginning of the project, a Sustainable Finance Assessment will be undertaken to identify potential financing partnerships, investment opportunities and long-term financing mechanisms that could support the operation, maintenance and scaling of project interventions beyond the project lifetime. The assessment will consider opportunities across the project's major intervention areas, including peatlands, watersheds, wetlands, urban and peri-urban NbS, and community-based restoration activities, and will assess the feasibility of a range of sustainable financing approaches, such as payments for ecosystem services, biodiversity and carbon finance, ecotourism and recreation, sustainable production systems, public-private partnerships and other context-appropriate financing mechanisms. As part of the assessment, feasible financing initiatives will be identified for implementation. Specifically, a targeted economic analysis of community nurseries (Output 3.1) will be undertaken to confirm their financial viability as livelihood and ecosystem restoration support mechanisms. The assessment will include gender-responsive analysis of participation, benefit-sharing and livelihood opportunities associated with community nursery operations. The analysis will quantify start-up and operating costs, revenue potential from seedling sales and complementary products or services, and broader livelihood benefits. Findings will inform the design of sustainable community nursery business models while also providing recommendations for broader financing and institutional arrangements to support the long-term sustainability of project investments.

Towards the end of the project, a Scaling and Replication Framework will be developed based on implementation experience, monitoring results and lessons generated through Components 1, 2 and 3. The framework will identify opportunities, requirements and enabling conditions for wider application of climate-informed adaptation and NbS approaches beyond the initial project intervention sites. Financing options may include public-sector investment pathways, integration into government planning and budgeting processes, co-financing opportunities, avoided-cost

approaches, Payment for Ecosystem Services and other mechanisms identified through stakeholder consultation and analysis.

In relation to output 2.3, the Scaling and Replication Framework will build on municipal uptake pathways tested through the Malaysia Adaptation Sharing Hub (MASH) and participating local authorities under Output 2.3. Where feasible, recommendations may support incorporation of NbS approaches into Local Plans (Rancangan Tempatan), municipal development guidelines and related planning instruments. The Urban Nature-based Solutions Toolkit and associated guidance will be designed for potential application across the large number of existing retention ponds and similar stormwater-management assets nationwide, estimated at more than 10,000 sites.

Drawing on project experience, the framework will consolidate lessons learned, good practices and operational recommendations into a practical roadmap for future expansion and investment. Particular attention will be given to opportunities for integrating climate-risk information, restoration planning and NbS approaches into national and sub-national planning, investment and programme development processes.

Output 1.3 Milestones

- **Year 1** Sustainable Finance Assessment completed and institutional uptake requirements identified.
- **Year 4** Draft SOPs, technical guidance packages and toolkits prepared and tested through project implementation. Draft Institutional Uptake Framework, NbS guidance packages and Scaling Framework structure developed.
- **Year 5** Institutional uptake framework operationalized; Scaling and Replication Framework endorsed and disseminated.

Activity	Key Stakeholders	Targets and Beneficiaries
A.1.3.1. Forest-Sector Institutional Uptake Framework	FRIM, NRES, JPSM, State Forestry Departments, DID/JPS, NAHRIM, METMalaysia, MYSA, PLANMalaysia	Target: Institutional uptake framework operationalized and climate intelligence, vulnerability assessment and adaptation-planning tools applied by at least six participating institutions in planning, prioritization, monitoring or decision-making processes. Beneficiaries: National and sub-national institutions applying climate-risk information in planning and decision-making.
A.1.3.2 Standard Operating Procedures, Technical Guidance and NbS Toolkits	FRIM, JPSM, DID/JPS, MADA, Kubang Pasu Municipal Council (MPKP), Bomba and relevant agencies	Target: Three NbS technical guidance packages and associated SOPs developed and validated. Beneficiaries: Government agencies, local authorities and future adaptation programmes.
A.1.3.3 Sustainable Finance, Scaling and Replication Framework	FRIM, NRES, PLANMalaysia, Ministry of Economy, UNDP Climate Finance Network	Target: 1 Sustainable Finance Assessment and 1 Scaling and Replication Framework developed, identifying financing pathways and opportunities for wider application of project approaches. Beneficiaries: National and sub-national institutions, local authorities and future implementing agencies.

Component 2: Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience

Outcome 2: Ecosystems and climate-resilient infrastructure provide strengthened hydrological, buffering and adaptation functions.

Alignment with the Adaptation Fund Results Framework: Component 2 contributes primarily to AF Outcome 5 and Output 5 by strengthening ecosystem resilience and improving the capacity of natural-resource assets to withstand climate variability and climate change. Through peatland hydrological restoration, climate-adaptive watershed management and enhancement of urban

stormwater detention systems using NbS, the component strengthens ecosystem services, improves water regulation, reduces climate-related risks and enhances resilience of vulnerable communities, livelihoods and economic systems.

Component 2 represents the project's investment and demonstration component. It implements NbS across three priority climate-vulnerable landscape systems in Peninsular Malaysia: peatland ecosystems, forested watersheds and urban stormwater-management systems. These landscapes are increasingly affected by climate variability and change, including prolonged dry periods, peatland degradation and fire risk, increasing rainfall intensity, erosion and sediment mobilisation, localized flooding, water-security challenges and urban heat stress. These pressures reduce ecosystem resilience and threaten water resources, livelihoods, public health and critical infrastructure.

The component therefore focuses on restoring and strengthening ecosystem functions that support climate adaptation. Interventions are designed to improve water retention and regulation, maintain peatland moisture, reduce fire susceptibility, stabilize watersheds, reduce erosion and sediment transport, strengthen flood-management functions and improve adaptive management of ecosystem and water-resource assets through three complementary outputs:

- **Output 2.1: Climate-Resilient Peatland Rewetting, Fire Resilience and Monitoring Systems Operationalized.**
- **Output 2.2: Climate-Adaptive Watershed Management through Nature-based Solutions implemented in the Ulu Muda Watershed.**
- **Output 2.3: Urban and Peri-Urban Nature-based Solutions for Flood and Heat Resilience Implemented**

Activities under Component 2 are implemented in selected landscapes in Selangor and Kedah. Community participation, technical capacity development, gender-responsive implementation, social inclusion, environmental and social safeguards and long-term sustainability of Component 2 interventions are supported through Component 3.

Output 2.1: Climate-Resilient Peatland Rewetting, Fire Resilience and Monitoring Systems Operationalized

Output 2.1 strengthens the climate resilience of the KLSFR landscape through peatland rewetting, hydrological restoration, fire-resilience measures and adaptive monitoring systems. The output responds to increasing climate variability, prolonged dry periods and declining peat moisture conditions that increase the risk of peat fires, ecosystem degradation and associated impacts on livelihoods, public health and surrounding infrastructure.

The output adopts an integrated EbA approach that combines hydrological restoration, peat-fire prevention and preparedness, and adaptive management. Building on existing peatland management plans, scientific assessments and stakeholder consultations, interventions are designed to maintain peat moisture, strengthen water-retention functions, reduce climate-induced fire risk and improve the long-term resilience of peatland ecosystems. Recent assessments indicate that a significant proportion of monitoring stations exceed recommended groundwater thresholds associated with elevated fire risk, highlighting the need for targeted restoration and improved management interventions. The project will therefore focus on restoring peatland hydrological functions while strengthening institutional and community capacities for fire prevention, monitoring and adaptive management.

Interventions will be implemented across priority areas of the KLSFR landscape through a combination of peatland rewetting measures, fire-resilience systems and monitoring technologies. These measures will support adaptive management of peatland ecosystems while strengthening

institutional and community capacities for peatland stewardship, fire prevention and climate adaptation.

The output contributes directly to improved ecosystem resilience, reduced peat-fire occurrence, strengthened hydrological functions and enhanced climate-adaptation benefits for surrounding communities and stakeholders. Community participation, including engagement of women and local communities, will support peatland stewardship, fire-risk awareness, monitoring and adaptive management, contributing to the long-term sustainability of restoration outcomes.

Activity 2.1.1: Peatland Rewetting and Hydrological Restoration through Nature-based Solutions

Peatland rewetting and hydrological restoration measures will be implemented within priority areas of KLSFR to improve water retention, stabilize groundwater levels and reverse peat drying during prolonged dry periods.

Interventions will build on existing peatland rehabilitation approaches and include a portfolio of peatland rewetting and hydrological restoration measures, including clay dykes, canal controls, water-retention structures, swales and other low-impact techniques appropriate to peatland environments. AquaVault water-storage units may be deployed as a supplementary water-retention and fire-preparedness measure where technical assessments demonstrate clear added value and cost-effectiveness.

Hydrological interventions will be informed by groundwater monitoring, peat condition assessments, hydrological modelling and site-specific engineering design. Prior to implementation, the project will undertake a landscape-scale hydrological modelling and design optimisation study to assess the most effective configuration of clay dykes, swales, canal-blocking measures, water-retention structures and associated infrastructure. Where groundwater abstraction is proposed, a groundwater sustainability assessment will determine sustainable abstraction limits, potential drawdown impacts and associated monitoring requirements. The project will prioritize restoration of peatland hydrological functions while minimizing disturbance to peat soils and ecological processes.

Before implementation, detailed baseline assessments and technical studies will be undertaken to identify priority intervention areas and refine intervention design. Building on existing peatland management plans, fire-risk assessments, hydrological studies and stakeholder consultations, the assessments will evaluate peatland condition and degradation, hydrological and groundwater dynamics, climate and fire risks, existing drainage and water-management infrastructure, and suitable NbS and water-retention measures. The studies will also identify priority intervention areas, establish baseline indicators for monitoring and evaluation, and develop detailed engineering and implementation designs for hydrological restoration measures.

Results will inform final intervention design, site prioritization and implementation planning for peatland rewetting, hydrological restoration and fire-risk reduction measures. Consistent with the Environmental and Social Management Framework (ESMF), the project will develop peatland-specific environmental, social, occupational health and safety, construction-management and monitoring measures and procedures to guide implementation, as detailed in a site specific ESMP. These procedures will include contractor management requirements, emergency response arrangements, worker health and safety measures and community safety considerations associated with hydrological restoration works.

Activity 2.1.2: Peatland Fire Resilience, Prevention and Institutional Coordination

Measures will be implemented to strengthen peatland fire prevention, preparedness and institutional response capacity across the KLSFR landscape. The activity will support operational

preparedness measures, fire prevention systems, peatland fire protection infrastructures and institutional coordination mechanisms involving FRIM, the Selangor State Forestry Department (JPNS), JBPM/Bomba and other relevant agencies.

The activity will strengthen operational planning, contingency arrangements and inter-agency coordination procedures required to improve preparedness and response during periods of elevated fire risk. Community awareness and reporting mechanisms related to peat-fire prevention will be implemented in coordination with Component 3, with particular attention to participation of women, youth and vulnerable groups in awareness and preparedness activities.

Emergency water-supply systems, including deep tube wells and supplementary water-storage infrastructure where appropriate, will support rapid response during periods of elevated fire risk.

Activity 2.1.3: Peatland Monitoring, Early Warning and Adaptive Management Systems

An integrated monitoring and early warning system will be established to support adaptive peatland management, hydrological monitoring and fire-risk assessment. The real-time monitoring system will combine groundwater piezometers, water-level sensors, peat-moisture sensors, weather stations, telemetry systems and other monitoring equipment required to assess peatland conditions and intervention performance. Satellite-derived indicators and climate-risk information generated through Component 1 will be integrated into the monitoring framework to strengthen early warning and adaptive management functions.

Monitoring information will support identification of elevated fire-risk conditions, validation of hydrological restoration performance, operational decision-making and long-term adaptive management. Community-based observation and reporting mechanisms established under Component 3 will complement technical monitoring systems and strengthen local participation in peatland stewardship and fire-risk management.

Lessons learned, operational experience, monitoring results and stakeholder feedback generated through peatland restoration, fire-risk reduction and monitoring activities will be documented throughout project implementation. Findings will contribute to the Peatland Restoration and Fire Management Toolkit, operational guidance and associated Standard Operating Procedures developed under Output 1.1.3, while also generating practical evidence on peatland adaptation approaches, hydrological management, community-based fire resilience and monitoring systems to support future replication and scaling.

Output 2.1 Milestones

- **Year 1:** Baseline assessments including water abstractions study, peatland condition mapping, landscape hydrological modelling, groundwater sustainability assessment (where applicable), fire-risk assessment, stakeholder consultations, peatland firefighting capacity building audit, safeguards procedures, site level ESMP, and detailed intervention design completed. Priority restoration areas identified, and implementation plan finalized.
- **Year 2:** Peatland rewetting and hydrological restoration interventions initiated; fire-management equipment and monitoring systems procured and installed.
- **Year 3:** Hydrological restoration measures operational; fire-management coordination mechanisms established; monitoring systems fully functional.
- **Year 4:** Adaptive management measures refined based on monitoring results; operational procedures tested and coordination arrangements strengthened.
- **Year 5:** Intervention performance validated; lessons documented, integrated into operational and scaling framework and disseminated.

Activity	Stakeholders	Targets and Beneficiaries
A.2.1.1 Peatland Rewetting and Hydrological Restoration through Nature-based Solutions	FRIM, JPNS, DID/JPS, relevant technical partners	Target: Baseline assessments, landscape hydrological modelling, groundwater sustainability assessment (where applicable) and detailed intervention design completed. Peat hydrological stabilisation measures implemented across at least 1000 ha of degraded peatland within KLSFR. Dry-season groundwater maintained above the -40 cm fire-risk threshold at monitored points within intervention areas. Approximately 720 ha of adjacent agricultural land benefiting from improved water availability and strengthened hydrological resilience associated with peatland restoration measures. Beneficiaries: 4,760 people (1,129 households) benefiting from reduced peat-fire risk, improved ecosystem resilience and reduced haze exposure. Approximately 513 farmers and associated workers directly benefiting from improved groundwater availability and landscape resilience.
A.2.1.2 Peatland Fire Resilience, Prevention and Institutional Coordination	FRIM, JPNS, JBPM/Bomba, Mineral and Geoscience Department (JMG), DID/JPS, local authorities	Target: Integrated peatland fire-resilience system established, including one landscape-level fire prevention and contingency framework, operational inter-agency coordination mechanisms, and preventive fire-management measures implemented across at least 1000 ha of priority peatland areas. Beneficiaries: Approximately 4,760 people (1,129 households) in peatland-adjacent communities benefiting from reduced fire risk, reduced haze exposure and improved landscape resilience.
A.2.1.3 Peatland Monitoring, Early Warning and Adaptive Management Systems	FRIM, JPNS, DID/JPS, JBPM/Bomba, METMalaysia, relevant technical partners	Target: Integrated peatland monitoring and adaptive management system established at at least two intervention locations, including 12 monitoring points and operational groundwater deep well, peat-moisture and fire-risk monitoring systems. Community observation and reporting mechanisms established in two surrounding communities. Beneficiaries: Approximately 4,760 people (1,129 households) benefiting directly from improved risk monitoring, early warning and adaptive peatland management.

Output 2.2: Climate-Adaptive Watershed Management through Nature-based Solutions implemented in the Ulu Muda Watershed

Output 2.2 supports climate-adaptive watershed management within the Ulu Muda watershed to strengthen water security, reduce climate-induced soil erosion and sediment delivery, and enhance the resilience of critical watershed functions under increasing climate variability and change. The output adopts an EbA approach combining watershed protection, soil-erosion management, sediment management and adaptive monitoring. Building on existing watershed-management plans, scientific assessments and stakeholder consultations, interventions are designed to strengthen hydrological regulation, reduce erosion and sediment risks, improve water quality and support long-term watershed resilience.

The Ulu Muda watershed area comprises several existing and proposed forest reserves, the largest of which is the Ulu Muda Forest Reserve (105,060 ha), while the Ulu Muda State Park covers an area of 26,275 ha with 11,118 ha overlapping with the Ulu Muda Forest Reserve. Prior to implementation, detailed site assessments and safeguard due diligence will be undertaken to identify eligible intervention areas within the broader Ulu Muda watershed that are under the State Park protection status.

Focusing interventions within the Ulu Muda State Park area provides strong safeguards in terms of land tenure and minimisation of risks from potential development activities, given its strong legal protection. Interventions will be implemented within priority watershed management units identified through baseline assessments, stakeholder consultations and safeguard screening. Priority areas will be selected based on hydrological, ecological, climate-risk and watershed-

protection criteria to ensure that project investments contribute directly to climate adaptation, watershed resilience and downstream water security.

The project will strengthen the climate resilience of 800 ha of priority areas within the Ulu Muda watershed through an integrated package of climate-adaptive watershed protection, soil-erosion and sediment management, and adaptive monitoring measures in Activities 2.2.1–2.2.3. The location, type and extent of specific on-the-ground interventions will be determined through Year 1 assessments, field validation and safeguard screening. Forest enrichment, assisted natural regeneration and riparian rehabilitation (Activity 2.2.1) will be concentrated in approximately 50 ha of the highest-priority sites, while additional direct interventions, including nature-based slope and riverbank stabilization measures (Activity 2.2.1), sediment-management structures (Activity 2.2.2), and adaptive watershed monitoring (Activity 2.2.3), will be implemented, as appropriate for the watershed conditions. Together, these complementary measures will strengthen watershed resilience, improve hydrological functions, reduce climate-induced erosion and sediment delivery, and enhance downstream water security across the 800-ha priority watershed area.

The output contributes directly to improved watershed condition, reduced climate-induced erosion and sediment delivery, strengthened hydrological regulation and enhanced climate resilience for downstream water users and associated ecosystems. Inclusive and gender-responsive approaches will be applied throughout assessment, planning and implementation processes, recognizing differentiated water use, resource dependence and climate vulnerabilities among women, men and vulnerable groups. Consistent with the ESMF requirements, check dams and other water-related infrastructure will undergo safeguard screening, assessment and management measures to address community safety risks.

Activity 2.2.1 Climate-Adaptive Watershed Soil-Erosion Management

Year 1 will undertake hydrological, erosion-risk, ecological, climate-risk and socio-economic baseline assessments to identify and validate priority intervention areas and establish monitoring baselines. This will also include safeguard screening, site-selection analysis, delineation of priority watershed management units, and development of climate-smart planting, maintenance and survival-monitoring regimes, including site-selection criteria and native species mixes appropriate for watershed protection and climate adaptation objectives. Baseline assessments and stakeholder consultations will consider gender-differentiated water use, livelihood dependencies and climate risks to inform intervention design and implementation priorities.

Site selection will be guided by climate-risk, hydrological, ecological and watershed-protection criteria, as well as practical considerations (accessibility, distance from entry point etc.), and will ensure that project-supported activities contribute directly to climate adaptation, watershed resilience and downstream freshwater security. The assessment process will establish intervention typologies, site-selection criteria and management requirements, while excluding areas that do not meet project eligibility requirements or where activities would duplicate existing rehabilitation obligations.

Building on these assessments, climate-adaptive watershed protection and soil-erosion management measures will be implemented within validated priority management zones. Priority intervention areas will be identified through erosion-risk analysis, hydrological assessments, field validation, stakeholder consultation and safeguard screening. Potential intervention areas may include degraded slopes, riparian corridors, erosion hotspots and other disturbed catchment areas contributing to surface soil erosion and sediment delivery. The assessment will establish intervention typologies, implementation specifications, climate adaptation rationale and monitoring requirements for different watershed conditions.

The activity applies a strategic mosaic approach targeting priority erosion and runoff hotspots in the catchment area rather than applying interventions uniformly across the watershed landscape. This enables resources to be concentrated on hotspot locations contributing disproportionately to erosion, sediment delivery and watershed instability while improving management across the wider priority watershed area. Interventions should include enrichment planting of native species, assisted natural regeneration, riparian rehabilitation, and nature-based slope and riverbank stabilization measures. It is designed to strengthen watershed resilience by reducing surface erosion and strengthening hydrological functions under increasing climate variability.

Selection of native species for the enrichment planting not only assists forest regeneration but also promotes species that are resilient to climate change. This will prioritize species suitable for watershed protection, erosion control and long-term climate resilience. Species selection and planting regimes will be informed by ecological suitability, weather patterns, biodiversity objectives, availability of planting materials, long-term maintenance requirements and safeguards assessment identified in Year 1.

Activity 2.2.2 Climate-Adaptive Watershed Sediment Management

The activity aims to reduce sediment delivery, improve water quality and strengthen long-term watershed stability supporting downstream water supply and irrigation systems by implementing targeted sediment-management measures within priority intervention areas validated through baseline assessments and safeguard screening. Areas will be selected in the tributaries of the Muda River upstream of the Muda dam. During Year 1, catchment and river processes studies will be conducted to inform the design of check dams; this can include hydro-modelling, Soil and Water Assessment Tool (SWAT) mapping with sedimentation rate assessment to inform the project team on an achievable rate reduction target within the project term. From then, studies will inform on specific strategic sites that can be prioritized and selected for measures implementation.

Sediment reduction will be achieved through construction of check dams and other nature-based sediment-management approaches. Natural engineering and bio-anchorage (using living root systems) will be used to secure unstable terrain and stabilize filtering structures. Filtering and vegetated gabion weirs against rushing water and erosion will help trap running sediments in the river network and provide permanent stability. The project targets to install 30 check dams structures within the 800ha of improved watershed management. These measures are intended to reduce climate-induced erosion and sediment delivery into critical assets such as Muda dam and its intertwined irrigation network. Associated with more intense rainfall, this will ensure watershed functions which are critical for downstream water security, benefiting several water treatment plants and a more resilient irrigation system for downstream MADA rice fields.

Activity 2.2.3 Watershed Monitoring, Evaluation and Adaptive Management

This activity establishes a watershed monitoring framework to assess hydrological interventions performance of watershed management measures, changing conditions and adaptation outcomes. Monitoring will include vegetation recovery, planting survival assessments, erosion rate indicators, sediment yields, turbidity measurements, hydrological observations, biodiversity indicators and remote-sensing analysis. The monitoring framework will complement and strengthen existing monitoring systems operated by MADA and other agencies and support adaptive management of watershed interventions throughout implementation.

The activity will generate evidence on adaptation effectiveness, watershed soil-erosion reduction and sediment-management performance to support adaptive management, future investment decisions and wider replication of successful approaches. Lessons learned, monitoring results and implementation experience will be documented and incorporated into the Watershed Soil Erosion and Sediment Management Toolkit, operational guidance and associated Standard

Operating Procedures developed under Output 1.3. The activity will also generate evidence supporting future replication and scaling of watershed adaptation approaches in Malaysia.

The activity will also assess the economic value of watershed protection for downstream water users and water service providers. In collaboration with the Kedah State Water Company/Syarikat Air Darul Aman (SADA) and relevant agencies, the project will undertake baseline and end-line assessments of selected water treatment plants supplied by the Ulu Muda watershed to evaluate changes in raw water quality, sediment loads, treatment requirements and operational costs. The assessment will generate evidence on the economic benefits of watershed protection and explore opportunities for future financing mechanisms, including Payment for Ecosystem Services (PES) approaches for consideration in future scaling and replication under output 1.3.

Output 2.2 Milestones

- **Year 1:** Hydrological, erosion-risk, ecological, climate-risk and safeguard assessments completed; site-selection criteria established; priority intervention areas validated; monitoring framework established; climate-smart planting and maintenance regimes developed; detailed intervention design finalized; integrated site-level ESMP covering forest restoration and sediment management activities prepared.
- **Year 2:** Watershed protection, soil-erosion management and sediment-management interventions initiated; check dams and stabilization measures established; monitoring systems operational.
- **Year 3:** Nature-based watershed interventions operational; adaptive management processes informed by monitoring data; sediment-management measures functioning across priority intervention areas.
- **Year 4:** Adaptive management measures refined; watershed performance assessed; operational guidance and lessons learned documented.
- **Year 5:** Intervention performance validated; monitoring results and lessons integrated into the Watershed Soil Erosion and Sediment Management Toolkit and disseminated for replication and scaling.

Activity	Stakeholders	Targets and Beneficiaries
A.2.2.1 Climate-Adaptive Watershed Soil-Erosion Management	FRIM, Kedah State Forestry Department, LSANK, MADA	Target: Baseline hydrological, erosion-risk, ecological, climate-risk and safeguard assessments completed; site-selection criteria established; and detailed intervention design finalized for validated priority watershed management units. 800 ha under improved watershed management through climate-adaptive watershed protection, soil-erosion management, sediment-management and adaptive monitoring measures, including 50 ha of forest enrichment, assisted natural regeneration, riparian rehabilitation and related nature-based stabilization measures. Beneficiaries: 57,635 MADA farmers and agricultural water users benefiting from strengthened watershed resilience, improved water regulation and reduced climate-related water-security risks.
A.2.2.2 Climate-Adaptive Watershed Sediment Management	FRIM, Kedah State Forestry Department, LSANK, MADA, JPS/DID	Target: Priority sediment-management interventions implemented through check dams and other nature-based sediment-management measures contributing to reduced sediment delivery and improved watershed condition, subject to baseline validation. 30 check dams established within priority sub-catchments. Beneficiaries: Approximately 4.2 million people in Kedah, Penang and Perlis benefiting indirectly from strengthened watershed functions, enhanced raw-water security and reduced climate-related water-supply risks. SADA benefitting from improved raw-water quality and reduced sediment-management requirements.
A.2.2.3 Watershed Monitoring, Evaluation	FRIM, MADA, LSANK, Kedah State Forestry Department, JPS/DID, SADA	Target: Operational watershed monitoring framework established, including hydrological, sediment, turbidity, vegetation recovery, planting survival and adaptation-performance indicators; lessons and operational guidance generated for incorporation into Output 1.3. Beneficiaries: MADA, LSANK, Kedah State

and Adaptive Management		Forestry Department, SADA and other agencies utilizing watershed-monitoring and adaptation decision-support information.
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Output 2.3: Urban and Peri-Urban Nature-based Solutions for Flood and Heat Resilience Implemented

Output 2.3 supports the integration of NbS into municipal stormwater-management systems to strengthen climate resilience, reduce flood risks and improve adaptive management of urban and peri-urban water assets. The output demonstrates how existing retention ponds, wetlands, drainage corridors and associated green-blue infrastructure can be managed as multifunctional climate-resilience assets that provide flood attenuation, water regulation, biodiversity enhancement, urban cooling and community benefits. The output combines statewide planning and investment prioritization with on-the-ground demonstration, monitoring and learning. It aims to strengthen the evidence base, institutional capacity and practical experience required to scale urban NbS across Kedah while delivering tangible climate-adaptation benefits in the Kubang Pasu municipal landscape.

Implementation is centred on Kubang Pasu, where approximately 71 ha of stormwater detention facilities and associated green-blue infrastructure will be brought under improved climate-resilient management through assessment, rehabilitation, habitat enhancement, monitoring and adaptive management. Rather than measuring success based on the number of retention ponds treated, the project will assess outcomes based on the total area managed using climate-resilient and biodiversity-sensitive approaches.

The output adopts a three-part approach. First, a Statewide NbS Opportunity Scan (NBSOS) will identify priority adaptation opportunities, support future investment planning and strengthen integration of NbS into municipal and state planning processes across Kedah. Second, urban and peri-urban NbS will be implemented within the Kubang Pasu demonstration landscape to enhance stormwater management, flood resilience, biodiversity and ecosystem services. Third, monitoring systems and adaptive-management processes will generate evidence on intervention performance and support replication, learning and long-term sustainability.

The output contributes directly to reduced urban flood risk, strengthened management of municipal stormwater assets, enhanced ecosystem services, improved adaptive capacity and increased institutional experience in the application of NbS for urban climate resilience. Consistent with ESMF requirements, environmental and social screening and assessment will be conducted to inform a site-level ESMP covering biodiversity, community health and safety, and other safeguards. A review of existing grey infrastructure will also be conducted to identify any additional safety measures required (e.g. fencing and signage).

Activity 2.3.1: Statewide Nature-based Solutions Opportunity Scan, Municipal Learning and Replication Pathways

A Statewide Nature-based Solutions Opportunity Scan (NBSOS) will be undertaken using the World Bank (2024) framework to identify priority opportunities for nature-based adaptation investments across Kedah. The assessment will progressively cover all districts in the state and will include urban and peri-urban flood-prone areas, agricultural landscapes, river catchments, drainage networks, wetlands, retention ponds, coastal ecosystems, mangroves and areas vulnerable to urban heat stress.

The NBSOS will generate climate-risk and NbS opportunity maps, identify priority investment areas and support development of a Statewide Nature-based Solutions Planning and Investment Framework. The assessment will support integration of NbS into state and municipal planning processes and provide a strategic evidence base for future adaptation investments. Findings will support decision-making by the Kedah State Government, state technical agencies, all 12 local

authorities in Kedah and other stakeholders involved in climate adaptation, flood management, biodiversity conservation and urban development.

The assessment will be implemented progressively across the project period. Year 1 will focus on Kubang Pasu to support planning and implementation of the demonstration landscape. Subsequent years will expand the assessment to additional districts across Kedah, culminating in statewide synthesis, analysis and dissemination during the final year of the project.

Building on the NBSOS process and lessons generated through implementation in Kubang Pasu, the activity will support municipal learning, replication planning and scaling pathways for urban NbS across Kedah. Participating local authorities will be engaged through technical exchanges, peer-learning activities, municipal dialogues and knowledge-sharing processes that strengthen understanding of how NbS can be integrated into municipal planning, stormwater management, retention-pond management, urban greening and climate-adaptation programmes.

The project will facilitate state-wide learning and replication through MASH and Kedah local-authority networks. A Kedah Nature-based Solutions Adaptation Forum will be organized towards the latter part of the project, bringing together representatives from all 12 local authorities, relevant state agencies, academia, civil society organizations and technical partners. As the demonstration local authority, MPKP will share implementation experience, lessons learned, challenges encountered and practical solutions developed through the project. Site visits and peer-learning activities will facilitate exchange among participating local authorities and support identification of future opportunities for NbS investment and implementation.

Knowledge products developed through the project, including the Urban Nature-based Solutions Toolkit, technical guidance, monitoring protocols, implementation case studies and lessons learned, will be disseminated through MASH and local-authority networks. The activity will support all 12 local authorities in Kedah to access planning tools, technical guidance and implementation experience generated through the project, while supporting at least three local authorities to initiate consideration, planning or integration of NbS approaches within local planning, retention-pond management, urban greening or climate-adaptation programmes.

The activity will deliver one Statewide Kedah Nature-based Solutions Opportunity Scan, climate-risk and NbS opportunity maps, a Statewide Nature-based Solutions Planning and Investment Framework, a Kedah Nature-based Solutions Adaptation Forum, municipal learning and exchange activities, and an Urban Nature-based Solutions Replication Toolkit to support future scaling and replication across Kedah.

Activity 2.3.2: Kubang Pasu Urban Nature-based Solutions Demonstration Landscape

Kubang Pasu will serve as the demonstration landscape for implementation of urban and peri-urban NbS. Approximately 71 ha of stormwater detention facilities, including retention ponds, wetlands, riparian buffers and associated green-blue infrastructure, will be brought under improved climate-resilient management through a phased programme of assessment, rehabilitation, habitat enhancement and ecosystem-based management.

Prior to implementation, detailed technical, environmental and social assessments will be undertaken to inform intervention design and safeguard implementation. These assessments will include hydrological and climate-risk assessments to evaluate flood-risk reduction potential and avoid unintended upstream, downstream and site-level hydrological impacts; biodiversity, aquatic habitat and ecosystem-services assessments to evaluate ecological condition, ecosystem services and biodiversity values; and community health, safety and climate-risk assessments addressing public safety considerations, accessibility, vector-breeding risks, climate hazards and operational requirements.

A district-wide assessment of retention ponds and associated drainage assets will establish the adaptation baseline and identify priority intervention sites. The assessment will consider hydrological performance, drainage connectivity, flood exposure, maintenance requirements, biodiversity values, ecological condition, urban heat exposure, surrounding land use, community exposure, accessibility considerations, community priorities and municipal planning needs.

Community consultations will inform intervention planning and detailed design, with particular attention given to the needs and priorities of women, youth, older persons, persons with disabilities and other user groups when considering accessibility, safety, public use, maintenance requirements and the overall functionality of retention ponds and associated green-blue infrastructure.

Based on these assessments, retention ponds and associated drainage assets will be classified into management typologies reflecting different functions, risk profiles and intervention requirements. Site-selection criteria and prioritization methodologies will be developed to guide investment decisions and ensure resources are directed towards locations where adaptation benefits can be maximized.

NbS interventions will subsequently be implemented across priority sites. Interventions will include retention pond rehabilitation, wetland enhancement, riparian restoration, native vegetation planting, bioengineered bank stabilization, vegetated buffers, sediment-trapping systems, infiltration enhancement, urban mini-forests, biodiversity habitat creation, shading systems and other ecological-engineering measures appropriate to local conditions.

Planting materials required for implementation will progressively be supplied through the MPKP central nursery and satellite community nurseries established under Activity 3.1.4. Initial planting stock required during the establishment phase will be procured externally where necessary. Thereafter, nursery-produced native trees, shrubs and wetland plants will support restoration, replacement planting and long-term maintenance activities.

Design and implementation of interventions will incorporate accessibility, public-safety and usability considerations to ensure that retention ponds and associated green-blue infrastructure provide equitable benefits to women, children, older persons and persons with disabilities. Community consultations will continue throughout implementation to inform adaptive design and management decisions.

The activity will deliver hydrological, biodiversity and community-risk assessments, a completed retention pond inventory and typology framework for Kubang Pasu, detailed designs and implementation plans for priority sites, and approximately 71 ha of stormwater detention assets under improved climate-resilient and biodiversity-sensitive management.

Activity 2.3.3: Monitoring, Data Generation and Adaptive Management Systems

Establishes an integrated monitoring, data-management and adaptive-management system to assess the performance, effectiveness and long-term sustainability of urban NbS implemented under Activity 2.3.2. The activity will generate evidence on hydrological, biodiversity, climate and ecosystem outcomes while supporting data-driven management of municipal stormwater assets.

A climate-resilience monitoring system will be established combining automated monitoring technologies, environmental sensors, biodiversity monitoring systems and digital decision-support tools. The system will support monitoring of flood attenuation, hydrological performance, water levels, rainfall, temperature, vegetation establishment, habitat condition, biodiversity outcomes and maintenance requirements across intervention sites.

Monitoring infrastructure will include water-level sensors, rainfall gauges, climate-monitoring stations, environmental sensors, monitoring cameras, communications infrastructure, data-storage systems and dashboard platforms. Monitoring systems will be integrated into municipal decision-making processes and linked to MPKP Smart City systems where feasible.

Bioacoustic monitoring systems will be deployed to assess biodiversity responses to NbS interventions and track changes in ecological condition over time. Monitoring programmes will focus on birds, amphibians and other indicator species to provide cost-effective and scientifically robust evidence on ecosystem recovery, habitat quality and biodiversity outcomes.

The activity will also establish monitoring protocols, quality-assurance procedures and data-management systems to support integration of information generated through automated monitoring systems and community-based monitoring activities. Citizen-science observations generated under Activity 3.1.4 will contribute to biodiversity monitoring, environmental reporting and adaptive-management processes while strengthening local stewardship and public engagement.

Monitoring results will be reviewed periodically to assess intervention performance, identify maintenance needs and inform adaptive-management decisions. Data generated through the monitoring system will support refinement of operational procedures, maintenance regimes, restoration approaches and future investment planning.

Selected intervention sites will function as living laboratories supporting applied research, university partnerships, student internships and long-term monitoring of urban NbS. Monitoring results, implementation experience and lessons learned will contribute directly to the Urban NbS Toolkit, monitoring protocols, operational guidance and scaling framework developed under Outputs 1.3 and 2.3.1.

The activity will deliver an operational climate-resilience monitoring and adaptive-management system, monitoring protocols, bioacoustic and biodiversity monitoring programmes, integrated data-management and dashboard systems, periodic performance assessments and evidence-based recommendations supporting long-term management and scaling of urban NbS.

Output 2.3 Milestones

- **Year 1:** Kubang Pasu NBSOS completed; climate-risk and NbS opportunity maps developed; baseline hydrological, biodiversity and community-risk assessments completed; retention pond inventory, typology framework and site-selection criteria developed; monitoring framework established; site-level ESMP developed, establishing standard technical designs and safeguard requirements for both upgrading of existing assets and new infrastructure; approximately 10 ha stormwater detention assets under improved climate-resilient management.
- **Year 2:** NBSOS completed for four additional districts in Kedah; detailed designs completed; ESMP requirements incorporated into contractor Site Plans; priority NbS interventions initiated; monitoring systems installed and operational; municipal learning and exchange activities initiated; approximately 25 ha stormwater detention assets under improved climate-resilient management.
- **Year 3:** NBSOS completed for four additional districts in Kedah; NbS interventions expanded to approximately 45 ha stormwater detention assets under cumulative improved management; with ESMP requirements applied to incremental Site Plans; biodiversity, hydrological and climate monitoring systems operational; adaptive-management procedures integrated into municipal asset-management processes.

- **Year 4:** NBSOS completed for three additional districts in Kedah; NbS interventions expanded to approximately 61 ha stormwater detention assets under cumulative improved management; performance assessments completed; adaptive-management approaches refined; monitoring results incorporated into urban NbS guidance and operational procedures; Kedah Nature-based Solutions Adaptation Forum conducted.
- **Year 5:** Statewide NBSOS completed covering all 12 districts in Kedah; approximately 71 ha stormwater detention assets under improved climate-resilient management; monitoring results, lessons learned and implementation experience incorporated into the Urban Nature-based Solutions Toolkit, Operational Guidance and Scaling Framework; long-term management arrangements adopted by MPKP; at least three local authorities supported to initiate consideration or integration of urban Nature-based Solutions approaches.

Activity	Stakeholders	Targets and Beneficiaries
A.2.3.1 Statewide Nature-based Solutions Opportunity Scan, Municipal Learning and Replication Pathways	FRIM, Kedah State Government, MPKP, MBAS, participating local authorities, DID/JPS, PLANMalaysia and relevant state agencies	Targets: One statewide Kedah NbS Opportunity Scan (NBSOS) completed covering all 12 districts; climate-risk and NbS opportunity maps developed; Statewide NbS Planning and Investment Framework prepared; municipal exchange visits, technical learning activities and peer-learning programmes conducted; Kedah NbS Adaptation Forum conducted; Urban NbS Replication Toolkit developed; lessons learned disseminated through MASH and local-authority networks; all 12 local authorities engaged through municipal learning and replication activities; at least three local authorities supported to initiate planning, adoption or integration of NbS approaches within municipal planning, retention pond management, urban greening or climate-adaptation programmes. Beneficiaries: Kedah State Government, local authorities, technical agencies, planners and municipal practitioners benefiting from improved climate-risk information, NbS planning tools, investment guidance and replication pathways for urban climate adaptation.
A.2.3.2 Kubang Pasu Urban Nature-based Solutions Demonstration Landscape	FRIM, MPKP, DID/JPS, Kedah State Government and relevant technical partners	Targets: Hydrological and climate-risk assessment, biodiversity and ecosystem-services assessment, and community health and safety assessment completed; retention pond inventory and typology framework completed; approximately 200 retention ponds assessed and categorized; site-selection criteria and prioritization methodology developed; priority retention ponds, wetlands, riparian buffers and associated green-blue infrastructure rehabilitated and enhanced through NbS interventions; approximately 71 ha of stormwater detention assets under improved climate-resilient and biodiversity-sensitive management. Beneficiaries: Approximately 85,687 residents benefiting from improved flood resilience, enhanced stormwater management, climate resilience, biodiversity enhancement and ecosystem services in the Kubang Pasu demonstration landscape.
A.2.3.3 Monitoring, Data Generation and Adaptive Management Systems	MPKP, FRIM, DID/JPS, universities and relevant technical partners	Targets: Operational monitoring and adaptive-management system established; monitoring stations, sensors, dashboard systems and associated smart-monitoring infrastructure installed and operational; hydrological, climate, biodiversity and safeguards monitoring protocols developed and operationalized; bioacoustic monitoring systems established; biodiversity monitoring implemented; citizen-science observations integrated into municipal monitoring systems; monitoring outputs incorporated into municipal asset-management and decision-making processes, including MPKP Smart City systems where feasible; adaptive-management procedures operationalized to support long-term maintenance and performance improvement of NbS assets; monitoring results incorporated into the Urban NbS Toolkit, Operational Guidance and Scaling Framework. Beneficiaries: Municipal agencies, technical personnel and approximately 85,687 residents benefiting from improved flood-risk management, adaptive maintenance, evidence-based decision-making and climate-resilient management of municipal assets. Monitoring systems will incorporate gender-responsive and socially inclusive indicators and reporting mechanisms.

Component 3: Institutionalizing Capacity, Stewardship and Sustainable NbS Management

Outcome 3: Communities and institutions strengthen climate resilience through inclusive participation, enhanced capacities and application of adaptation knowledge.

Alignment with Adaptation Fund Results Framework: Component 3 contributes primarily to **AF Outcome 2 and Output 2.1** by strengthening the capacity of government agencies, local stakeholders and community members to support, implement, monitor and sustain climate adaptation measures. Through technical training, community stewardship mechanisms, citizen-science initiatives, knowledge management and dissemination activities, the component strengthens the institutional and human capacities required to maintain, replicate and scale adaptation investments. The component also supports the long-term sustainability of ecosystem restoration and NbS interventions implemented under Component 2 by strengthening local ownership, adaptive management and knowledge-sharing processes.

Component 3 serves as the project's sustainability, capacity-development and knowledge-management component. While Component 1 generates climate intelligence, planning tools and operational guidance, and Component 2 implements landscape-level adaptation investments, Component 3 strengthens the capacities, stewardship mechanisms and learning systems required to support long-term implementation, adaptive management, institutional uptake and replication.

The component is structured around three complementary outputs:

- **Output 3.1: Inclusive Community Participation, Capacity and Livelihoods Strengthened.** This output promotes locally led adaptation, community participation, social inclusion and livelihood opportunities linked to peatland restoration, watershed management and urban Nature-based Solutions.
- **Output 3.2: Technical Capacity for Climate Intelligence, NbS Management and Project Implementation Strengthened.** This output builds technical and institutional capacities required to apply climate intelligence, implement adaptation interventions, operate monitoring systems and support adaptive management.
- **Output 3.3: Knowledge Management, Learning and Dissemination Systems Operationalized.** This output captures, consolidates and disseminates project lessons, tools, methodologies and implementation experience to support institutional learning, replication and scaling.

Gender equality, social inclusion and environmental and social safeguards are integrated throughout Component 3. Particular attention will be given to participation of women, youth and vulnerable groups, while ensuring that stakeholder engagement, grievance management, benefit-sharing mechanisms, the ESMF, Stakeholder Engagement Plan (SEP) and GAP are implemented in a transparent and inclusive manner. Where relevant, implementation will follow UNDP requirements relating to Indigenous Peoples and local communities.

Activities under Component 3 are implemented across the project intervention landscapes in Selangor and Kedah, while national and sub-national training, learning and knowledge-sharing functions support broader institutional uptake of project approaches throughout Malaysia.

Output 3.1: Inclusive Community Participation, Capacity and Livelihoods Strengthened

Output 3.1 strengthens community participation, stewardship and climate resilience while supporting the long-term sustainability of project investments under Components 1 and 2. Recognizing that successful adaptation depends on local ownership and capacity, the output promotes meaningful participation of communities in the implementation, monitoring and management of adaptation measures, guided by principles of Locally Led Adaptation (LLA), gender equality and social inclusion.

The output supports community-based livelihood opportunities linked to nursery development, ecosystem management, monitoring services and climate-resilient value chains, with particular attention to women, youth and vulnerable households. Experiences from community stewardship, local adaptation services and livelihood models will contribute to the sustainable financing and scaling approaches developed under Output 1.3.

Gender-responsive grievance redress and stakeholder feedback mechanisms will be established and integrated into project implementation. Capacity-building will support FRIM, project staff and partners in environmental and social safeguards monitoring, grievance management, Protection from Sexual Exploitation, Abuse and Harassment (PSEAH) and inclusive community engagement. A Gender Equality and Social Inclusion (GESI) Action Plan will be developed during the inception phase and integrated into project implementation. The GESI Action Plan will establish participation targets, inclusion measures, monitoring indicators, gender-responsive benefit-sharing approaches and procedures for addressing barriers faced by women, youth, Indigenous Peoples, persons with disabilities and other vulnerable groups.

Activity 3.1.1 Inclusive Community Participation and Locally Led Adaptation Mechanisms

Establishes the institutional and operational arrangements required to support meaningful, inclusive and sustained community participation across all project intervention landscapes. Building on principles of Locally Led Adaptation (LLA), gender-responsive adaptation and social inclusion, the activity will develop and operationalize a common project framework for community engagement, participation, benefit-sharing, grievance management and adaptive management.

The activity will support stakeholder mapping, community profiling and socio-economic assessments to identify target groups, vulnerable households, women, youth and other priority beneficiaries. Based on these assessments, the project will establish transparent participation criteria, beneficiary-selection procedures and mechanisms for equitable access to training, livelihood opportunities, monitoring activities and project-supported incentives.

Project-wide procedures and guidance will be developed covering community engagement, participation mechanisms, gender and social inclusion targets, stakeholder feedback processes, grievance redress mechanisms (GRM), community monitoring arrangements and safeguards implementation. Capacity-building will be provided to FRIM, project staff and partners on environmental and social safeguards monitoring, grievance management, PSEAH and inclusive community engagement.

Local participation and coordination mechanisms will be established where appropriate to support implementation of peatland, watershed and urban NbS activities. Special attention will be given to ensuring meaningful participation of women, youth and vulnerable groups in project decision-making, implementation and monitoring processes, thereby strengthening local ownership and long-term sustainability of project investments.

Activity 3.1.2 Peatland Community Stewardship and Climate Resilience in KLSFR

Strengthens community participation, resilience and livelihood opportunities associated with peatland restoration, fire-risk reduction and sustainable landscape management in the KLSFR landscape. The activity recognizes that long-term peatland restoration and fire prevention depend on active community participation, local stewardship and sustained engagement of communities and land users adjacent to peatland ecosystems.

Community participation mechanisms will support local involvement in peatland restoration, fire prevention, monitoring, reporting and adaptive management activities, while ensuring that project benefits are delivered through transparent, inclusive and gender-responsive processes.

During Year 1, the project will undertake a more detailed assessment of vulnerable farmers, agricultural operators and forest-edge land users in the intervention area, including the number of farmers, workers and land users potentially affected by peatland fire risk and dry-season water stress. This assessment will be linked to the water abstraction study and baseline assessment under Output 2.1, allowing the project to compare conditions before and after clay dyke installation and other rewetting interventions.

Based on the assessment findings, the project will identify specific measures to strengthen climate-resilient livelihoods and reduce vulnerability among farmers and land users benefiting from improved dry-season water availability, reduced fire risk and enhanced peatland management. Possible measures may include awareness raising, technical guidance on sustainable water use, participation in community-based monitoring, and support for improved coordination between land users and peatland management agencies.

Community-based monitoring and reporting mechanisms established under Output 2.1 will be supported through training, awareness activities and engagement processes that strengthen collaboration between communities, farmers, land users and participating agencies responsible for peatland management, restoration and fire prevention. Lessons learned from community engagement, peatland stewardship, farmer participation and locally led adaptation approaches will contribute to the development of guidance, toolkits and replication strategies under Output 1.3.

Activity 3.1.3. Watershed Stewardship, Climate Resilience and Community Awareness in Ulu Muda and downstream area

Supports community participation in climate-adaptive watershed management while strengthening local awareness, stewardship and socio-economic resilience among communities associated with the Ulu Muda watershed and downstream water users.

The activity will establish a community-managed nursery to support production of native planting materials required for watershed protection and enrichment planting activities under Output 2.2. Community members will participate in seed collection, seedling production, nursery operations, maintenance and monitoring activities, generating local employment opportunities while strengthening stewardship of watershed resources. Participation will prioritize women, youth and vulnerable households identified through socio-economic assessments to ensure equitable access to project benefits and livelihood opportunities. The community nursery will also serve as a platform for capacity development in ecosystem and sustainable resource management and climate adaptation practices. The community nursery will be designed to explore longer-term operational and financing models, including the potential production and sale of native planting materials and the provision of ecosystem-management services beyond project implementation, where viable and appropriate. These measures are intended to support the long-term sustainability of nursery operations and strengthen local ownership of restoration activities. Community nursery participation activities will target a minimum of 50% women participants in nursery related employment, training and capacity building activities and will actively promote women's leadership in nursery management, decision making and monitoring functions with a target of at least 40% women representation in management and coordination roles.

The activity will support climate-resilience awareness and adaptation capacity among downstream farming communities dependent on water resources originating from the Ulu Muda watershed. Activities may include awareness programmes on climate risks, water security, watershed functions, climate-smart agricultural practices, financial literacy, household resilience planning and informed adaptation decision-making. The activity will begin with a socio-economic and climate-vulnerability assessment covering approximately 200 households in downstream farming communities to identify climate-related livelihood risks, adaptation priorities, barriers to resilience and opportunities for community participation. The activity will adopt gender-responsive and

socially inclusive approaches throughout implementation. Participation in awareness, training and capacity-development activities will target a minimum of 50% women participants and at least 20% participation from vulnerable groups. Findings will inform the design of climate-resilience awareness activities, adaptation-support measures and targeted engagement of women, youth and vulnerable groups.

Lessons from previous watershed-management initiatives, community engagement programmes and adaptation experiences within the Ulu Muda landscape will be incorporated into implementation design and awareness materials.

Activity 3.1.4 Urban NbS Stewardship, Climate Resilience and Community Awareness in Kubang Pasu

This activity strengthens community stewardship, environmental awareness and citizen participation in urban NbS interventions implemented under Output 2.3. The activity aims to build long-term community ownership of retention ponds, wetlands and associated green-blue infrastructure while supporting biodiversity monitoring, environmental education and climate-resilience awareness.

A community nursery network will be established to support production of native trees, shrubs, aquatic plants and other vegetation required for retention pond enhancement and urban greening activities. Building on the central nursery established by MPKP, four satellite community nurseries will be established and community members, particularly women, youth and vulnerable groups, will receive training in nursery management, plant propagation and maintenance of climate-resilient native species. Nursery activities will provide planting materials for NbS interventions while strengthening local stewardship and creating opportunities for longer-term community participation and livelihood development.

The activity will establish a Citizen Science Monitoring Programme focusing on biodiversity and ecosystem monitoring within retention ponds, wetlands and associated green-blue corridors. Monitoring may include bird, frog and other biodiversity observations using citizen science platforms and protocols developed with technical support from FRIM and specialist partners. Community members, schools, university students, interns, Nature Clubs (Kelab Pencinta Alam), teachers and local volunteers will participate in monitoring activities and environmental stewardship initiatives. A network of Eco-Wardens will be established as trained community champions supporting long-term monitoring, stewardship and public engagement. Eco-Wardens will receive additional training and mentoring to coordinate monitoring activities, support data quality assurance, organize community awareness activities and act as focal points between communities, MPKP and project partners. Citizen scientist, Eco-Warden selection and community participation approaches will seek balanced representation of women and men while creating opportunities for youth leadership and participation by vulnerable groups.

The activity will further support community awareness, environmental education and outreach programmes focused on flood resilience, urban heat, biodiversity conservation, water stewardship and climate adaptation. Activities may include school programmes, citizen-science workshops, biodiversity events, volunteer planting campaigns, nature walks, awareness materials and public outreach initiatives. Community engagement approaches will promote participation of women, youth, older persons and persons with disabilities while encouraging inclusive use and stewardship of urban green-blue infrastructure.

Training will also cover inclusive design principles, gender-responsive community engagement approaches and accessibility considerations to ensure that urban Nature-based Solutions provide equitable benefits to women, youth, older persons and persons with disabilities. Lessons, materials and experiences generated through community participation and citizen-science

activities will contribute to project knowledge products, awareness materials and dissemination activities under Output 3.3.

Output 3.1. Milestones

- **Year 1:** Community participation framework, GESI Action Plan, grievance redress mechanism (GRM) and stakeholder engagement procedures established; socio-economic and climate vulnerability assessments completed; Sustainable Finance Assessment completed.
- **Year 2:** Community stewardship, nursery, awareness, citizen science and monitoring programmes operational across the three intervention landscapes.
- **Year 3:** Community livelihood, stewardship and monitoring activities expanded and fully integrated into peatland, watershed and urban NbS interventions.
- **Year 4:** Community stewardship, citizen science and livelihood models consolidated; lessons learned and locally led adaptation approaches incorporated into project guidance, knowledge products and replication materials.
- **Year 5:** Community stewardship mechanisms, local capacity and sustainable financing arrangements established to support the long-term sustainability and scaling of adaptation investments.

Activity	Stakeholders	Targets and beneficiaries
A.3.1.1 Inclusive Community Participation and Locally Led Adaptation Mechanisms	FRIM, local authorities, community organizations, women's groups, Community Development Department (KEMAS)	Target: Community participation framework developed and applied across all project landscapes; stakeholder mapping and socio-economic profiling completed; transparent beneficiary-selection, participation and incentive mechanisms established; project grievance redress and stakeholder feedback mechanisms operationalized; safeguards and PSEAH procedures integrated into community engagement processes; local participation mechanisms established in project intervention areas; minimum 50% women participation target adopted across all community activities. Beneficiaries: community representatives and local stakeholders participating in planning, consultation, governance and community engagement activities. The activity adopts gender-responsive and socially inclusive participation targets, including a minimum of 50% women participation across all community engagement activities and at least 20% participation from identified vulnerable groups. In addition, meaningful participation by promoting women's representation in leadership roles within community committees, consultation platforms and local decision-making structures, with a target of at least 40% women representation in such roles where applicable.
A.3.1.2 Peatland Community Stewardship and Climate Resilience in KLSFR	FRIM, JPNS and local partners	Target: Community participation mechanisms established in peatland intervention areas; Year 1 assessment completed on vulnerable farmers, workers, land users, water use and livelihood resilience needs; approximately 30 community members/farmers/land users engaged in peatland restoration, forest-edge stewardship and monitoring activities, 4 community-based monitoring groups established with 100 community members and land users trained in peatland fire prevention, early warning, reporting, basic monitoring and sustainable peatland management practices. Beneficiaries: Approximately 4,833 community members from peatland-adjacent communities benefiting from improved peatland management, reduced fire risk, strengthened climate resilience and enhanced participation in local adaptation processes.
A.3.1.3 Watershed Stewardship, Climate Resilience and Community	FRIM, Kedah State Forestry Department, MADA, Universiti Utara Malaysia	Target: One community nursery established and operational to support watershed restoration activities. Approximately 100 community members engaged in nursery development, forest enrichment, watershed stewardship and monitoring activities (minimum 50% women and 20% vulnerable groups). Socio-economic and climate-vulnerability assessment covering approximately 200 downstream farming households completed. Climate-resilience awareness, adaptation and livelihood-support activities implemented for

Awareness in Ulu Muda and downstream area	and local partners	approximately 350 downstream farmers and community members, including at least 30 youth participants (minimum 50% women and 20% vulnerable groups). Beneficiaries: Approximately 57,635 downstream farmers and water users benefiting from strengthened watershed resilience, water-security functions and adaptation-awareness activities, with targeted engagement of women, youth and vulnerable groups.
A.3.1.4 Urban NbS Stewardship, Climate Resilience and Community Awareness in Kubang Pasu	FRIM, MPKP, local partners	Target: Four satellite community nurseries established and operational (50% women). At least 300 citizen scientists engaged in biodiversity and environmental monitoring by Year 5 (50% women). At least 20 Eco-Wardens trained and operational as local stewardship leaders. At least 10 awareness, citizen-science, school or community outreach activities implemented. Participation targets will promote representation of women, youth and vulnerable groups. Beneficiaries: Approximately 30 nursery participants (minimum 70% women), 300 citizen scientists and 20 Eco-Wardens (50% women participation), and at least 500 community members, students and local stakeholders participating in awareness, stewardship and monitoring activities.

Output 3.2: Technical Capacity for Climate Intelligence, NbS Management and Project Implementation Strengthened

This output strengthens the technical and institutional capacities required to apply climate intelligence, implement adaptation interventions, operate monitoring systems and support adaptive management across the project landscapes. The output supports national, state and municipal institutions responsible for climate-risk assessment, ecosystem management, project implementation and long-term operation of adaptation investments.

Capacity-building activities will focus on three complementary areas: (i) application of climate intelligence, climate-risk and vulnerability information for adaptation planning and decision-making; (ii) implementation, monitoring and adaptive management of landscape-specific NbS interventions; and (iii) monitoring, safeguards, gender-responsive implementation and project management functions required to ensure effective delivery and sustainability of project results.

Training programmes will be tailored to the needs of participating institutions and may include technical training, operational guidance, field demonstrations, peer-to-peer learning, training-of-trainers approaches and knowledge-exchange activities. Particular attention will be given to strengthening institutional uptake of project tools, guidance and monitoring systems beyond the project implementation period.

Activity 3.2.1 Climate Intelligence, Project Implementation and Adaptive Management Capacity Building

Strengthens the capacity of national and sub-national institutions to apply climate intelligence, vulnerability information and project management approaches to support climate-resilient planning, implementation and adaptive management. Training will focus on practical application of ICFIS, the Forest-Climate Vulnerability Atlas, climate-risk and vulnerability assessment approaches, restoration prioritization and evidence-based adaptation planning.

The activity will also strengthen capacities related to project monitoring, adaptive management, environmental and social safeguards implementation, stakeholder engagement, grievance management, gender-responsive adaptation planning, collection and reporting of sex-disaggregated indicators, knowledge management and institutional learning. Training-of-trainers approaches will be applied where appropriate to support long-term institutional uptake and sustainability. Training will include collection, analysis and reporting of sex-, age- and disability-disaggregated data and application of gender-responsive monitoring approaches consistent with Adaptation Fund requirements.

Activity 3.2.2 Peatland Restoration, Fire Resilience and Monitoring Capacity Building

Strengthens the technical and institutional capacities required for long-term management of peatland restoration, hydrological rehabilitation, fire-risk reduction and monitoring systems established under Output 2.1. Training and technical support will target FRIM, Selangor State Forestry Department (JPNS), JBPM/Bomba, DID/JPS, local authorities and other relevant stakeholders responsible for peatland restoration, hydrological management, fire prevention, related environmental and social safeguards, monitoring and adaptive management.

Capacity-building activities will strengthen technical skills related to peatland ecology and hydrology, clay dyke construction, water-retention systems, groundwater and peat-moisture monitoring, fire-risk assessment, early warning systems, operational response procedures, monitoring technologies, telemetry systems, adaptive management and inter-agency coordination. Practical field demonstrations, simulation exercises and training-of-trainers approaches will support long-term institutional uptake and sustainability. Lessons and operational experience generated through implementation will contribute to peatland restoration guidance, fire-management toolkits, monitoring protocols and operational procedures developed under Output 1.1.3.

Activity 3.2.3 Watershed Management, Monitoring and Restoration Capacity Building

Strengthens the technical and institutional capacities required for long-term implementation, monitoring and adaptive management of watershed adaptation measures established under Output 2.2. Training and technical support will target the Kedah State Forestry Department, MADA, Kedah State Water Resources Board (LSANK), SADA and other relevant stakeholders responsible for watershed management, soil-erosion management, sediment management, water-resource management and adaptation planning.

Capacity-building activities will strengthen technical skills related to climate-adaptive watershed management and related environmental and social safeguards for forest enrichment, assisted natural regeneration, nursery management, soil-erosion management, sediment management, check dam implementation, watershed monitoring systems, sediment and turbidity monitoring, hydrological monitoring, interpretation of watershed performance indicators, adaptive management and inter-agency coordination. Field demonstrations, practical exercises, site visits and training-of-trainers approaches will support institutional uptake and sustainability. Lessons, monitoring results and implementation experience generated through watershed adaptation activities will contribute to watershed management guidance, soil-erosion and sediment-management toolkits, monitoring protocols and operational procedures developed under Output 1.1.3.

Activity 3.2.4: Urban Nature-based Solutions Monitoring, Adaptive Management and Municipal Capacity Building

Strengthens the technical and institutional capacities required for long-term planning, implementation, monitoring and management of urban NbS interventions established under Output 2.3. Training and technical support will target MPKP, DID/JPS, FRIM and other relevant agencies responsible for urban drainage, retention pond management, biodiversity monitoring, landscaping, Smart City operations and climate-resilient municipal planning.

Capacity-building activities will support application of the Nature-based Solutions Opportunity Scan, retention pond typologies, monitoring systems and adaptive-management approaches developed under Output 2.3. Training will cover NbS planning and implementation, retention pond assessment and enhancement, climate-resilient stormwater management, native plant nursery management, biodiversity monitoring, bioacoustic monitoring, environmental monitoring systems, monitoring sensors, dashboard systems, climate-adaptation monitoring and reporting, adaptive maintenance, community engagement, Eco-Warden integration, community health and safety,

accessibility considerations and integration of NbS into municipal planning and asset-management processes. Field demonstrations, peer-learning exchanges, study visits, training-of-trainers approaches and practical application at demonstration sites will support institutional uptake and future replication. Lessons and materials developed through the activity will contribute to the Urban NbS Toolkit, standard operating procedures and operational guidance developed under Output 1.1.3. Training programmes will incorporate safeguards requirements, gender-responsive engagement approaches, accessibility principles and community health and safety considerations relevant to urban NbS implementation.

Output 3.2. Milestones:

- **Year 1:** Capacity needs assessment completed and training programme developed.
- **Year 2:** Initial training programmes delivered on climate intelligence, safeguards, adaptation planning and landscape-specific NbS implementation.
- **Year 4:** Technical personnel trained and applying climate intelligence, monitoring systems and adaptive-management approaches across project landscapes.
- **Year 5:** Institutional capacities strengthened for long-term operation, monitoring and replication of adaptation investments and climate-risk management systems.

Activity	Stakeholders	Targets and Beneficiaries
A.3.2.1 Climate Intelligence, Project Implementation and Adaptive Management Capacity Building	FRIM, NRES, JPMS, State Forestry Departments, DID/JPS, NAHRIM, METMalaysia, MYSA, PLANMalaysia	Target: 200 personnel trained in application of ICFIS and Atlas products, climate-risk assessment, adaptation planning, restoration prioritization, monitoring, safeguards implementation, stakeholder engagement and gender-responsive adaptation planning. 30 personnel trained on monitoring and evaluation, environmental and social safeguards implementation, stakeholder engagement, grievance redress mechanisms, Indigenous Peoples engagement, and gender-responsive adaptation planning and monitoring. Beneficiaries: National and sub-national agencies, project management teams and implementing partners responsible for climate adaptation, planning, safeguards and monitoring.
A.3.2.2 Peatland Restoration, Fire Resilience and Monitoring Capacity Building	FRIM, JPNS, JBPM/Bomba, DID/JPS, JMG, local authorities and relevant technical partners	Target: 40 personnel trained in peatland restoration, hydrological rehabilitation, groundwater and peat-moisture monitoring, fire-risk assessment, early warning systems, operational fire-response procedures, contingency planning and adaptive management approaches. Beneficiaries: FRIM, JPNS, JBPM/Bomba, DID/JPS, JMG and participating agencies responsible for peatland management, fire-risk reduction and long-term operation of monitoring and restoration systems.
A.3.2.3 Watershed Management, Monitoring and Restoration Capacity Building	FRIM, Kedah State Forestry Department, MADA, LSANK, SADA	Target: 10 technical personnel trained in climate-adaptive watershed management, forest enrichment, soil-erosion management, sediment management, watershed monitoring systems and adaptive management approaches. Training materials, operational guidance and technical knowledge products developed and applied by participating agencies. Beneficiaries: Forestry, watershed and water-resource agencies responsible for implementation, monitoring and long-term management of watershed adaptation interventions in the Ulu Muda watershed.
A.3.2.4 Urban Nature-based Solutions Monitoring, Adaptive Management and Municipal Capacity Building	MPKP, FRIM, DID/JPS	Target: 50 municipal and technical personnel trained in NbS planning, retention pond management, biodiversity monitoring, nursery management, monitoring systems, dashboard operations, adaptive maintenance, community engagement and climate-resilient asset management. Training materials, monitoring protocols and operational procedures developed and applied by participating agencies. Beneficiaries: Municipal engineers, drainage and public works personnel, planners, landscape officers, nursery staff, dashboard operators, biodiversity monitoring teams and technical officers responsible for urban flood resilience and Nature-based Solutions implementation.

Output 3.3: Knowledge Management, Learning and Dissemination Systems Operationalized

This output ensures that knowledge, tools, methodologies and lessons generated through the project are systematically documented, shared and maintained beyond the project period. It supports dissemination of climate-risk information, NbS approaches and implementation experience generated under Components 1, 2 and 3, while providing long-term access to project knowledge products and lessons learned.

The output will establish a knowledge management system that facilitates learning and exchange among government agencies, local authorities, technical institutions, researchers, practitioners and future adaptation programmes. Emphasis will be placed on documenting practical implementation experience and supporting replication of successful approaches in forest, peatland, watershed and urban landscapes.

Knowledge management activities will capture technical, institutional and community perspectives, including locally led adaptation experiences, community stewardship approaches, gender-responsive adaptation practices and lessons from vulnerable groups participating in project activities. Knowledge products and dissemination activities will support replication, scaling and future adaptation investment while promoting inclusive adaptation approaches.

Activity 3.3.1: National Knowledge Portal

A National Knowledge Portal will be established and maintained as a central repository for project knowledge products, guidance materials and implementation lessons.

The portal will provide access to selected outputs from ICFIS and the Forest-Climate Vulnerability Atlas, operational guidance and NbS toolkits developed under Output 1.3, the Sustainable Finance and Scaling Framework, case studies, policy briefs, technical publications and other project knowledge products.

The portal will serve as a dissemination and learning platform rather than a primary data-hosting system. Long-term hosting and maintenance arrangements will be established and hosted by FRIM and other relevant national adaptation knowledge platform that may be established in the future to ensure continued access to project resources beyond the project implementation period.

Activity 3.3.2: Knowledge Products and Case Studies

Knowledge products will be developed to document project experience, lessons learned and good practices emerging from implementation across the three intervention landscapes.

Products will synthesize technical findings, implementation experience and evidence generated through climate-risk assessment, peatland adaptation, watershed management and urban NbS interventions. Materials may include technical briefs, policy notes, case studies, awareness materials, factsheets and synthesis reports designed to support learning, replication and future investment.

Knowledge products will document both technical and implementation lessons, including experiences from local authorities, community participants, women leaders, community champions and locally led adaptation initiatives where relevant. Particular attention will be given to documenting practical lessons on adaptation planning, stewardship mechanisms, community participation, monitoring systems and NbS implementation.

Knowledge products will be prepared in formats appropriate to their intended audiences and, where relevant, made available in both English and Bahasa Malaysia. User-friendly

communication products will be developed to support wider accessibility and uptake among local authorities, practitioners, communities and future adaptation programmes.

Knowledge products will seek to document diverse adaptation experiences, including perspectives and lessons from women, local communities, youth and community-based adaptation practitioners. Case studies may highlight women leaders, community champions and locally led adaptation initiatives where relevant. Documentation of community experiences will follow appropriate informed-consent procedures.

Activity 3.3.3: Learning, Dissemination and Knowledge Exchange

National and sub-national learning and dissemination activities will be implemented to communicate project results, facilitate knowledge exchange and support replication of successful adaptation approaches.

Three sub-national learning and dissemination events will be conducted in the project intervention landscapes related to output 2.1, 2.2 and 2.3 and corresponding component 3 activities to share implementation experience, technical lessons and good practices emerging from project activities. The events will bring together implementing agencies, local authorities, technical partners, community representatives and other stakeholders to review project results, discuss operational lessons and identify opportunities for future replication and scaling.

Knowledge products developed through the project, including technical guidance, implementation tools, case studies, lessons learned, policy recommendations and adaptation approaches, will be disseminated through the National Knowledge Portal and other relevant knowledge-sharing platforms. Knowledge products will support learning across sectors involved in climate adaptation, forestry, ecosystem management, water resources management and NbS planning.

national dissemination event will be organized towards the end of the project to present key findings, tools, guidance materials and policy recommendations to national and sub-national decision-makers, technical agencies, development partners and other stakeholders involved in climate adaptation, forestry, water resources and NbS planning.

Learning and dissemination activities will seek balanced participation of government agencies, local authorities, technical institutions, community representatives, women, youth and other relevant stakeholders. Activities may include peer-learning exchanges, practitioner dialogues, municipal learning events and knowledge-sharing sessions coordinated through MASH and other relevant knowledge-sharing platforms.

Learning and dissemination activities will promote inclusive participation and representation among speakers, panellists and participants. Where appropriate, activities may facilitate exchanges involving women, Indigenous Peoples, youth, local communities and technical practitioners to support intergenerational learning and sharing of practical adaptation experience.

Output 3.3 Milestones

- **Year 2:** Knowledge management and dissemination strategy developed.
- **Year 3:** National Knowledge Portal established and initial project resources uploaded.
- **Year 4:** Knowledge products, case studies and dissemination materials prepared and shared through the portal and learning events.
- **Year 5:** Knowledge Portal fully operational with project tools, guidance materials and lessons learned consolidated and disseminated nationally.

Activity	Stakeholders	Targets and Beneficiaries
A.3.3.1 National Knowledge Portal	FRIM, NRES, NAHRIM, PLANMalaysia, UNDP and relevant technical partners	Target: 1 National Knowledge Portal established and maintained, providing access to project tools, guidance materials, SOPs, toolkits, case studies and knowledge products generated under Components 1, 2 and 3. Beneficiaries: Government agencies, local authorities, researchers, practitioners and future adaptation programmes.
A.3.3.2 Knowledge Products and Case Studies	FRIM, UNDP, research institutions, local authorities and project partners	Target: At least 7 knowledge products and case studies developed and disseminated, including 1 ICFIS and Forest-Climate Vulnerability Atlas synthesis brief, 2 peatland adaptation and fire-management knowledge products, 2 watershed adaptation and water-security knowledge products, and 2 urban Nature-based Solutions knowledge products. Products will document technical lessons, implementation experience, locally led adaptation approaches and inclusive adaptation practices. Beneficiaries: Technical institutions, practitioners, decision-makers and future adaptation programmes.
A.3.3.3 Learning, Dissemination and Knowledge Exchange	FRIM, NRES, local authorities, universities, NGOs, MASH and project partners	Target: 1 national dissemination event conducted; at least 3 sub-national learning and knowledge-sharing events conducted in Selangor, Ulu Muda and Kubang Pasu. Beneficiaries: Government agencies, local authorities, researchers, practitioners, community representatives, development partners and future adaptation programmes.

B. Economic, Social and Environmental benefits

The project will contribute to **AF Outcome 2** (Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses) and **AF Outcome 5** (Increased ecosystem resilience in response to climate change and variability-induced stress). It will generate adaptation benefits at local, landscape and national scales through investments in climate-risk management, peatland and watershed resilience, urban flood management, institutional capacity development and community participation. Benefits are expected to accrue to communities, water users, public institutions and ecosystems, while contributing to broader climate resilience, water security and sustainable development objectives. The following section summarizes the principal adaptation benefits, beneficiary groups and social and environmental outcomes expected from project implementation.

Adaptation Benefits and Co-benefits

The project is designed to reduce climate-related risks associated with peat fires, hydrological variability, erosion, sedimentation, flooding and water insecurity, while strengthening the resilience of ecosystems, communities and institutions. Adaptation benefits are expected through improved peatland hydrological conditions, strengthened watershed functions, enhanced urban flood-buffering capacity, improved climate-risk information and increased capacity for climate-informed planning and management. In addition to these direct adaptation outcomes, the project is expected to generate wider economic, social and environmental co-benefits.

Primary adaptation benefits include strengthened peatland hydrological resilience and reduced peat-fire risk using canal blocking and clay dikes to re-establish a high groundwater table. This saturates the soil and prevents deep, persistent underground smouldering that is incredibly difficult to extinguish, protecting surrounding communities from extreme air pollution during dry spells; The Kuala Langat peatlands serve as a vital hydrological sponge for the southern section of the Greater Kuala Lumpur area. Restoring their resilience ensures they can absorb massive quantities of water during heavy monsoons—preventing devastating floods in towns like Banting and Sepang. For the Ulu Muda catchment benefits are improved watershed functions, reduced erosion and sedimentation pressures will ensure sufficient water reserves that can be carried over to survive extended periods of climate-induced drought. Keeping the Muda Dam free of excessive sediment maintains also its flood-attenuation capabilities, preventing catastrophic overflows that threaten communities downstream during extreme weather events. Mitigating reservoir sedimentation prevents structural decline in water quality (such as high turbidity) and secures the

baseline volume needed to sustain cross-border municipal water supplies during dry seasons, thus enhancing water security; improved urban flood buffering, stormwater management and urban cooling; strengthened climate-risk information and adaptive planning capacity; and improved stewardship, monitoring and adaptive-management capacity among participating institutions and communities.

Enhancing fire resilience prevents significant releases of carbon dioxide and methane, directly aligning with national emission-reduction targets because degraded peatlands release millennia-old carbon stocks during fires. Rewetting and maintaining soil moisture protects regional biodiversity and prevents land subsidence, as well as maintaining waterlogged peatlands acts as a natural regional coolant, buffering surrounding urban populations from extreme temperature spikes. Restoring these peatlands' function will benefit prevention of recurrent public health crises, avoid airport and school closures, and cut down localized greenhouse gas emissions that threaten Malaysia's climate targets. The project generates broader co-benefits by using native species, improved ecosystem management, strengthened institutional coordination, technical capacity development, community stewardship and inclusive participation in climate adaptation processes.

Quantified estimates presented below are based on available technical assessments, published literature, project design assumptions and concept-stage analyses undertaken by FRIM. Where indicated, values are preliminary estimates that will be refined through baseline studies, monitoring systems, technical assessments and economic analyses undertaken during implementation.

Table: Economic, Social and Environmental Benefits

Category	Output	Quantified Estimate / Indicative Benefit	Methodology and Data Source
ECONOMIC BENEFITS			
Reduced flood-related damages and maintenance pressures	O.2.3	Preliminary estimate: 20–25% reduction in localized flood damages and maintenance requirements in intervention areas	Historical records indicate that between 561 and 1,188 households were displaced during major flood events in 2024. The project aims to reduce flood impacts for a significant proportion of households located within the priority intervention areas by Year 5.
Reduced water-treatment costs and sediment-management pressures	O.2.2	To be quantified through economic valuation study under Output 2.2	Economic valuation of avoided sedimentation, improved raw-water quality and reduced treatment requirements
Strengthened resilience of water-dependent agricultural systems	O.2.2	57,635 registered MADA farmers benefiting from improved watershed functions and water security	MADA service-area data and beneficiary methodology
Stewardship, nursery and monitoring opportunities	O.3.1	Community nursery participants, Eco-Wardens, citizen scientists and stewardship groups engaged in adaptation activities	Project monitoring and participation records
SOCIAL BENEFITS			
Improved water security and climate resilience	O.2.2	Up to 4.2 million people benefiting indirectly from strengthened watershed functions and water security	Watershed service-area estimates and beneficiary methodology
Reduced peat-fire risk and associated community exposure	O.2.1	Preliminary estimate: 70 to nearly 100% reduction in fire ignition risk within well-managed peatland intervention areas	Based on FRIM literature review and research conducted regionally
Improved urban thermal comfort	O.2.3	Preliminary estimate: 2.0–3.0°C localized cooling effect around selected NbS intervention sites (findings confirm that establishing tree belts and pocket forests	Published literature on urban NbS performance and site-level monitoring

		around retention ponds can realistically achieve the target)	
Gender-responsive and inclusive participation	O.3.1, O.3.2, O.3.3	Minimum 50% women participation across training, stewardship, governance and monitoring activities	GESI Action Plan and project monitoring framework
Community participation in adaptation	O.3.1	Eco-Warden programme, citizen-science activities, community nurseries and stewardship mechanisms operationalized across project landscapes	Project monitoring records
ENVIRONMENTAL BENEFITS			
Improved peatland hydrological resilience	O.2.1	1000 ha under improved hydrological management and monitoring	FRIM monitoring systems and project reporting
Reduced erosion and sedimentation pressures	O.2.2	800 ha under climate-adaptive watershed management, enrichment planting and assisted natural regeneration	FRIM monitoring and project reporting
Improved urban flood-buffering functions	O.2.3	71ha of stormwater management asset enhanced through NbS and ecological retrofitting measures	Municipal records and project monitoring
Biodiversity and ecosystem-function benefits	O.2.1, O.2.2, O.2.3	Habitat enhancement and improved ecosystem functionality across intervention landscapes	Ecological monitoring and project reporting
Carbon-stock protection and ecosystem resilience	O.2.1	Protection of peatland carbon stocks and strengthened ecosystem resilience within managed peatland areas	Published literature & FRIM assessments and project monitoring (groundwater-threshold analyses, peat moisture monitoring)

These benefits are expected to be experienced at different scales and by different stakeholder groups. While some outcomes are localized to project intervention sites, others extend across broader service areas through improved watershed functions, water security and climate-risk management systems. The beneficiary estimates presented below summarize the populations expected to directly and indirectly benefit from project implementation.

Project Beneficiaries and Methodology

The project will generate significant direct and indirect adaptation benefits for vulnerable communities, ecosystem-dependent livelihoods, technical personnel and institutions through implementation of climate-risk management systems, EbA, NbS, community stewardship approaches and institutional capacity strengthening across the project landscapes.

The project is expected to directly benefit approximately 148,382 people, including 59,826 women (40.3%) and 88,556 men (59.7%), through interventions implemented under Components 1, 2 and 3. Direct beneficiaries include communities within the KLSFR landscape benefiting from reduced peat-fire risk and improved ecosystem resilience; MADA farmers and agricultural water users benefiting from strengthened watershed functions and improved water security; urban and peri-urban residents benefiting from enhanced retention-pond systems and associated NbS interventions in Kubang Pasu; and national, state and municipal personnel receiving training and institutional capacity support.

The project is also expected to generate broader indirect benefits for approximately 4.2 million people, including an estimated 1,995,000 women and 2,205,000 men, through strengthened watershed regulation, improved hydrological resilience and enhanced raw-water supply security associated with the Ulu Muda watershed system.

While the overall beneficiary profile reflects the demographic composition of the target populations and sectors reached by the project, implementation targets generally aim to achieve at least **50%**

participation of women across training, stewardship, monitoring, governance and capacity-development activities, with a minimum target of 70% women participation in women-prioritized nursery activities. Detailed gender and social inclusion targets, participation approaches and monitoring arrangements are presented in the GESI Assessment and Action Plan.

Direct beneficiaries are defined as individuals who directly participate in, receive support from, or experience measurable resilience benefits resulting from project interventions. Indirect beneficiaries are populations benefiting from broader ecosystem, hydrological, water-security and climate-risk reduction functions supported by the project. Beneficiary estimates were developed using demographic statistics, agricultural databases, watershed service-area assessments, municipal records and project participation targets. Detailed beneficiary calculations, assumptions and methodologies are provided in the Beneficiary Assessment Annex.

Approaches to beneficiary verification, sex-disaggregation, social inclusion and avoidance of double counting will be refined during project inception and incorporated into the project monitoring and evaluation framework. Given the differentiated ways in which climate risks affect women, men and vulnerable groups, the project incorporates gender-responsive and socially inclusive approaches throughout design and implementation.

Table: Summary of Project Direct and Indirect Beneficiaries

Output / Beneficiary Group	Direct Beneficiaries	Women	Men	Gender Target	Indirect Beneficiaries
Kuala Langat Selatan Forest Reserve landscape (Outputs 2.1 and 3.1)	4,760	2,261	2,499	National population ratio (47.5% women)	–
MADA farmers and water users benefiting from strengthened watershed resilience (Output 2.2)	57,635	16,714	40,921	29% women, based on registered farmers	–
Kubang Pasu urban and peri-urban NbS landscape (Output 2.3)	85,687	40,701	44,986	National population ratio (47.5% women)	–
National, state and municipal personnel receiving training and institutional support (Output 3.2)	300	150	150	Minimum 50% women	–
Broader regional population benefiting from strengthened watershed regulation and raw-water security (Output 2.2)	–	–	–	National population ratio (47.5% women)	4,200,000
Total Direct Beneficiaries (unique individuals)	148,382	59,826	88,556	–	–
Total Indirect Beneficiaries (unique individuals)	–	1,995,000	2,205,000	–	4,200,000

Beneficiary estimates exclude subset beneficiary groups used for project monitoring and reporting to avoid double counting. Detailed beneficiary calculations, assumptions and methodologies are provided in the Beneficiary Assessment Annex.

Gender and Social Inclusion

A GESI Assessment and Action Plan has been prepared and is included as an annex. The assessment examined gender-differentiated climate vulnerabilities, barriers to participation, access to resources and decision-making, and opportunities to strengthen inclusive adaptation outcomes across the project landscapes. Findings from the assessment have informed project design, beneficiary targeting, implementation arrangements, monitoring systems and safeguards measures.

The assessment was informed by extensive stakeholder consultations undertaken during project preparation at national, sub-national and community levels across all project landscapes and components. Consultation methods included stakeholder interviews, focus group discussions with women, men and mixed groups, community scorecards, perception surveys, field visits, institutional consultations and literature review. The process engaged government agencies, local authorities, community representatives, civil society organizations, technical experts and vulnerable groups, and provided important insights into local climate risks, adaptation priorities, participation barriers and opportunities for more equitable adaptation outcomes.

The assessment found that climate change and ecosystem degradation affect women, men and vulnerable groups differently across the project landscapes. Women often experience disproportionate impacts associated with unpaid care responsibilities, household water management, livelihood disruption and health-related burdens arising from floods, droughts, heat stress and peat-fire haze events. Low-income households, older persons, persons with disabilities and other vulnerable groups may face additional constraints in accessing information, participating in decision-making processes and benefiting from adaptation investments.

In Kuala Langat Selatan, peat-fire haze creates significant health burdens and caregiving responsibilities, particularly for women and female-headed households, who are often responsible for caring for children, older family members and individuals with respiratory conditions during haze events.

In Ulu Muda, increasing rainfall variability, drought risk and water insecurity can disrupt agricultural livelihoods and place additional pressure on household water management, disproportionately affecting women's responsibilities related to household wellbeing, food security and care work.

In Kubang Pasu, recurring flooding and stormwater management challenges can increase household recovery burdens, disrupt access to services and livelihoods, and create additional caregiving and safety concerns, particularly for women, older persons and vulnerable households. Increasing temperatures and heat exposure may further contribute to time poverty, mobility constraints and rising household costs associated with cooling, water use and transportation.

At the same time, the assessment identified strong opportunities for more inclusive adaptation approaches. Consultations demonstrated high willingness among both women and men to participate in ecosystem restoration, watershed management, monitoring and NbS activities, with women frequently expressing equal or greater interest in participation than men. Community nurseries and native seedling production emerged as particularly promising opportunities for women-led livelihood development and local stewardship, while existing informal leadership roles held by women within community groups provide a foundation for stronger participation in adaptation governance and decision-making processes.

The assessment also identified several structural barriers that may limit equitable participation and benefit sharing if not explicitly addressed. These include time poverty associated with unpaid care responsibilities, male-dominated leadership structures, limited access to technical and leadership roles for women, insufficient integration of gender-responsive budgeting and benefit-sharing approaches, and weak inclusion of vulnerable groups in planning and monitoring processes. Despite strong willingness to participate, women remain underrepresented in many governance and decision-making structures relevant to natural-resource management and adaptation planning.

In response, the project integrates gender-responsive and socially inclusive approaches across all components, with particular emphasis on equitable participation in stewardship activities, community monitoring, ecosystem restoration, technical training, institutional capacity

development, climate-risk planning and knowledge-sharing processes. Activities will be designed to address participation barriers and promote equitable access to project benefits, leadership opportunities and decision-making processes.

The project includes explicit gender-responsive participation targets across its community and institutional capacity-development activities. As a minimum standard, the project aims to achieve 50% participation of women across community stewardship, citizen-science programmes, Eco-Warden networks, awareness activities, restoration and monitoring initiatives, technical training, institutional capacity-development activities and governance-related processes. In addition, women-prioritized nursery and livelihood activities will target a minimum of 70% women participants to strengthen women's leadership, economic participation and engagement in NbS implementation. The project also seeks to strengthen the participation of vulnerable and underrepresented groups, including low-income households, female-headed households, youth, older persons and persons with disabilities where relevant and feasible. Indicative social inclusion targets of approximately 20% participation by vulnerable and underrepresented groups have been incorporated into relevant community-based activities and will be refined during project inception based on site-specific assessments and stakeholder engagement processes.

The project will allocate dedicated resources for implementation of the GESI Action Plan, including gender-responsive capacity development, targeted outreach, inclusive participation measures, monitoring and reporting, and support for women-led and community-based adaptation initiatives. The allocation for GESI-related activities is estimated at 12.3% of the total project budget as detailed in the GESI budget in the Gender Action Plan (GAP) annex.

Progress against these targets will be monitored through sex-disaggregated participation records, beneficiary monitoring systems and GESI indicators integrated within the project Results Framework. Detailed participation targets, social inclusion measures, implementation actions and monitoring arrangements are provided in the GESI Assessment and Action Plan annex.

Avoiding and Mitigating Negative Impacts

In addition to maximizing adaptation benefits and promoting inclusive participation, the project has been designed to avoid, minimize and manage potential environmental and social risks associated with implementation. The project has been screened in accordance with the Adaptation Fund Environmental and Social Policy (ESP), Adaptation Fund Gender Policy and UNDP Social and Environmental Standards (SES), and incorporates measures to avoid, minimize and manage potential environmental and social risks throughout implementation. The project is classified as **Moderate Risk (Category B)**.

The project applies a native-species and ecosystem-compatibility approach for peatland, watershed and urban NbS activities. Biodiversity screening, site-level safeguards review and good-practice environmental management measures will be integrated into implementation. Physical interventions will avoid land acquisition, involuntary resettlement, physical displacement and restrictions on customary access. Activities will be limited to existing disturbed, managed or degraded areas where feasible and appropriate.

Social safeguards measures include inclusive stakeholder engagement, strengthened participation of women, youth and vulnerable groups, grievance redress mechanisms and public safety considerations for urban and water-related infrastructure. The project will also apply a zero-tolerance approach toward Sexual Exploitation and Abuse/Sexual Harassment and Gender-Based Violence (GBV), with related awareness and reporting measures integrated into project implementation and training activities.

Detailed safeguards measures and management approaches are further elaborated through the SES screening process, ESMF, GRM and related safeguards instruments included in the Safeguards Annexes. Together, these measures are intended to ensure that adaptation benefits are delivered in an inclusive, environmentally sustainable and socially responsible manner while supporting long-term resilience outcomes across the project landscapes.

C. Cost-effectiveness

The project is designed to support cost-effective climate adaptation by combining improved climate-risk information, ecosystem-based approaches, operational monitoring systems and local stewardship across peatland, watershed and urban landscapes. Rather than relying primarily on large-scale grey infrastructure expansion, the project seeks to address underlying drivers of climate vulnerability while improving the performance, management and sustainability of existing natural and built systems.

Component 1 supports development of climate-risk assessment and decision-support tools, including the ICFIS and the Forest-Climate Vulnerability Atlas. These tools help inform prioritization, planning and monitoring of adaptation investments across the project landscapes and support more coordinated management of climate-related risks.

The project further improves cost-effectiveness by integrating peatland, watershed and urban adaptation objectives within existing government systems and assets; enhancing the performance of existing infrastructure and landscapes rather than relying solely on new construction; strengthening monitoring, maintenance-support and stewardship arrangements; improving the targeting of adaptation investments; and building on existing institutional mandates, municipal systems and forestry operations.

Comparative analysis: NbS vs. Grey Infrastructure

The project prioritizes NbS and ecosystem-based approaches where these provide flexible, scalable and ecosystem-compatible alternatives or complements to conventional infrastructure investments. The proposed interventions are intended to enhance, rather than replace, existing engineered systems and government investments.

Table: Technical and Economic Comparison of Adaptation Alternatives

Intervention Area	Proposed NbS / Hybrid Approach	Conventional Alternative	Cost-Effectiveness and Co-Benefits
Peatland water management and fire-risk reduction (Output 2.1)	Hydrological management and rewetting, peat moisture monitoring and community stewardship	Expanded centralized water-supply and fire-suppression infrastructure	Supports preventive peatland management, reduces fire vulnerability and strengthens ecosystem functions while using modular and scalable systems adapted to peat landscapes.
Watershed stabilization and erosion reduction (Output 2.2)	Climate-adaptive watershed management, enrichment planting, assisted natural regeneration, erosion-control measures and sediment-management interventions	Repeated dredging, hard erosion-control structures and downstream sediment management	Addresses upstream drivers of erosion, sedimentation and hydrological instability while strengthening watershed functions, water security and long-term ecosystem resilience.
Urban flood and heat mitigation (Output 2.3)	Retention-pond enhancement, native planting, biodiversity-support measures, urban cooling features and associated NbS interventions	Expansion of concrete drainage systems and conventional flood-control infrastructure	Enhances flood buffering, stormwater management and urban cooling while strengthening biodiversity, public amenity value and lower-intervention maintenance approaches.
Monitoring and maintenance systems (Outputs 1.3 and 3.1)	Adaptive management systems, stewardship mechanisms, citizen science	Reactive maintenance and periodic outsourced	Improves early identification of maintenance needs, strengthens local ownership and supports more

	and condition-based maintenance support	inspection systems	responsive maintenance coordination.
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Economic and Avoided-cost Rationale

The project's cost-effectiveness is based primarily on reducing future climate-related losses and strengthening the capacity of ecosystems, institutions and communities to manage increasing climate risks. The proposed interventions address key drivers of vulnerability, including peatland drying and fire risk, watershed erosion and sedimentation, flood exposure, hydrological instability and limited capacity for climate-informed planning and management. By reducing these risks, the project is expected to help lower future costs associated with peat-fire suppression, haze impacts, sediment management, flood damage, ecosystem degradation, infrastructure maintenance and inefficient adaptation investments.

Expected benefits include reduced peat-fire risks and associated environmental, health and suppression costs; reduced erosion and sedimentation pressures affecting reservoirs, irrigation systems and downstream water users; improved flood-buffering and stormwater-management performance; strengthened resilience of water-dependent agricultural systems; improved water security; and more effective prioritization of adaptation investments through improved climate-risk information and monitoring systems.

Compared with stand-alone grey infrastructure approaches, the project emphasizes modular and ecosystem-based interventions that can generate multiple benefits simultaneously, including improved watershed condition, enhanced water regulation, biodiversity benefits, reduced maintenance requirements and increased resilience to climate variability. These characteristics make such approaches particularly relevant in landscapes where climate risks, ecosystem degradation and competing land and water demands are closely interconnected.

Preliminary concept-stage analysis undertaken by FRIM indicates that the proposed portfolio of interventions has the potential to generate substantial avoided-cost and resilience benefits over time. Watershed-management and sediment-control measures are expected to contribute to improved raw-water quality and reduced pressures on downstream water-treatment systems, while strengthened peatland hydrological management and urban flood-management functions may help reduce future climate-related losses. Detailed economic valuation methodologies and benefit estimates will be further refined through monitoring, performance assessment and targeted economic studies during implementation.

Long-term sustainability will be supported through strengthened institutional capacity, monitoring systems, stewardship mechanisms, community nurseries, citizen-science and Eco-Warden programmes, and improved coordination among forestry, water management, municipal and other relevant agencies. These arrangements intend to support continued monitoring, maintenance, learning and replication of project approaches beyond the project lifetime.

D. National policy framework

The project is fully aligned with Malaysia's national development priorities, climate adaptation agenda, biodiversity commitments and water-security objectives. Project interventions support government priorities related to climate adaptation, flood-risk management, watershed resilience, peatland management, water security, ecosystem conservation and institutional capacity development. The project also contributes to Malaysia's increasing emphasis on ecosystem-based approaches, risk-informed planning and integrated management of climate-sensitive landscapes.

Consistency with National Strategies and Climate Frameworks

National Adaptation Plan (MyNAP 2027–2050)

Malaysia is developing its first National Adaptation Plan (MyNAP 2027–2050), which is expected to provide the overarching framework for climate adaptation across sectors and levels of government. The project aligns strongly with emerging MyNAP priorities related to water security, agricultural resilience, ecosystem conservation, resilient infrastructure and strengthened climate-risk information systems. Through improved climate-risk assessment, watershed and peatland management, urban adaptation measures and institutional capacity development, the project contributes practical approaches that support operationalization of Malaysia's adaptation agenda.

National Climate Change Policy 2.0 (NCCP 2.0, 2024)

The project contributes directly to:

- **Strategic Thrust 3 (Adaptation and Resilience)** through climate-risk planning, ecosystem resilience, watershed stabilization, peatland restoration and NbS implementation; and
- **Strategic Thrust 1 (Climate Governance and Capacity)** through strengthening climate-risk information systems, institutional capacity, operational adaptation planning and technical decision-support systems.

Malaysia's Nationally Determined Contributions (NDC 3.0, 2025)

The project supports adaptation priorities reflected in Malaysia's Nationally Determined Contribution (NDC 3.0), particularly those related to water security, ecosystem resilience, flood management, climate-resilient agriculture, forest conservation and resilient urban systems. Project interventions contribute to strengthening watershed functions, reducing peat-fire risks, improving urban flood management and enhancing climate-risk assessment and adaptation planning capacity across multiple sectors.

Thirteenth Malaysia Plan (13MP, 2026–2030)

The project directly supports 13MP priorities related to flood mitigation, climate adaptation, water security, biodiversity protection and resilient urban development. The project's institutional uptake and scaling approach also supports integration of adaptation measures into state and national planning systems.

Water Sector Transformation 2040 (WST 2040)

The project contributes to Water Sector Transformation 2040 by strengthening resilience of watersheds and water-related ecosystems against floods, droughts and hydrological instability. Interventions in the Ulu Muda watershed support long-term water security, watershed stabilization and climate-resilient water-resource management.

National Policy on Biological Diversity 2022–2030 (NPBD 2030)

The project contributes to implementation of the National Policy on Biological Diversity 2022–2030 through protection and enhancement of ecosystem functions, use of native species, strengthened ecological monitoring and improved integration of biodiversity considerations into climate adaptation planning. Interventions in peatland, watershed and urban landscapes support ecosystem resilience while generating adaptation benefits linked to water regulation, flood management and climate-risk reduction.

National Food Security Policy 2030 (NFSP 2030)

The project contributes to National Food Security Policy 2030 by strengthening ecological resilience and reducing climate risks affecting agricultural systems and water security within the MADA landscape. In particular, the project contributes to:

- **Goal 6:** strengthening resilience outcomes for climate-vulnerable and resource-constrained communities; and

- **Goal 12:** strengthening ecological resilience of agrofood systems through watershed stabilization, flood mitigation and climate-resilient water management.

National Gender Policy and Inclusive Development Alignment

The project aligns with Malaysia's National Women's Policy (DWN 2025–2030), the inclusivity objectives of the Thirteenth Malaysia Plan and broader national commitments on gender equality and social inclusion. Gender-responsive measures are integrated across project implementation through targeted participation in stewardship activities, technical training, community monitoring, livelihood opportunities, leadership structures and project decision-making processes. The project also incorporates sex-disaggregated monitoring, gender-responsive budgeting and safeguards measures to promote equitable adaptation outcomes.

Alignment with Sub-National and Institutional Frameworks

The project supports long-term ownership and sustainability by aligning interventions with the mandates, planning priorities and operational responsibilities of key state, municipal and sectoral institutions in Selangor and Kedah.

Selangor State Alignment

Project interventions in the Kuala Langat peat landscape under Output 2.1 support the Selangor State Structure Plan 2035 (RSN Selangor 2035), the First Selangor Plan 2021–2025 (FSP 2025) and the Selangor Smart Action Plan 2025. The project contributes to state priorities related to peatland management, fire-risk reduction, biodiversity conservation, climate adaptation and promotion of NbS. It also supports improved climate-risk assessment, community participation and long-term management of peatland ecosystems.

Kedah State and Municipal Alignment

The project supports priorities in the Greater Kedah 2050 Blueprint and Kedah Development Plan 2035 on water security, agricultural sustainability, climate resilience, disaster-risk reduction and natural-resource management. Interventions in Ulu Muda and Kubang Pasu contribute to improved watershed condition, flood management, climate adaptation and protection of water resources that are critical for downstream communities and agricultural production.

The project strengthens upstream watershed resilience in the Ulu Muda catchment under Output 2.2 while supporting urban and peri-urban NbS implementation in Kubang Pasu under Output 2.3. Component 1 supports climate-risk intelligence, forest-climate vulnerability analysis and operational planning tools relevant to forestry, watershed management and municipal adaptation planning. Components 2 and 3 support implementation, stewardship and adaptive-management approaches linked to flood mitigation, water regulation and protection of the national rice bowl.

The project also supports institutional strengthening within MPKP through urban NbS planning, community stewardship approaches and adaptive maintenance systems linked to retention ponds, drainage corridors and climate-resilient green infrastructure.

Sectoral Alignment with Muda Agricultural Development Authority (MADA)

Project interventions in the Ulu Muda watershed complement MADA's mandate on irrigation management, agricultural productivity and national food security. While MADA's primary focus is downstream irrigation infrastructure and agricultural water management, the project strengthens upstream ecological functions that support long-term water regulation, sediment control and climate resilience within the Muda River Basin. By integrating watershed management, enrichment planting and erosion-control measures, climate-risk monitoring and adaptive-management approaches, the project supports more climate-resilient water supply conditions for downstream agricultural systems. Community-based adaptation activities under Output 3.1 further

strengthen resilience and preparedness among downstream farming communities affected by rainfall variability, flooding and water-related climate risks.

E. Alignment with National technical standards

The project is designed to comply with all relevant Malaysian legal requirements, technical codes, and environmental standards. In accordance with AF ESP Principle 1 (Compliance with the Law), the project will be implemented in partnership with the Government of Malaysia, utilizing existing country safeguard systems and institutional arrangements.

Key legislation includes regulations pertaining to Environmental Impact Assessment (EIA), land tenure (National Land Code), forestry, and occupational health and safety (OHS). The following table demonstrates the project's logical alignment with these standards. Detailed technical designs, site-specific screening requirements, permits and approvals will be confirmed during project inception and prior to implementation of relevant activities. Compliance requirements identified through environmental and social screening will be incorporated into project planning, procurement, contractor management and implementation arrangements.

Table: National Technical Standards and Alignment with AF ESP Principle 1

Technical Standard / Regulation	Scope / Relevance	Related Outcome/ Output	Compliance Status and Steps to Comply	Authority
Environmental Quality Act 1974 (EIA Order 2015)	Mandates environmental assessment requirements for activities affecting environmentally sensitive areas.	Outcome 2 (Outputs 2.1 and 2.2: peatland hydrological management and watershed management interventions).	Procedural Step: Official screening submission to Department of Environment (DOE) during project inception. If triggered, a Schedule 1 or 2 EIA will be undertaken by registered expert in the first 6 months of the project and approved by DOE prior to implementation. For Output 2,3, no statutory EIA screening requirement is anticipated, as it involves small-scale enhancements to existing retention ponds. Site-level design will still undergo SES screening, with good-practice construction and environmental management measures applied.	Department of Environment (DOE)
National Land Code 1965	Regulates land ownership, land use and registration in Peninsular Malaysia and Labuan.	Outcome 2 and Outcome 3 (Outputs 2.1, 2.2 and 2.3).	Procedural Step: Site screening and detailed design review to avoid land acquisition, involuntary resettlement, restrictions on access and other land-related impacts. Temporary access routes, lay-down areas and construction activities under Outputs 2.1, 2.2 and 2.3 will be managed to minimize short-term disturbance through strict site zoning, traffic management and environmental controls.	Department of the Director General of Land & Mines (JKPTG)
State Forestry Laws of Kedah and Selangor	Govern gazettement and classification of forest reserves, forest management planning, licensing and permitted activities.	Outcome 2 (Outputs 2.1 and 2.2: peatland hydrological management, enrichment planting, assisted natural regeneration and watershed management).	Screening and compliance with applicable approvals, permits and forest-management requirements for project interventions within forest reserve areas.	State Forestry Departments
National Water Quality Standards (NWQS)	Defines parameters for raw-water quality and aquatic ecosystem protection.	Outcome 2 (Output 2.2: watershed and sediment-management interventions)	Baseline water-quality assessments and monitoring integrated into project design and implementation. Monitoring will support alignment with applicable NWQS standards.	NRES

Urban Stormwater Management Manual (MSMA) 2nd/3rd Edition	Technical standards for urban stormwater management and nature-based drainage design.	Outcome 2 (Output 2.3: retention-pond enhancement and associated NbS measures).	Required: Urban interventions will be designed in accordance with relevant MSMA standards and applicable flood-management requirements. Retention-pond enhancement and associated NbS measures will be designed to a 1-in-50-year ARI in line with MSMA 2nd Edition design acceptance criteria for major urban drainage and detention systems, unless a higher standard is specified by the relevant authority. The MSMA 3rd Edition remains in draft pending formal gazettment JPS; upon adoption, Output 2.3 designs will be reviewed and updated to comply with any revised standards.	Department of Irrigation and Drainage (DID/JPS)
PLANMalaysia Green Infrastructure Guidelines	National guidance for green infrastructure and NbS integration within urban planning.	Outcome 1 and Outcome 2 (Outputs 1.3 and 2.3).	Alignment with national planning guidance for urban NbS implementation, retention-pond enhancement and climate-resilient urban design.	PLANMalaysia
Occupational Safety and Health Act (OSHA) 1994	Ensures safety, health and welfare of workers.	Outcome 3 and all field-based activities.	Required: Contractors and partners will comply with applicable OSHA requirements, including site-specific safety procedures and risk-management measures. Community health and safety risks associated with field-based activities, including construction works, planting operations and community monitoring activities, will be managed in accordance with OSHA 1994 requirements.	Department of Occupational Safety and Health (DOSH)
National and State forestry guidelines/ rules/schedules on enrichment planting and forest rehabilitation	Technical guidance on enrichment planting, assisted natural regeneration and rehabilitation practices.	Outcome 2 (Output 2.2: enrichment planting, assisted natural regeneration and watershed management interventions).	Required: Species selection, planting approaches and site management will comply with relevant technical guidance and approvals from forestry authorities.	JPSM, State Forestry Departments, FRIM
Plant Quarantine Act 1976 and Malaysian Quarantine and Inspection Services Act 2011	Regulates movement and biosecurity of planting materials, seedlings and nursery stock.	Outcome 2 and Output 3.1 (community nurseries and planting activities).	Required: Nursery operations and planting activities will prioritize native species and comply with applicable phytosanitary and biosecurity requirements.	State Forestry and Agriculture Departments, Malaysian Quarantine and Inspection Services
Fire Services Act 1988	Fire prevention, emergency preparedness and public safety.	Output 2.1: peatland hydrological management and fire-risk reduction measures.	Required: Fire-risk mitigation measures will be integrated into peatland interventions and relevant emergency-response coordination mechanisms.	Fire and Rescue Department Malaysia
Child Act 2001	Provides protection and welfare provisions for children.	Outcomes 2 and 3 (Outputs 2.3, 3.1 and awareness-related activities).	Required: Child-safety will be incorporated into public-facing infrastructure, awareness activities and community engagement processes where relevant. Where Eco-Warden, citizen-science or school-based awareness activities involve participants under 18, additional safeguarding measures will apply, including parental or guardian consent, adult supervision requirements, child-appropriate	Department of Social Welfare (JKM)

			activity design and prohibition of hazardous field tasks, in compliance with the Child Act 2001.	
Persons with Disabilities Act 2008	Safeguards rights and welfare of persons with disabilities.	All Outcomes (All Outputs).	Required: Project activities, consultations, training and public-facing interventions will promote accessibility and inclusive participation for persons with disabilities where feasible and appropriate.	Department of Social Welfare (JKM)

F. Other relevant projects/programmes

The project has been designed to complement, rather than duplicate, ongoing investments in climate adaptation, watershed management, peatland restoration, flood management and climate-resilience planning in Malaysia. It builds on existing government programmes, applied research initiatives and development-partner investments while addressing key gaps related to climate-risk intelligence, operational adaptation planning, NbS implementation, long-term stewardship systems and adaptive management. Emphasis is placed on translating research, pilot initiatives and policy frameworks into operational models that can be integrated into routine planning, management and maintenance systems.

Table: Other relevant projects in Malaysia

Project Title, Timeline, Location, Budget	Main Interventions & Target Population	Implementing Entity	Lessons Learned	Overlaps and Synergies with the Project
FRIM R&D and Pilot Projects Ongoing; National; Government core funding	Applied research and technical pilots related to forest-climate intelligence, peatland hydrology, NbS and climate-resilient water management, including AquaVault systems. Target users include forestry agencies and technical institutions.	FRIM	Pilot-scale technologies require operational validation, institutional uptake and integration into wider planning and adaptive-management systems to support long-term scaling.	Operationalizes and scales FRIM's research and pilot systems through integration with climate-risk intelligence, watershed management, peatland restoration and adaptive-management systems under Components 1–3. AquaVault implementation under Output 2.1 builds directly on FRIM technical innovation and field-testing experience.
Global Environment Centre (GEC) Peatland Restoration Ongoing; Selangor/Pahang; Donor-funded	Community-based peatland restoration, canal blocking, fire prevention and Eco-Warden stewardship systems targeting peatland buffer-zone communities.	GEC	Passive rewetting and community fire-prevention systems provide important restoration benefits, but prolonged drought conditions require strengthened hydrological management and monitoring.	The project builds on existing peatland stewardship and Eco-Warden systems by integrating active hydrological management and adaptive-management approaches under Output 2.1.
MADA Irrigation and Climate Works Ongoing; Kedah; State/local funding	Irrigation infrastructure, flood-control systems and agricultural water management supporting approximately paddy farmers within the Muda irrigation scheme.	MADA	Long-term agricultural resilience increasingly depends on upstream watershed stability, sediment control and climate-resilient water regulation.	Complements MADA's downstream irrigation mandate through upstream watershed restoration, erosion reduction and adaptive-management systems in Ulu Muda under Output 2.2. Community-based adaptation activities under Output 3.1 further strengthen downstream resilience and preparedness.

DID Urban Stormwater Management Ongoing; National; National funding	Urban drainage systems, retention ponds, stormwater infrastructure and flood-risk management for urban populations.	Department of Irrigation and Drainage (DID)	Conventional drainage systems perform more effectively when integrated with NbS approaches that improve ecological buffering and runoff retention.	Complements existing urban drainage infrastructure by integrating NbS approaches, adaptive-maintenance systems and climate-resilient retention pond upgrading under Output 2.3.
AF Penang Island Urban NbS Project / MASH Framework 2022–2027; Penang; USD 10M (AF)	Urban greening, sustainable drainage systems, river restoration and application of the MASH framework for integrated urban NbS management. Target population includes residents of George Town and municipal agencies.	UN-Habitat / Think City	Urban NbS systems require strong municipal ownership, long-term maintenance planning and community stewardship to remain functional after implementation.	Builds on the AF Penang urban NbS programme and adopts the MASH framework in Output 2.3, including adaptive-management systems, municipal coordination, monitoring approaches, community stewardship models and maintenance protocols.
UNDP Climate Promise and CFIL/Climate Finance Network 2025–2026+; National; USD 1.25M	Climate policy support, climate finance mechanisms and resilience financing models targeting government agencies and financial institutions.	UNDP	Climate finance operationalization requires validated field models and measurable resilience outcomes.	Provides field-tested NbS, watershed and climate-risk management models that can support broader climate-finance operationalization and investment planning.
UNDP/Ministry of Agriculture Hill Paddy Resilience 2025–2028; Sabah; USD 750k	Climate-resilient agricultural practices and livelihood resilience support for hill paddy farmers in Sabah.	UNDP / Ministry of Agriculture	Agricultural adaptation approaches must reflect local ecological and socio-economic conditions, including traditional knowledge systems.	Complements ongoing agricultural adaptation initiatives through watershed resilience, climate-risk management and community-based adaptation approaches in a different geographic and agricultural context.
Japan International Cooperation Agency (JICA) Flood Management Multi-year; National	Large-scale flood-control and grey infrastructure investments in major river basins.	Japan International Cooperation Agency (JICA)	Grey infrastructure performs more effectively when supported by upstream ecosystem buffering and sediment reduction.	Complements downstream flood infrastructure through upstream watershed restoration, erosion reduction and NbS buffering under Outputs 2.2 and 2.3.
World Bank Analytical Work Ongoing; National	Climate resilience analytics, policy support and infrastructure financing.	World Bank	Pilot NbS models require operational validation before integration into large-scale financing mechanisms.	Provides field-tested NbS and watershed resilience models that may inform future scale-up and investment planning.
World Bank: Sustainable Forest Management 2023–2028; National; ~USD 100M loan	Institutional strengthening for forestry management, reducing deforestation and improving forest-carbon management.	World Bank / JPSM	Forest conservation outcomes are strengthened when linked to community stewardship and livelihood resilience mechanisms.	Complements broader forestry institutional reforms through community stewardship, adaptive-management systems and livelihood-support approaches under Component 3.
UNDP-Sida Gender-Responsive Climate Action 2021–2024; National	Development of gender-responsive climate-policy frameworks and GESI integration approaches.	UNDP / NRES	Gender-responsive climate frameworks require operational community-level implementation models to translate policy into practice.	Operationalizes gender-responsive adaptation through stewardship, livelihood and governance systems under Component 3, including women-led NbS participation and gender-responsive monitoring approaches.

Green Climate Fund (GCF) FP181: NbS for Climate-Resilient Landscapes and Communities 2023–2030; Kelantan; USD 30.2M	Integrated watershed management and climate resilience interventions targeting rural smallholders.	Ministry of Natural Resources / GCF	Integrated landscape approaches require strong coordination between forestry, agriculture and local governance systems.	Complements broader national NbS and watershed resilience initiatives through climate-risk intelligence, adaptive-management systems and operational lessons relevant to wider scaling.
ASEAN NbS Scaling Initiative 2023–2028; Regional	Regional NbS policy, financing and technical standards development across ASEAN member states.	ADB / ASEAN	Scaling NbS requires standardized evidence, monitoring systems and implementation models.	Contributes practical field evidence, climate-risk analytics and implementation lessons relevant to regional NbS scaling and knowledge-sharing efforts.
Jeniang Water Transfer Scheme Phase 1 completed in 2022; Phase 2: 2026–2030; Kedah; MYR 492 million	Water-transfer and irrigation infrastructure supporting approximately 36,467 ha of agricultural land and 18,000 farmers in the southern MADA region.	Ministry of Agriculture and Food Security	Long-term effectiveness of water-transfer infrastructure depends on reliable upstream water availability and watershed stability.	The proposed project complements downstream water-transfer infrastructure through upstream watershed restoration, erosion reduction and hydrological resilience measures in Ulu Muda.
Global Environment Facility (GEF): Sustainable Management of Peatland Ecosystems in Malaysia (SMPEM) 2020-2026; USD10.3 million.	Peatland ecosystem rehabilitation, fire prevention, hydrological management and community engagement in peatland landscapes in North Selangor, South Selangor (including KLSFR), Southeast Pahang, Maludam Peninsula (Sarawak), Klias Peninsula (Sabah).	International Fund for Agricultural Development / NRES & GEC	Integrated peatland restoration requires sustained hydrological management, institutional coordination and long-term monitoring systems.	Complements ongoing peatland rehabilitation activities and implementation of the Integrated Management Plan for KLSFR through integration of climate intelligence, active hydrological management, AquaVault systems and adaptive-management approaches.
World Wide Fund for Nature (WWF): Strengthening the resilience of Malaysia's Ulu Muda Forest Complex (part of SIG-WWF's; Forests Forward Program) 2024-2028; Ulu Muda Forest Complex; Funding amount not disclosed.	Enhancement of forest governance and improvement of forest management, covering 170,000ha through advocacy for improved forest protection status, pilot restoration of 25 hectares, recommendations to ensure the connectivity and intactness of the forest and engagement with local people to help reduce poaching activities and incidences of human-wildlife conflict.	WWF Malaysia	Investment in Ulu Muda Forest Complex can help improve climate resilience and the management of forests, enhance water and food security, and strengthen community empowerment initiatives,	Potential synergies may exist related to watershed management, biodiversity conservation and community engagement in Ulu Muda.

Together, these initiatives provide a strong foundation. The project adds value by linking climate-risk information, watershed and peatland management, urban NbS interventions and community stewardship approaches within a single adaptation framework. It therefore fills an important gap between research, policy development and practical implementation, while strengthening institutional capacity to sustain and replicate successful approaches beyond the project landscapes.

G. Learning and knowledge management

The project incorporates a structured learning and knowledge-management approach to capture, apply and disseminate experience generated through implementation. Learning activities are designed to support continuous improvement of project interventions, strengthen institutional capacity and facilitate replication of successful approaches in other climate-vulnerable landscapes.

Particular emphasis will be placed on generating practical lessons from implementation of EbA and NbS in tropical peatland, watershed and urban environments. The project will document technical, institutional and operational experience related to peatland hydrological management, watershed resilience, erosion and sediment management, retention-pond enhancement, community stewardship approaches and climate-informed planning. Lessons generated through implementation will be used to strengthen decision-making, support future investments and inform adaptation planning at national, state and local levels.

Knowledge Generation and Technical Learning

Knowledge generation will be supported through implementation of Components 1 and 2. Climate-risk assessments, vulnerability analyses, monitoring systems and field-based interventions will provide information on climate hazards, ecosystem conditions, hydrological processes and adaptation performance across the project landscapes. Experience from peatland hydrological management, enrichment planting, assisted natural regeneration, erosion-control measures, sediment-management interventions and retention-pond enhancement will be systematically documented throughout implementation.

The project will develop technical reports, case studies, operational guidance notes and learning products that capture implementation experience and lessons related to planning, design, monitoring, maintenance and long-term management of adaptation interventions. Particular attention will be given to identifying enabling conditions for successful implementation, operational challenges, maintenance requirements, institutional coordination needs and factors influencing long-term sustainability. Output 1.3 will support translation of technical experience into practical guidance, decision-support resources and implementation frameworks that can inform future adaptation planning, investment prioritization and replication in other locations.

Community-Based Learning and Applied Knowledge

Component 3 supports generation of practical knowledge through community participation, stewardship activities and local monitoring initiatives. Eco-Warden and citizen-science programmes will contribute field observations and operational experience that complement technical monitoring and help strengthen long-term management of project interventions. Community nurseries and stewardship activities will provide lessons on participation models, maintenance arrangements, volunteer engagement and locally appropriate approaches for sustaining adaptation investments.

Training activities implemented under Outputs 3.1 and 3.2 will generate experience related to capacity development, adaptation awareness, stewardship approaches and institutional uptake of climate adaptation measures. Lessons from these activities will be incorporated into training materials, guidance documents and outreach resources to support replication and scaling.

Dissemination, Learning and Knowledge Sharing

Knowledge dissemination and awareness activities will be implemented primarily through Output 3.3. A project knowledge portal will provide access to selected climate-risk information, technical guidance, case studies, monitoring results and lessons generated through implementation. The

portal will serve as a platform for sharing practical experience related to peatland management, watershed resilience, urban NbS implementation and community-based adaptation approaches.

The project will also organize technical exchanges, learning workshops, dissemination events and stakeholder dialogues involving government agencies, municipalities, researchers, practitioners, civil-society organizations and community representatives. These activities will facilitate exchange of experience among project sites and support wider application of successful approaches.

Where appropriate, project lessons and technical outputs will be disseminated through national adaptation platforms, professional networks, conferences, research publications and UNDP and AF knowledge-sharing mechanisms. Selected project sites may also serve as demonstration locations supporting peer learning and applied training.

Knowledge Sustainability and Institutional Uptake

The project emphasizes practical application and institutional uptake of lessons rather than establishment of a stand-alone knowledge-management system. Knowledge products, operational guidance, training materials and technical resources developed through the project are intended to support continued use of project approaches by relevant agencies, municipalities and local stakeholders following project completion.

Responsibility for knowledge-management coordination will rest with the Project Management Unit (PMU), working closely with FRIM, UNDP and relevant technical partners. Outputs 1.3 and 3.3 provide the primary mechanisms for documenting implementation experience, translating lessons into practical guidance and supporting dissemination, learning and replication.

H. Stakeholders consultations and engagement

A gender-responsive and inclusive stakeholder consultation process has been undertaken during preparation of the full proposal, led by the FRIM in collaboration with UNDP and supported by gender, safeguards and stakeholder-engagement specialists. Consultations have involved national and sub-national government agencies, technical institutions, municipalities, civil-society organizations, local communities, women and representatives of vulnerable groups, consistent with the Adaptation Fund Environmental and Social Policy and Gender Policy.

The consultation process combined technical consultations, institutional coordination meetings, site visits, field verification missions, focus-group discussions and community engagement sessions in Selangor and Kedah. These consultations helped validate climate risks, adaptation priorities, implementation approaches, beneficiary groups, institutional arrangements and opportunities for strengthening local participation and long-term sustainability.

Consultations informed refinement of project interventions under Components 1–3, including peatland hydrological management, watershed resilience measures, retention-pond enhancement, stewardship approaches, capacity-development activities and proposed monitoring arrangements. Discussions also explored climate vulnerabilities, ecosystem pressures, livelihood implications, implementation feasibility, governance arrangements, institutional coordination needs and opportunities for strengthening adaptation benefits for vulnerable groups.

Stakeholder inputs were incorporated in project design, GESI Assessment and Action Plan, SEP, and environmental and social safeguards instruments, including the Social and Environmental Screening Procedure (SESP) and ESMF. Consultation findings contributed to the design of community stewardship mechanisms, capacity-development activities, monitoring approaches, grievance mechanisms and safeguards measures.

Recognizing that some site-specific interventions and implementation arrangements will be refined during project inception, stakeholder engagement will be an ongoing process throughout implementation. Field officers and safeguards and gender expertise will be engaged across project components to ensure adequate resources are available to engage appropriately with communities. Additional consultations will be undertaken, where required, to validate detailed intervention designs, strengthen local ownership, support adaptive implementation and ensure continued compliance with environmental, social and gender-related commitments.

Table: Summary of stakeholder consultations

Project Area / Output	Main Stakeholders Consulted	Consultation Status	Key Issues Discussed	Key Design Adjustments as a result of stakeholder consultations
Component 1 – Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning	FRIM, NRES, JPSM, State Forestry Departments, DID/JPS, NAHRIM, METMalaysia, MYSA, PLANMalaysia and relevant agencies	Initial national technical consultations completed	Data-sharing, institutional coordination, climate-risk intelligence systems, operational roles and integration with planning systems	Agencies expressed openness to collaboration but requested clearer definition of roles, commitments and data requirements to ensure the interventions add value to existing systems. Component 1 outputs and institutional coordination arrangements are being refined accordingly.
Output 2.1 – Climate-Resilient Peatland Rewetting, Fire Resilience and Monitoring Systems Operationalized	Selangor State Forestry Department, GEC, JAKOA, Kampung Sungai Kelambu representatives, FRIM and technical partners	Technical consultations and preliminary local engagement undertaken; free, prior and informed consent (FPIC)-sensitive and broader community consultations remain ongoing	Peat fire risks, hydrological degradation, Orang Asli engagement procedures, peatland restoration approaches, site selection and governance arrangements	Consultations with GEC, Selangor State Forestry Department and Department of Orang Asli Development (JAKOA) resulted in a change from the earlier Raja Musa project site toward KLSFR, as Kuala Langat North Forest Reserve was already undergoing more established rewetting and restoration efforts while KLSFR showed more immediate degradation, hydrological instability and recurrent fire risks. Following the site change, the project focus also shifted away from domestic water-supply objectives no longer relevant at the new site, toward peatland hydrological management, rewetting support and fire-risk reduction. Extensive assessments and stakeholder consultations have confirmed that there are no Orang Asli customary claims, livelihood dependencies, or cultural associations within the new intervention areas.
Output 2.2 – Climate-Adaptive Watershed Management through Nature-based Solutions implemented in the Ulu Muda Watershed	FRIM, Kedah State Forestry Department, MADA, WWF	Primarily technical and institutional consultations completed; community-level consultations remain limited	Watershed stabilization, erosion control, restoration feasibility, hydrological resilience, restoration logistics and workforce arrangements	Consultations with MADA, Kedah State Forestry Department and WWF helped confirm the relevance of strengthening upstream watershed restoration and erosion-control functions linked to downstream water security and resilience. Discussions also highlighted operational and logistical challenges related to restoration implementation in remote forest conditions, including access, workforce arrangements and long-term maintenance considerations. Inputs from WWF and forestry stakeholders suggested that a hybrid contractor- and community-supported implementation approach may be more realistic than large-scale community workforce deployment. Assessments and stakeholder consultations have confirmed no

				customary land claims, livelihood dependencies or distinct cultural associations between Orang Asli communities and the intervention areas (note no Orang Asli villages exist within Ulu Muda).
Output 2.3 – Urban and Peri-Urban Nature-based Solutions for Flood and Heat Resilience Implemented	MPKP, local communities, KEMAS, Kedah State Economic Planning Unit, community representatives.	Community and municipal consultations substantially completed for the current Kedah intervention sites	Retention pond upgrading, maintenance responsibilities, urban flooding, nursery activities, community safety, stewardship and women-focused livelihoods	Consultations strengthened focus on adaptive maintenance approaches, low-maintenance native planting systems, women-prioritized nursery activities and community stewardship models linked to retention pond upgrading. Municipal support for the project was confirmed. Operation and maintenance protocols will be agreed in year 1 including responsibilities for key stakeholders.
Output 2.3 Concept note Kuala Lumpur and Petaling Jaya urban pilot NbS sites	Kuala Lumpur City Hall (DBKL), C40 Cities, Selangor Climate Adaptation Centre, Selangor State Economic Planning Unit	Preliminary consultations completed during earlier design stages	Urban resilience concepts, flood-risk reduction, NbS opportunities and GESI integration approaches	The proposed Kuala Lumpur and Petaling Jaya interventions have been removed following technical, feasibility and stakeholder discussions. In Petaling Jaya, consultations indicated that a separate hard-engineering intervention had already been initiated at the proposed site, reducing the relevance and additionality of the proposed NbS intervention. In Kuala Lumpur, community consultations indicated stronger local preference for conventional hard-engineering flood solutions rather than NbS-focused approaches. The project therefore shifted toward testing a more scalable replication approach in Kedah through alternative urban/peri-urban sites better aligned with project objectives and local implementation conditions.

I. Justification and Adaptation reasoning

The project is a full-cost adaptation investment designed to address increasing climate-related risks affecting Malaysia's peatland, watershed and urban systems, water resources and climate-vulnerable communities. The project responds to growing climate pressures including prolonged dry periods, peatland fire risk and carbon release, erosion and sedimentation, water-security challenges, flooding, urban heat stress and increasing pressure on water-management systems.

The justification for AF support is based on the need to move beyond fragmented, reactive and sector-specific approaches towards more integrated, climate-informed adaptation systems. While Malaysia has established important systems for water management, forestry, disaster-risk management and environmental protection, existing financing mechanisms primarily support routine operations, infrastructure maintenance, conventional firefighting, drainage management and sector-specific interventions. They provide limited support for integrated climate-risk assessment, EbA, long-term stewardship mechanisms and the incremental costs associated with implementing adaptation measures across interconnected landscapes.

Baseline scenario: limitations of current systems

Under the baseline scenario, climate adaptation efforts remain fragmented across agencies, sectors and landscapes.

In peatland areas, management remains heavily focused on reactive fire monitoring and suppression once high-risk conditions emerge. Existing systems have limited capacity for integrated hydrological management, preventive water-retention measures, climate-informed peatland management and community-linked monitoring approaches that address the underlying

drivers of peat-fire vulnerability. Moreover, there is limited adapted peatland firefighting capacity and peatland defence against fire. Specifically, findings highlight inadequacies in fire management, gaps in prevention and suppression strategies, and notable firefighter safety concerns. Furthermore, perspectives from management and frontline responders reveal operational challenges and key areas for improvement in terms of capacities.

The Ulu Muda watershed supplies 80% of Kedah's, 70% of Perlis's, and up to 80% of Penang's raw water; erosion, sedimentation and hydrological pressures continue to affect its functions, reservoir performance, irrigation systems and downstream water users. Existing investments primarily focus on water infrastructure, routine maintenance and downstream system management, while more limited financing is available for climate-adaptive watershed management, erosion control, assisted natural regeneration, enrichment planting and other upstream measures that strengthen long-term watershed resilience. Reservoir operational models traditionally rely on a fixed, historic baseline estimate for "dead storage"—the designated area at the bottom of the dam reserved to collect sediment over its projected 50-to-100-year lifespan. Current engineering baselines do not account for the climate-driven acceleration of extreme rainfall events. High-energy downpours are washing silt into the reservoir at a rate that outpaces original designs, drastically reducing the active pool volume and shortening the operational life of the Muda Dam decades ahead of schedule.

In urban and peri-urban areas, local authorities continue to rely primarily on conventional drainage and retention systems that are increasingly stressed by changing rainfall intensity, runoff patterns and rising temperatures. current water management and drainage frameworks are highly reactive, locked into rigid concrete-engineering models, and functionally unable to keep pace with intensifying climate fluctuations. Legacy drainage systems were engineered decades ago based on historical, predictable monsoon rainfall intensity. Current systems cannot cope with the sheer volume of stormwater generated by modern, climate-driven downpours. Because the rigid concrete channels offer no natural infiltration or temporary storage, they immediately bottleneck during high-intensity storms, turning urban corridors and village roads into active floodways. Local authorities (such as the Kubang Pasu Municipal Council and DID) rely on continuous, expensive desilting and physical reconstruction of fractured concrete retaining walls and drainage channels. Existing municipal budgets generally support routine maintenance but provide limited financing for retention-pond enhancement, ecological retrofitting, biodiversity-support measures, monitoring systems and integrated NbS approaches that strengthen flood buffering and urban resilience. This "hard engineering" approach is financially unsustainable under climate acceleration. Increased runoff speeds up structural erosion, cracking concrete banks and causing frequent structural failures. Because local budgets are constrained, maintenance is frequently delayed, leaving the infrastructure compromised before the next major storm event arrives.

At the institutional level, climate-risk information, hydrological monitoring, ecosystem data and adaptation planning systems remain dispersed across agencies and are not consistently translated into practical decision-support tools for planning, implementation and maintenance. Community participation in climate adaptation also remains relatively limited under existing financing models. Existing programmes often support consultation and short-term engagement activities but provide more limited support for long-term stewardship systems, Eco-Warden and citizen-science programmes, community nurseries, technical training and sustained monitoring and maintenance arrangements.

Adaptation Fund Additionality

The AF investment provides additionality by financing adaptation measures that fall outside the scope of existing sectoral financing mechanisms and operational mandates.

Component 1: Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning

Existing government systems provide important climate, hydrological and ecosystem-monitoring functions. However, current systems are not fully configured to support integrated climate-risk analysis, climate-informed planning or practical decision-support for adaptation planning and implementation.

The AF investment supports development of the ICFIS, the Forest-Climate Vulnerability Atlas, institutional uptake mechanisms, operational planning protocols and associated guidance and monitoring systems. These investments strengthen the ability of agencies and local authorities to assess climate risks, prioritize interventions and support climate-informed planning and management across peatland, watershed and urban landscapes.

Component 2: Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience

Current financing mechanisms primarily support conventional infrastructure maintenance, drainage management, firefighting and sector-specific ecosystem management activities. They provide limited support for integrated adaptation approaches that combine climate-risk information, hydrological management, watershed resilience measures, retention-pond enhancement and monitoring systems.

The AF investment supports the incremental costs of adaptation measures that are not routinely financed through existing sectoral budgets. These include peatland hydrological management and water-retention measures; climate-adaptive watershed management, erosion-control and sediment-management interventions; community nurseries supporting native planting material production; urban retention-pond enhancement and associated NbS interventions; monitoring systems; and integration of climate-risk information into planning, implementation and maintenance. The project complements existing infrastructure and management systems by addressing underlying drivers of climate vulnerability and strengthening the resilience of natural systems that support water security and flood management.

Component 3: Institutionalizing Capacity, Stewardship and Sustainable NbS Management

Existing programmes provide limited financing for long-term stewardship systems, operational adaptation training, community-based monitoring systems and institutional uptake of EbA and NbS approaches. The AF investment supports stewardship mechanisms, Eco-Warden and citizen-science programmes, community nurseries, technical training, institutional capacity development and knowledge-sharing systems that strengthen long-term sustainability, monitoring and maintenance of project investments.

These investments help strengthen institutional uptake, stewardship capacity, operational management functions and the long-term sustainability of the project's adaptation interventions.

Component / Output	Baseline Situation (BAU)	With-Project Scenario (AF Additionality)	Financing Gap and Adaptation Logic
Component 1: Climate-risk intelligence and decision-support systems (Outputs 1.1–1.3)	Climate, hydrological and ecosystem data systems remain fragmented across agencies and are not consistently linked to adaptation planning, prioritization and adaptive management.	Climate-risk intelligence, vulnerability assessments, operational guidance and decision-support tools support climate-informed planning, prioritization and implementation across selected landscapes.	Existing financing supports routine monitoring systems but provides limited support for integrated climate-risk intelligence, adaptive-management and adaptation decision-support systems.
Component 2: Peatland hydrological	Peatland management focuses primarily on reactive fire monitoring and suppression, with	Improved peatland hydrological resilience through modular water-retention systems, monitoring,	Existing financing does not adequately support integrated peatland adaptation systems

resilience (Output 2.1)	limited preventive hydrological management systems and community-linked monitoring approaches.	adaptive water management, capacity building and stewardship approaches that reduce peat-fire and strengthen ecosystem resilience.	combining hydrological management, monitoring and stewardship.
Component 2: Climate-adaptive watershed management (Output 2.2)	Erosion, sedimentation and hydrological pressures continue to affect watershed functions, reservoir performance, irrigation systems and downstream water users. Existing investments focus primarily on water infrastructure and routine maintenance, with limited financing for upstream adaptation measures.	Climate-adaptive watershed management, erosion-control and sediment-management measures, assisted natural regeneration, enrichment planting and community nurseries strengthen watershed functions to ensure it can continue to capture, filter, and slowly release rainfall, maintaining a baseline water supply for millions of municipal and industrial users during climate-induced droughts.	Existing financing primarily supports conventional water infrastructure and maintenance rather than integrated watershed adaptation measures that address underlying drivers of climate vulnerability.
Component 2: Urban NbS and retention-pond enhancement (Output 2.3)	Urban drainage and retention systems are increasingly stressed by changing rainfall intensity, runoff patterns and rising temperatures. Municipal budgets primarily support routine maintenance and conventional drainage approaches.	Retention-pond enhancement, biodiversity-support measures, native planting, urban-cooling features and associated NbS interventions improve flood buffering, stormwater management and urban resilience.	Existing financing provides limited support for ecological retrofitting, adaptive monitoring systems and integrated NbS approaches that strengthen urban climate resilience.
Component 3: Stewardship and capacity development (Outputs 3.1 and 3.2)	Community participation and technical adaptation capacity remain limited and are often project-specific or short-term. Existing programmes provide limited support for long-term stewardship, monitoring and maintenance systems.	Stewardship mechanisms, Eco-Warden and citizen-science programmes, community nurseries, technical training and adaptive-management systems established across selected landscapes.	Existing programmes provide limited financing for long-term stewardship systems, operational adaptation training and community-linked monitoring approaches needed to sustain adaptation investments.
Component 3: Knowledge management and institutional learning (Output 3.3)	Lessons from adaptation initiatives are not consistently translated into operational guidance, institutional learning processes or future adaptation investments.	Knowledge products, learning platforms, dissemination mechanisms and institutional learning systems support replication, scaling and continuous improvement of adaptation approaches.	Limited financing exists for operational knowledge-sharing, replication support and institutional learning related to EbA and NbS implementation.

The requested AF financing is therefore necessary to bridge the gap between conventional sectoral management approaches and more integrated, climate-informed adaptation systems that combine climate-risk information, EbA and NbS interventions, institutional capacity strengthening and long-term stewardship mechanisms. The project supports long-term climate resilience by strengthening ecosystem functions, water security, institutional capacity and community participation across peatland, watershed and urban landscapes, while generating lessons that can support wider replication and scaling across Malaysia.

J. Sustainability

The long-term sustainability of the project's adaptation benefits has been integrated into the design across institutional, operational, financial, social and environmental dimensions. Rather than creating parallel structures, the project is designed to strengthen existing systems, capacities and management arrangements so that climate-resilience benefits can be maintained beyond the project implementation period.

The project supports the long-term capacity of national, state and local institutions to incorporate climate-risk information, ecosystem-based approaches and monitoring systems into existing

planning, management and maintenance functions. Sustainability is supported through strengthened institutional capacity, operational guidance, monitoring systems, stewardship arrangements, technical training, knowledge-sharing and integration with existing government mandates and programmes.

Institutional sustainability

Institutional sustainability is supported primarily through Components 1 and 3. Component 1 strengthens the availability and use of climate-risk information through development of the ICFIS, the Forest-Climate Vulnerability Atlas and associated guidance and monitoring systems. These tools are intended to support continued climate-risk assessment, prioritization and planning by FRIM and relevant government agencies beyond the project lifetime.

The project also strengthens institutional sustainability by developing operational guidance, monitoring protocols and implementation frameworks that can be applied by forestry, watershed, municipal and planning agencies. Capacity-development activities, institutional coordination mechanisms and knowledge-sharing processes will help strengthen the ability of participating institutions to apply project approaches within their routine functions and responsibilities.

Knowledge products, guidance materials and dissemination activities developed under Outputs 1.3 and 3.3 will support continued access to technical information, implementation lessons and experience relevant to peatland management, watershed resilience and NbS implementation. The project's knowledge management and dissemination activities intend to support continued access to technical guidance, implementation lessons and operational experience relevant to peatland management, watershed restoration and urban NbS implementation.

Financial and operational sustainability

The project prioritizes approaches that can be incorporated into existing institutional systems, operational and maintenance practices, rather than stand-alone financing mechanisms.

For peatland and watershed interventions under Outputs 2.1 and 2.2, sustainability will be supported through strengthened coordination among forestry, watershed-management and local institutions, combined with stewardship and monitoring arrangements established through Component 3. For urban interventions in Output 2.3, through integration of NbS maintenance requirements within existing municipal maintenance systems and operational workflows, combined with stewardship and monitoring arrangements established through Component 3. Retention-pond enhancement measures are designed to complement existing drainage and stormwater-management systems, while monitoring and maintenance approaches will help improve prioritization of maintenance needs over time. Under Outputs 2.2 and 2.3, the project also supports community nurseries and local participation mechanisms that can contribute to continued maintenance, monitoring and management of project-supported interventions.

Community and technical sustainability

Component 3 strengthens sustainability through technical training, stewardship mechanisms and locally relevant capacity development linked to peatland management, watershed resilience and urban NbS maintenance. Community stewardship, Eco-Warden and citizen-science initiatives are intended to complement, rather than replace, the responsibilities of government agencies and technical institutions by supporting local monitoring, awareness and participation.

Training activities implemented under Outputs 3.1 and 3.2 will strengthen technical capacity related to monitoring, field observations, nursery management, stewardship approaches, operation and maintenance of NbS interventions, and use of climate-risk information. Guidance materials, operational manuals, training resources and knowledge products developed through the project will help retain and transfer knowledge beyond the project implementation period.

Environmental sustainability

The project supports long-term environmental sustainability through protection and enhancement of ecosystem functions across peatland, watershed and urban landscapes.

Peatland hydrological management interventions under Output 2.1 are intended to strengthen peat moisture retention, reduce fire vulnerability and improve ecosystem resilience under changing climate conditions. Climate-adaptive watershed management measures under Output 2.2, including enrichment planting, assisted natural regeneration, erosion-control and sediment-management interventions, are designed to strengthen watershed functions, improve hydrological regulation and reduce pressures on downstream water systems. Urban NbS interventions under Output 2.3 support improved stormwater management, urban cooling, biodiversity enhancement and climate-resilient green infrastructure using native and climate-resilient species where appropriate.

Exit Strategy and Post-Project Continuation

Throughout implementation, the project will work with FRIM and NRES, state agencies, municipalities and other stakeholders to strengthen operational ownership and integration of project-supported systems and approaches within existing institutional arrangements. Post-project sustainability will rely primarily on continued use of climate-risk information systems, institutional capacity, monitoring arrangements, stewardship mechanisms and operational practices established through Components 1–3.

By embedding project approaches within existing government mandates, management systems and stakeholder networks, the project aims to ensure that adaptation benefits continue beyond the period of AF support and provide a foundation for wider replication and scaling.

K. Environmental and social impacts and risks

UNDP, as accredited Implementing Entity (IE) of the AF, commits to implementing the proposed project in compliance with the AF’s ESP. UNDP will do so through its own Environmental and Social Management System and application of UNDP’s SES, explicitly recognized as meeting the requirements of the AF ESP. A preliminary SESP screening conducted during concept note development has now been updated at project design stage in June 2026 and will be further updated during implementation when appropriate or required.

While the project is expected to have mainly positive social and environmental impacts and to integrate social and environmental standards in its design, several risks have been identified. As per UNDP’s SES policy and the AF’s ESP, the principles and standards outlined in the table below are triggered. Potential adverse social and environmental risks and impacts are few, largely site-specific, limited in scale, and can be identified with a reasonable degree of certainty and addressed through application of recognized good international practice, mitigation measures, and stakeholder engagement during project implementation.

Based on the updated design-stage SESP, the overall project risk category remains Moderate as per UNDP’s SES policy. The planned relevant social and environmental assessments and management measures are described in the sections below. The table below presents the relevant UNDP SES principles and project/project-level standards triggered by the proposed project, as identified during the updated SESP screening. For reference, the table also shows the equivalent AF ESP principles that are considered relevant.

Table: Environmental and Social Principles and Standards Triggered

UNDP SES Principles (P)/Standards (S)	AF ESP Principles
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P1: Human Rights/Leave No One Behind	P2: Access & Equity; P3: Marginalised & Vulnerable Groups; P4: Human Rights
P2: Gender Equality & Women's Empowerment	P5: Gender Equality & Women's Empowerment
P3: Sustainability & Resilience	P11: Climate Change
P4: Accountability	P2: Access & Equity; P4: Human Rights
S1: Biodiversity Conservation & Sustainable Natural Resource Management	P9: Protection of Natural Habitats; P10: Conservation of Biological Diversity
S2: Climate Change & Disaster Risks	P11: Climate Change
S3: Community Health & Safety	P13: Public Health
S4: Cultural Heritage	Relevant where chance finds / culturally significant landscapes may occur
S5: Displacement & Resettlement	P8: Involuntary Resettlement
S7: Labour & Working Conditions	P6: Core Labour Rights
S8: Pollution Prevention & Resource Efficiency	Cross-cutting relevance to AF ESP implementation

Environmental & Social Assessment and Risk Management

As a moderate risk project, an ESMF has been developed during the Program Formulation Grant (PFG) process. The ESMF sets out the approaches, steps and measures for the avoidance, management and mitigation of environmental and social risks identified through the updated design-stage screening and specifies additional targeted assessments to be undertaken during implementation where necessary.

The updated SESP confirms that neither a full Environmental and Social Impact Assessment (ESIA) nor a Strategic Environmental and Social Assessment (SESA) is required for a program of this nature. Targeted management plans have been prepared during the PFG process, including a GAP. A SEP, incorporating a GRM, has been developed and will be implemented throughout the project lifecycle.

Assessments and stakeholder consultations conducted during project formulation confirmed no customary land claims, livelihood dependencies or distinct cultural associations between Indigenous Peoples and the intervention areas. Therefore, although initially identified as a potential issue at Concept Note stage, UNDP SES Standard 6 (Indigenous Peoples) is not triggered and no Indigenous Peoples Planning Framework is required. This is also due to the change in location for output 2.1 and the resulting updated project beneficiaries.

In line with AF ESP Principle 1, the ESMF references and complies with the Malaysian legal and institutional framework providing relevant protections for the environment and communities. The project is implemented in partnership with the Government of Malaysia and utilises existing country safeguard systems and institutional arrangements wherever possible.

Additional Safeguards Measures

Additional measures ensure stronger integration of UNDP programming principles and compliance with best international practices. The project adopts a participatory approach involving local communities, women, youth, government agencies, academia and civil society in project consultation and design, and seeks to ensure that benefits and services are accessible to marginalised and vulnerable groups.

A comprehensive Gender Analysis has been conducted during programme design, together with preparation of a GAP to promote gender equality and women's empowerment. The GAP includes participation targets, gender-related indicators, and measures to prevent and manage GBV and Sexual Exploitation and Abuse (SEA) risks. Stakeholder mapping and analysis have been undertaken during project formulation, and the SEP provides strategic approaches for meaningful

participation and inclusion of all stakeholders, particularly marginalised individuals and groups, in project implementation and monitoring. The SEP also includes mechanisms for local communities and affected populations to raise concerns and grievances, and project stakeholders have access to UNDP's Accountability Mechanism.

Checklist of environmental and social principles

Principles	Potential impacts and risks — further assessment and management required for compliance
Compliance with the Law	Magnitude: Medium. There is a risk that small-scale physical works and site-based interventions may overlook specific technical standards, permitting requirements, or water-related regulatory provisions. Mitigation: the ESMF/Environmental and Social Management Plan (ESMP) will confirm legal and regulatory requirements and implementing partners will secure all necessary approvals before works commence. The ESMF additionally requires further screening, assessments and site-level ESMPs to manage environmental and social risks beyond Malaysian regulatory requirements.
Access and Equity	Magnitude: Medium. There is a risk of excluding non-beneficiaries or unintentionally creating inequitable access to project benefits, especially where hydrological or landscape interventions affect surrounding users. Mitigation: stakeholder mapping, social assessment, clear benefit-sharing criteria, participatory planning, and an accessible GRM.
Marginalized and Vulnerable Groups	Magnitude: Medium. There is a risk that vulnerable groups may be overlooked during planning, benefit distribution, or engagement processes. Mitigation: targeted stakeholder analysis, inclusive SEP measures, and design provisions that specifically address the needs of marginalised and vulnerable groups.
Human Rights	Magnitude: Low/Medium. There is a risk associated with limited capacities of duty bearers to meet human rights obligations and with potential adverse effects on affected communities if participation and safeguards are weak. Mitigation: capacity building on SES and socially inclusive approaches, participatory planning, FPIC where relevant, and implementation of the SEP and GRM.
Gender Equality and Women's Empowerment	Magnitude: Low/Medium. There is a risk of discrimination against women, inadequate participation in decision-making and livelihood opportunities, and project-related GBV/Protection of Sexual Exploitation and Abuse (PSEA) risks. Mitigation: implement the GAP, establish participation targets and gender indicators, and apply GBV/PSEA prevention and response measures throughout the project lifecycle.
Core Labour Rights	Magnitude: Medium. There are occupational health and safety risks for workers engaged in infrastructure installation, restoration, nursery activities, and related field operations. Mitigation: apply OHS procedures, contractor safety requirements, PPE, training, supervision, and compliance with Malaysian labour and occupational safety requirements.
Indigenous Peoples	Magnitude: Negligible. No customary land claims, livelihood dependencies or distinct cultural associations between Indigenous Peoples and the intervention areas. Mitigation: None. (No further assessment required)
Involuntary Resettlement	Magnitude: Low. No physical displacement is anticipated, but there is a risk of perceived or temporary restrictions on access to land, water, or resources. Mitigation: exclude activities involving land acquisition or physical resettlement, use participatory planning, and monitor any access-related effects closely.
Protection of Natural Habitats	Magnitude: Medium. Site-based interventions in peatlands, forests, and urban ecosystems may disturb habitats or ecosystem services if poorly designed. Mitigation: undertake ecological and hydrological assessments as needed, minimize construction footprints, avoid unnecessary vegetation clearance, and use site-appropriate safeguards.
Conservation of Biological Diversity	Magnitude: Medium. There are risks related to impacts on critical habitats, inappropriate species selection, forestry-related biodiversity impacts, and potential introduction of invasive alien species. Mitigation: use ecological screening, native and non-invasive species only, restoration guidance, and monitoring of ecological performance.
Climate Change	Magnitude: Low. There is a risk of maladaptation if interventions are not aligned with local hydrological and climate conditions. Mitigation: ensure climate-informed design, adaptive management, and integration of climate risk information into planning tools and site selection.
Pollution Prevention	Magnitude: Low/Medium. There is a risk of localized pollution, fuel or lubricant leakage, inadequate waste management, and inefficient resource use during infrastructure installation and nursery

and Resource Efficiency	operations. Mitigation: apply waste management procedures, spill prevention and response measures, proper storage and handling protocols, and site supervision.
Public Health	Magnitude: Medium. There is a risk of injury or drowning around retention ponds and a low risk of water- or vector-borne disease where water bodies are created or rehabilitated. Mitigation: fencing, warning signage, awareness measures, maintenance responsibilities, and routine monitoring.
Physical and Cultural Heritage	Magnitude: Low. There is a risk of inadvertent impacts on sites or landscapes with cultural significance during ground disturbance or site works. Mitigation: site screening, exclusion of sensitive areas where identified, and application of a Chance Finds Procedure.
Lands and Soil Conservation	Magnitude: Negligible/Low. Project activities are intended to enhance soil stability, peatland integrity, and watershed resilience. No significant adverse soil conservation risks are anticipated beyond those already covered under habitat, pollution, and construction-related safeguards. No further assessment required

PART III: IMPLEMENTATION ARRANGEMENTS

A. Project management arrangements

The project will be implemented under the National Implementation Modality with UNDP Country Office Support, with the implementation structure clearly defining the roles of the IE and the Executing Entity (EE). This supports a Whole-of-Government approach while ensuring compliance with UNDP and AF fiduciary, environmental, social, and gender requirements.

Overview:

UNDP, as the IE Entity, provides independent project assurance and agreed implementation support services under the Country Office Support to National Implementation Modality framework. FRIM, as the Executing Entity, retains overall responsibility and accountability for day-to-day project execution, management of the PMU, supervision of Responsible Parties, delivery of project outputs, financial management, and chairs the Project Board. NRES provides strategic policy oversight, and ensures alignment with national adaptation priorities, while UNDP co-chairs the Project Board in its capacity as the IE to provide implementation oversight and ensure compliance with Adaptation Fund and UNDP requirements. Together, these arrangements maintain a clear separation between implementation oversight and project execution while strengthening national implementation capacity.

Implementing Entity (IE): United Nations Development Programme (UNDP)

UNDP serves as the Multilateral IE for this project. In performing this role, UNDP undertakes distinct governance, assurance and implementation support functions that are operationally separated through clearly defined roles, responsibilities and decision-making arrangements to maintain independence and avoid conflicts of interest:

- **Programme Assurance (IE Function):** UNDP is responsible for oversight of monitoring and evaluation (M&E), safeguards compliance, and reporting to the AF Board. A designated UNDP representative will perform the Project Assurance function, attend Project Board meetings as and when necessary, and provide independent oversight of project performance, risk management, safeguards compliance, fiduciary management and reporting in

accordance with AF and UNDP requirements.

- **Programme Support Services (Country Office Services):** Based upon a formal written request by the Government of Malaysia and the EE (FRIM) included as annex, UNDP Malaysia Country Office may provide specific, cost-reimbursable support services to augment FRIM's implementation capacity. Under the National Implementation Modality Support Services framework, this may include support related to procurement, recruitment of technical experts, selected financial and administrative transactions, capacity sharing and other relevant activities. These services are provided on an exceptional basis to ensure efficiency and costs recovery are covered under the Project Execution Cost, not the IE fee.

Separately, the UNDP Resident Representative or Deputy Resident Representative, acting on behalf of UNDP in its capacity as the IE, will serve as Co-Chair and voting member of the Project Board in accordance with the approved governance arrangements.

Executing Entity (EE): The Forest Research Institute Malaysia (FRIM)

FRIM is the principal EE and technical lead for the project. FRIM holds overall responsibility for project execution, delivery of results, technical coordination, and effective use of AF resources. The Director-General of FRIM will serve as Project Director.

Strategic Guidance and Alignment with National Adaptation Policy: Ministry of Natural Resources and Environmental Sustainability (NRES)

As the parent ministry of FRIM, NRES will provide strategic leadership and policy guidance to support effective project implementation and ensure alignment with national development and climate adaptation priorities. NRES will support coordination with government stakeholders, provide strategic direction in implementation, and participate in the Technical Working Group, as appropriate, to support technical coordination and policy coherence.

Project Board

The Project Board is the highest project-level oversight and decision-making body, providing strategic guidance, reviewing implementation progress, approving annual workplans and budgets, supporting inter-agency coordination, and ensuring alignment with national climate adaptation priorities. The Project Board will also review implementation progress, key risks, safeguards and gender performance, project evaluation findings, and major project adjustments, and will provide strategic guidance to support achievement of project objectives and long-term sustainability.

The Project Board will meet biannually and will ensure coordination and alignment with national climate adaptation and sectoral coordination mechanisms, including the MyNAP process.

Project Board representation:

- **Project Executive / Chair:** Director General FRIM
- **Beneficiary Representatives:** One or more representatives of project beneficiary groups, including community-based organizations, women-led organizations, and other stakeholder groups directly benefiting from project interventions.
- **Development Partner Representative:** UNDP Malaysia Country Office, Resident Representative/Deputy Resident Representative, with voting rights as Co-Chair.

The Project Board is responsible for project oversight and strategic decision-making. Technical

coordination and advisory functions are delegated to the Technical Working Group (TWG), while project execution responsibilities remain with FRIM, the PMU, and designated Responsible Parties. Responsible Parties and entities with direct implementation responsibilities will not serve on the Project Board to maintain clear separation between project oversight and execution.

Technical Working Group (TWG)

To support effective operational coordination and technical decision-making, implementation coordination will be supported through a multi-disciplinary TWG chaired by FRIM, with regular coordination between FRIM, NRES, key stakeholders, UNDP, Responsible Parties, and relevant technical agencies. The TWG serves as a technical advisory and coordination mechanism and does not perform project oversight or approval functions. The TWG supports inter-agency coordination and technical alignment, validation of methodologies, designs and technical standards, data-sharing coordination and interoperability, integration across project components and outputs, and alignment with national climate and forestry priorities.

The TWG is expected to operate through four indicative technical workstreams covering: (i) Climate Intelligence and Data Governance (Component 1); (ii) Selangor Peatland Restoration (Output 2.1); (iii) Kedah - Ulu Muda Watershed and Kubang Pasu Urban NbS (Outputs 2.2 and 2.3); and (iv) Monitoring, Evaluation, Safeguards, GESI, Sustainability and Scaling (cross-cutting requirements). These workstreams are intended to facilitate coordination among technical agencies and responsible partners, support integration across project components, and provide technical inputs to project implementation. The detailed structure, membership, meeting arrangements and operating procedures of the TWG will be finalized during project inception.

Project Management Unit

A dedicated PMU will be established to support day-to-day project management, coordination, reporting and implementation oversight. The PMU will be hosted by FRIM as EE and will be responsible for project management, coordination of Responsible Parties, reporting, risk management, safeguards implementation, stakeholder engagement, and technical support to Project Board and TWG processes. The PMU will initially be fully funded by the project. UNDP will work closely with the PMU throughout implementation to support strategic oversight, technical quality, and effective project delivery. Over time, these functions are expected to transition progressively to the Government to strengthen national ownership and ensure long-term sustainability. The PMU will be supported by expertise in engineering, safeguards, gender and other technical areas as detailed in the project budget.

The PMU will include the following positions:

- **Project Manager:** Responsible for overall project coordination including overseeing project implementation, reporting and technical integration. The Project Manager will also oversee the financial management of the project, progress updates and activities as endorsed by the Project Board and TWG, and as outlined in the project document.
- **Finance, Procurement and Administrative Officer:** Responsible for financial management, procurement coordination, budgeting, accounting and administrative compliance in accordance with AF, UNDP and national procedures.
- **Monitoring, Evaluation and Knowledge Management Specialist:** Responsible for monitoring implementation progress against the Strategic Results Framework, AF Results

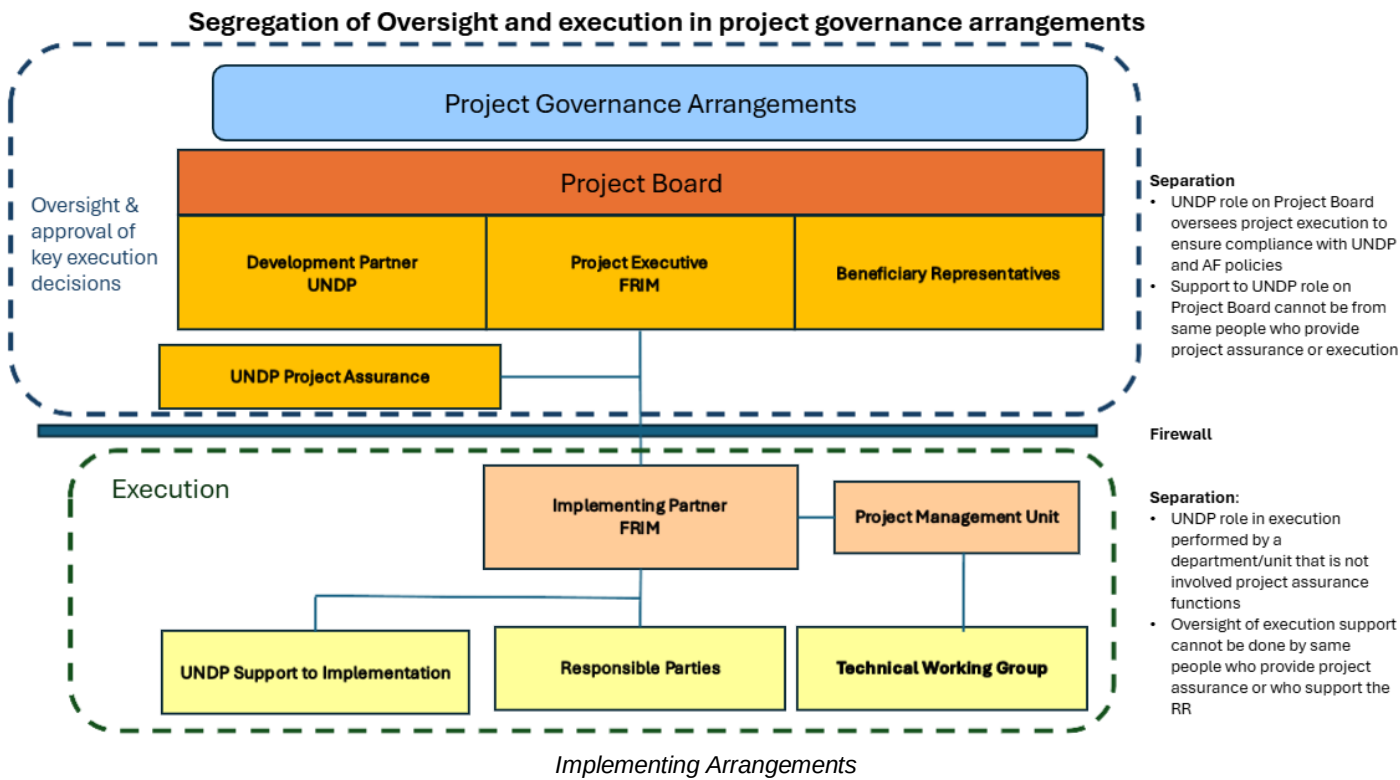
Framework, GAP, safeguards instruments, as well as for knowledge management, and dissemination of lessons learned.

Implementation: Technical Delivery and Accountability Framework

Under the coordination of FRIM as EE, selected project outputs and activities may be implemented through formal arrangements with designated RPs. Responsible Parties may include government agencies, technical institutions, local authorities, community organizations and specialized implementation partners with mandates aligned to specific project outputs and activities. Responsible Parties will be directly accountable to FRIM through formal implementation agreements and will not perform project oversight functions.

Financial and technical accountability arrangements will be governed through Memorandums of Agreement, Service Level Agreements, or other appropriate instruments, to be finalized during project inception and early implementation phases. Initial expressions of interest and stakeholder engagement records are reflected in the consultation documentation and annexes. A more detailed mapping of potential implementation responsibilities, technical collaboration arrangements and institutional roles may be further developed during project inception.

Project beneficiaries, including local communities, Indigenous Peoples, women, local authorities and other stakeholder groups, will participate in project planning, implementation and adaptive management through consultation processes, Technical Working Group engagement, community-level mechanisms and representation within project governance structures, as appropriate. Detailed arrangements are described in the Stakeholder Engagement Plan.



B. Measures for financial and project risk management

The project risk management plan will be overseen by the PMU, which is responsible for day-to-day monitoring and implementing mitigation measures for operational, technical, and SESP-related risks. To ensure high-level accountability, the Project Manager and Safeguards Specialist will provide regular risk status reports to the Project Director, UNDP, and the Programme Board, ensuring all activities remain compliant with UNDP and the AF's fiduciary and environmental standards.

#	Event	Cause	Impact(s)	Risk Category	Impact, Likelihood & Risk Level	Risk Valid From/To	Risk Owner	Risk Treatment and Treatment Owner
1	There is a risk of technical silos and data-sharing bottlenecks between national agencies (FRIM, JPS, MetMalaysia and other data custodians).	Fragmented datasets, differing data standards and limited institutional arrangements for sharing climate, hydrological and ecosystem information.	Could delay development, operationalization and institutional uptake of ICFIS and Forest-Climate Vulnerability Atlas.	Operational (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 3 (Intermediate) Risk Level: Moderate	01/02/2027 to 31/01/2032	Project Manager (PMU)	Risk Treatment 1.1: Establish formal data-sharing arrangements, technical working groups and agreed protocols for data management and exchange during project inception. Owner: PMU, FRIM and NRES.
2	There is a risk of limited institutional uptake of climate-risk information, planning tools and NbS approaches by participating agencies and municipalities.	Established planning practices, competing institutional priorities and continued preference for conventional sectoral approaches.	Which could reduce application of project-supported tools, guidance and adaptation approaches within planning, management and investment decisions.	Operational / Political (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 3 (Intermediate) Risk Level: Moderate	01/02/2027 to 31/01/2032	FRIM / PMU	Risk Treatment 2.1: Strengthen institutional engagement, capacity development and integration of project outputs into agency planning and operational systems. Owner: PMU and FRIM.
3	There is a risk of limited technical capacity or staff turnover among participating agencies and local authorities.	Competing workloads, personnel changes and varying levels of technical experience across institutions.	Which could affect implementation quality, monitoring effectiveness and long-term sustainability of project interventions.	Operational (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 4 (Extensive) Risk Level: Substantial	01/02/2027 to 31/01/2032	Project Manager	Risk Treatment 3.1: Deliver targeted training programmes, operational guidance and knowledge-transfer activities to institutionalize technical capacity within participating agencies. Owner: PMU.

4	There is a risk of delays in obtaining approvals, permits and technical clearances for field interventions.	Multiple approval requirements involving forestry authorities, local governments, water-management agencies and other relevant institutions.	Which could delay implementation of peatland, watershed and urban NbS interventions under Outputs 2.1-2.3 and affect project implementation schedules.	Operational (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 3 (Intermediate) Risk Level: Moderate	01/02/2027 to 31/01/2032	PMU	Risk Treatment 4.1: Establish approval pathways, institutional focal points and permitting schedules during project inception and maintain regular coordination with relevant authorities. Owner: PMU and Executing Entity.
5	There is a risk of limited long-term operation, maintenance and institutional ownership of project-supported systems and interventions.	Competing priorities, budget constraints, institutional changes, or unclear long-term maintenance responsibilities among participating agencies and local authorities.	Reduced sustainability of climate-risk information systems, stewardship arrangements, retention pond NbS interventions and other ecosystem restoration investments beyond the project lifetime.	Sustainability (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 3 (Intermediate) Risk Level: Moderate	01/02/2027 to 31/01/2032	FRIM / PMU	Risk Treatment 5.1: Integrate project-supported systems and approaches into existing mandates, operational procedures, monitoring systems and maintenance arrangements from the outset. Owner: PMU and Participating Agencies.
6	There is a risk of changes in political priorities, institutional leadership or government policies affecting project implementation and uptake.	National, state or local elections, changes in government, institutional restructuring or shifts in policy priorities.	Which could delay decision-making, approvals, resource allocation, institutional engagement and adoption of project-supported climate adaptation approaches and investments.	Political (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 2 (Minor) Risk Level: Moderate	01/02/2027 to 31/01/2032	PMU / FRIM	Risk Treatment 6.1: Maintain engagement across technical and political levels, strengthen institutional ownership across multiple agencies, align project interventions with existing policies and development priorities, and document commitments through formal agreements and endorsed workplans. Owner: PMU and FRIM.

C. Environmental and Social Risk Management

The project has been classified as Moderate Risk under UNDP's SES. In response, an ESMF has been prepared during the full project formulation phase to provide the overarching framework for identifying, avoiding, minimising, mitigating and monitoring environmental and social risks throughout implementation. The ESMF is aligned with the Adaptation Fund Environmental and Social Policy and Gender Policy and is implemented through UNDP's Environmental and Social Management System in partnership with the Government of Malaysia, drawing wherever possible on national legal and institutional safeguard systems.

The ESMF applies across all project components, particularly to site-based interventions under Output 2.1 on peatland hydrological resilience, Output 2.2 on climate-adaptive watershed management, and Output 2.3 on urban and peri-urban NbS. The updated SESP confirms that the programme is not expected to require a full ESIA, and that a SESA is also not applicable for a programme of this nature. Instead, the ESMF establishes a risk management hierarchy and provides for targeted assessments, management procedures and site-specific ESMPs, where required, to ensure that identified risks are addressed proportionately and in accordance with recognised good international practice.

The framework is anchored in compliance with Malaysian law and technical standards, including relevant requirements under the Environmental Quality Act 1974 and EIA Order 2015, the National Land Code 1965, forestry and biodiversity regulations, and occupational safety and health requirements. For Output 2.1 and Output 2.2 interventions, official screening will be undertaken with the Department of Environment during project inception, and if statutory thresholds are triggered, the necessary Schedule 1 or Schedule 2 EIA processes will be completed before implementation. For Output 2.3, no statutory EIA is currently anticipated because the proposed activities involve small-scale enhancement of existing retention ponds; however, all such interventions will still be subject to SES screening, design review and good-practice construction and environmental management requirements. Across Outputs 2.1–2.3, the ESMF also requires screening and design measures to avoid land acquisition, involuntary resettlement and restrictions on access, while managing any temporary access, laydown area and construction-related disturbance through site zoning, traffic management and environmental controls.

The ESMF is complemented by other safeguards instruments prepared during formulation and to be implemented throughout the project lifecycle, notably the Gender Action Plan (GAP), the SEP and the GRM. Assessments undertaken during formulation indicate that no customary land claims, livelihood dependencies or distinct cultural associations between Indigenous Peoples and the full proposal intervention sites have been identified, and therefore UNDP SES Standard 6 on Indigenous Peoples is not triggered and no Indigenous Peoples planning instrument is required. At the same time, the framework retains provisions for Free, Prior and Informed Consent where activities may subsequently affect Indigenous Peoples or local communities in ways requiring explicit consent, and it places strong emphasis on inclusive participation, gender-responsive implementation, protection of marginalised and vulnerable groups, and accessible grievance handling.

The principal risks identified through the SESP and addressed in the ESMF include: possible non-compliance with permitting or technical standards for small-scale physical works; inequitable access to project benefits; exclusion of marginalised or vulnerable groups; weak participation or limited capacity of duty bearers to uphold rights-based approaches; occupational and community health and safety risks; risks to natural habitats and biodiversity from site works or poor restoration design; temporary restrictions on access to land or resources; and pollution prevention and resource-efficiency issues associated with construction and field operations. The ESMF addresses these through clear screening procedures, legal compliance checks, participatory

planning, benefit-sharing criteria, targeted stakeholder analysis, biodiversity-sensitive design, use of native species, OHS requirements for workers and contractors, pollution prevention measures, contractor supervision, and regular safeguards monitoring and reporting.

A major feature of the ESMF is its reliance on targeted technical assessments and management procedures to translate framework safeguards requirements into site- and activity-specific implementation controls during the first year of project implementation. In Year 1, under Activity A.2.1.1 on Peatland Rewetting and Hydrological Restoration, a specialist hydrologist/engineer team will carry out a Landscape Hydrological Modelling and Design Optimisation Study to optimise the configuration of clay dykes, swales, AquaVault tanks and canal blocks and to confirm that rewetting measures deliver peat moisture and fire-risk reduction benefits without creating unacceptable off-site hydrological impacts. In parallel, an independent hydrogeologist will conduct a Groundwater Abstraction Sustainability Assessment to establish safe abstraction limits, assess potential drawdown impacts and define monitoring requirements where AquaVault systems are supplied by tube wells. In addition, during year 1 an independent peatland/safeguards consultant will prepare a Peatland Construction Environmental and Social Management Plan (a site specific ESMP as specified in section II) to manage construction-related impacts on peat stability, hydrology, biodiversity, and worker and community safety, and to translate UNDP SES requirements into peat-specific siting rules, earthworks protocols, occupational health and safety standards, and contractor supervision arrangements.

Under Activity 2.2.1 on Climate-Adaptive Watershed Management, the ESMF will be operationalised in Year 1 through an independent forest/ecological consultant's design of climate-smart Native Tree Planting and Maintenance Regimes. This work will establish site selection criteria and native species mixes tailored to stabilise slopes, protect water resources and improve ecosystem resilience, while avoiding inappropriate planting choices or maintenance practices that could undermine watershed function or biodiversity outcomes.

For Activity 2.3.1 on Retention Pond Assessment, Typology Development and NbS Implementation, the ESMF requires that a package of targeted assessments be completed in Year 1 before site-level implementation proceeds. This will include a Hydrological and Climate Risk Assessment and Technical Design Study by an independent hydrologist or drainage engineer to verify that pond enhancements reduce flood and climate risks without creating adverse upstream, downstream or site-level hydrological impacts. Year 1 activities will also comprise a Biodiversity, Aquatic Habitat and Ecosystem Services Assessment by an independent multidisciplinary ecology team to assess the effects of pond enhancement, hydrological modification and native planting on aquatic and riparian biodiversity, habitat condition, ecosystem services and human–wildlife interactions. In parallel, an independent public safety and environmental health team will undertake a Community Health, Safety and Climate-Related Risk Targeted Assessment to examine risks to nearby residents, school communities, visitors, workers and volunteers – including drowning hazards, vector breeding, wildlife encounters, sensor-related hazards, extreme rainfall and heat exposure – and to specify appropriate site-level mitigation and management measures. Findings from these assessments will feed into an integrated site-level ESMP, consolidating hydrological, biodiversity and community health/safety risk management measures for Activity 2.3.1.

Implementation of the ESMF is led by the PMU with UNDP providing independent programme assurance, quality control and safeguards oversight. The PMU oversees day-to-day safeguards implementation, coordination of responsible parties, stakeholder engagement, and risk monitoring and reporting, supported by a Monitoring, Evaluation and Knowledge Management Specialist, Safeguards Specialist, and a Technical Working Group providing multidisciplinary technical advice. Monitoring covers implementation of the ESMF, ESMPs, GAP, SEP and GRM, and includes annual Project Performance Reports (PPRs), supervision missions, adaptive

management reviews, and independent Mid-Term Review and Final Evaluation (FE) assessing environmental and social performance and compliance with AF and UNDP safeguards requirements.

D. Monitoring and evaluation arrangements including budgeted M&E plan

The project will implement a comprehensive Monitoring and Evaluation (M&E) system consistent with the Adaptation Fund Evaluation Policy, Adaptation Fund Results Framework, Adaptation Fund Gender Policy, Environmental and Social Policy, and relevant UNDP policies and procedures. Monitoring will be coordinated by the FRIM-led PMU with support from implementing partners, local stakeholders and UNDP as the IE.

The PMU will monitor implementation progress against the project results framework, including AF core indicators and project-specific indicators. Baseline data will be established in year 1 of project implementation where required, and indicators will be tracked annually throughout implementation. Baseline data includes peatland condition mapping, landscape hydrological modelling, groundwater sustainability assessment, biodiversity and community-risk assessments and other assessments as detailed in section IIA. The Baseline Data Report will consolidate and validate baseline information developed during project preparation, verify baseline values for the project results framework, confirm the beneficiary counting methodology, establish monitoring protocols, and document any additional information required. Results monitoring will cover project outputs and outcomes across the climate intelligence, ecosystem restoration, watershed management, urban NbS and community resilience components.

M&E will combine project-level performance monitoring with output-specific technical monitoring implemented under Components 1–3. Technical monitoring systems for peatland hydrology, watershed condition, urban NbS, biodiversity, citizen science and community stewardship are integrated within the respective project outputs and provide data for adaptive management and reporting, while the project M&E system focuses on results monitoring, Adaptation Fund indicators, safeguards compliance, beneficiary verification, learning and evaluation.

In accordance with the Adaptation Fund Environmental and Social Policy, monitoring will include implementation of the ESMF, ESMPs, GAP, SEP and GRM. Annual project reporting will include updates on environmental and social risk management measures, implementation of safeguards commitments, gender-responsive actions, stakeholder engagement activities and any corrective actions undertaken.

An Inception Workshop will be conducted within six months of the first AF disbursement to review implementation arrangements, monitoring responsibilities, annual work plans, safeguards requirements, financial procedures and reporting obligations. Annual PPRs will be prepared and submitted in accordance with AF requirements.

UNDP, as IE, will be responsible for oversight and quality assurance of project M&E processes. An independent Mid-Term Review will be undertaken at the project midpoint and an independent FE will be undertaken at project completion. These evaluations will assess project relevance, effectiveness, efficiency, sustainability, environmental and social performance, lessons learned and progress toward adaptation outcomes. The costs associated with management and oversight of the Mid-Term Review and FE will be covered through the IE Fee budget following AF guidance.

This M&E budget provides a breakdown of costs for M&E activities to be led by the Project Management Unit (PMU) and other responsible parties during project implementation. Other

project M&E activities have been included where they contribute directly to monitoring, evaluation, learning and adaptive management. Oversight and participation of the UNDP Country Office, Regional Technical Advisors and HQ units in these M&E activities, including the Independent Mid-Term Review (MTR), Final Evaluation (FE), evaluation oversight and management response process, will be financed through the IE Fee budget.

Table: M&E budget

M&E Activity	Indicative Costs (USD)
Baseline Data Report (including beneficiary methodology and baseline verification)	15,000
Inception Workshop and Report	10,000
M&E required to report on progress made in reaching AF Core Indicators and project results included in the Project Results Framework (including beneficiary tracking and results monitoring)	40,000
Preparation of the Annual AF Project Performance Reports (PPRs)	10,000
Monitoring of ESMF, ESMP, Gender Action Plan (GAP), Stakeholder Engagement Plan (SEP) and Grievance Redress Mechanism (GRM) implementation	40,000
Supervision and Monitoring Missions	30,000
Learning Missions, Knowledge Capture, Lessons Learned Documentation and Adaptive Management Reviews	30,000
Annual Results Review and Adaptive Management Workshops	10,000
Project Completion Report Support	10,000
Independent Mid-Term Review (MTR): The independent or semi-independent MTR will be commissioned by UNDP, not the Implementing Partner or PMU. Costs associated with the supervision and development of the MTR will be charged to the IE Fee budget for regular, LLA and Innovation projects.	20,000 (charged to IE Fee budget)
Independent Final Evaluation (FE): The independent FE will be commissioned by UNDP, not the Implementing Partner or PMU. Costs associated with the supervision and development of the FE will be charged to the IE Fee budget for regular, LLA and Innovation projects.	20,000 (charged to IE Fee budget)
TOTAL indicative COST (Project Budget)	195,000
TOTAL indicative Evaluation COST (IE Fee Budget)	40,000
TOTAL M&E Budget	235,000

The M&E Budget at \$235,000 is 2.5% of the project cost, within the 1-5% range requested in the AF Evaluation Policy.

Note: Project Management Costs (EE Budget) additionally finance the Project Board and Technical Working Group meetings (USD 25,000, and the inception workshop (USD 10,000), in accordance with the Adaptation Fund Harmonization of Costs and Fees guidance.

E. Strategic Results framework, including milestones, targets and indicators

Contribution to the Sustainable Development Goal(s): 6 (Clean Water and Sanitation), 13 (Climate Action), 15 (Life on Land), 17 (Partnerships for the Goals)							
Intended Outcome as stated in the UNSDCF/Country Programme Results and Resource Framework: By 2030, Malaysia has enhanced its environmental sustainability and climate resilience through improved governance, sustainable ecosystem management and strengthened disaster risk reduction (Malaysia UNSDCF 2021–2025, Pillar 4: Environment, Climate Change and Disaster Risk Resilience; Malaysia CPD 2021–2025 Outcome 4).							
Applicable Outputs from the UNDP Strategic Plan: SP 2022–2025 Output 2.1.2: Replicable models and enabling conditions for structural transformations toward sustainable development (forest landscape restoration and NbS); Output 2.5.1: Solutions developed, tested and scaled for sustainable management of nature, ecosystem services, biodiversity and genetic resources. Output 3.3.1: Capacities, systems and incentives for adoption of transformative technologies and approaches for sustainable development enhanced.							
Project Title and Quantum Project Number: Climate-Resilient Forest Ecosystems and Urban Nature-Based Solutions for Climate Adaptation in Malaysia							
Objective and Outcome Indicators		Data Source	Baseline	Mid-term Target	End of Project Target	Data Collection Methods	Risks/ Assumptions
Project Objective: To strengthen the climate resilience and adaptive capacity of vulnerable communities and national/sub-national institutions in Malaysia through the integration of evidence-based policy frameworks, the implementation of Ecosystem-based Adaptation (EbA) and integrated Nature-Based Solutions (NbS) for enhanced water security, and targeted capacity building and gender-responsive livelihood empowerment.	Mandatory Indicator 1: Number of direct and indirect project beneficiaries (individual people, sex-disaggregated)	DOSM census; project surveys; beneficiary registries; municipal, community and agency records	0 direct beneficiaries 0 indirect beneficiaries	At least 70,000 direct beneficiaries	At least 148,000 direct and 4.2 million indirect beneficiaries (approx. 50% women, sex-disaggregated)	Baseline and endline surveys; beneficiary registries; participation records; GIS service-area analysis; AF beneficiary methodology. Data disaggregated by sex.	Risk: Double counting across intervention areas. Assumption: Harmonized beneficiary methodology applied and validated through beneficiary mapping and registry systems.
	AF Core Indicator 2: Area of vulnerable ecosystems under improved ecosystem-based adaptation and NbS management (<i>AF Outcome 5, Indicator 5.1</i>)	FRIM GIS database; MPKP records; project reports; remote sensing	0 ha	925 ha (500 ha peatland; 400 ha watershed; 25 ha urban NbS)	At least 1,870 ha (1,000 ha peatland; 800 ha watershed; 71 ha urban NbS systems)	GIS mapping; remote sensing; field verification	Risk: Extreme drought, wildfire or flooding reduce effectiveness. Assumption: Restoration and NbS measures remain operational and maintained.
	Indicator 3: Number of national and sub-national institutions applying climate intelligence, vulnerability assessment and adaptation-planning tools in planning, prioritization, implementation, monitoring or decision-making processes (<i>AF Outcome 3, Indicator 3.2.2</i>)	Institutional reports; planning documents; user records; policy instruments	0	At least 2 institutions	At least 6 institutions	Planning document review; institutional surveys; user records	Risk: Limited institutional uptake. Assumption: Climate intelligence products address operational planning needs and are embedded within agency mandates.

Component 1		Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning					
Project Outcome 1 Outcome 1: Institutions apply climate intelligence, vulnerability information and adaptation evidence in planning, investment and decision-making processes.	Indicator 4: Number of climate intelligence and vulnerability assessment systems operationalized and institutionally adopted	FRIM records; system logs; institutional agreements	0	ICFIS prototype operational and tested; preliminary Atlas products developed and piloted	ICFIS and Forest-Climate Vulnerability Atlas fully developed and endorsed	Technical validation reports; system records; institutional agreements	Risk: Data-sharing barriers and interoperability challenges. Assumption: Long-term hosting, maintenance and updating arrangements established.
	Output 1.1: Integrated Climate-Forest Intelligence System (ICFIS) Developed and Operationalized						
	Output 1.2: Forest-Climate Vulnerability Atlas Developed and Applied						
	Output 1.3: Institutionalization, Operational Guidance and Scaling Frameworks Developed						
Component 2		Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience					
Project Outcome 2 Outcome 2: Ecosystems and climate-resilient infrastructure provide strengthened hydrological, buffering and adaptation functions.	Indicator 5: Area of peatland under improved hydrological management, fire resilience and monitoring systems	FRIM GIS database; monitoring systems; project reports	0 ha	500 ha peatland	1,000 ha peatland	GIS analysis; groundwater monitoring; field verification	Risk: Severe drought and wildfire events. Assumption: Hydrological restoration measures remain effective and maintained.
	Indicator 6: Area of watershed under improved climate-adaptive management and ecosystem restoration measures	FRIM GIS database; watershed monitoring reports	0 ha	400 ha watershed	800 ha watershed	GIS analysis; field validation; watershed monitoring	Risk: Extreme rainfall and site-access limitations. Assumption: Restoration measures successfully established and maintained.
	Indicator 7: Area of urban and peri-urban stormwater detention asset systems under improved climate-resilient NbS management	MPKP records; FRIM reports; GIS mapping	0 ha	25 ha urban and peri-urban stormwater detention asset systems	71 ha urban and peri-urban stormwater detention asset systems	GIS mapping; engineering assessments; site verification	Risk: Municipal maintenance and budget constraints. Assumption: NbS approaches integrated into municipal management systems.
Outputs to achieve Outcome 2		Output 2.1: Climate-resilient peatland rehabilitation, fire resilience and monitoring systems operationalized in the KLSFR landscape. Output 2.2: Climate-adaptive watershed management and EbA implemented in the Ulu Muda watershed to strengthen watershed stability, water security and ecosystem resilience.					

	Output 2.3: Urban and peri-urban NbS implemented through climate-resilient stormwater management, adaptive monitoring and municipal scaling approaches in Kedah.						
Component 3	Institutionalizing Capacity, Stewardship and Sustainable NbS Management						
Outcome 3 Outcome 3: Communities and institutions strengthen climate resilience through inclusive participation, enhanced capacities and application of adaptation knowledge.	Indicator 8: Number of community members actively engaged in ecosystem restoration, stewardship, monitoring, citizen-science, nursery management and climate-adaptation activities	Participation records; training records; community monitoring reports	0	500 community members	1,400 community members (minimum 50% women and 20% vulnerable groups)	Participation records; attendance sheets; training records; community monitoring records. Data disaggregated by sex and vulnerable-group category.	Risk: Low participation rates and volunteer retention. Assumption: Communities perceive tangible benefits and enabling measures support women and vulnerable groups.
	Indicator 9: Number of personnel trained in climate intelligence, adaptation planning, NbS implementation, monitoring and ecosystem management	Training records; attendance sheets	0	150 personnel	300 personnel (minimum 40% women)	Training evaluations; attendance records; post-training assessments. Data disaggregated by sex.	Risk: Staff turnover. Assumption: Skills retained and applied within participating institutions.
	Indicator 10: Number of institutions and local authorities utilizing project knowledge products, guidance materials and learning mechanisms to support adaptation planning, implementation, replication or decision-making	Portal analytics; dissemination records; publication records	No integrated platform	Knowledge Portal operational; at least 3 institutions utilizing project knowledge resources	At least 6 institutions and local authorities utilizing project knowledge products, guidance materials and learning mechanisms	Portal analytics; publication review; dissemination records; event reports; institutional uptake assessment.	Risk: Low engagement with knowledge products. Assumption: Knowledge Portal is maintained and actively disseminated beyond project duration.
Outputs to achieve Outcome 3	Output 3.1: Inclusive Community Participation, Capacity and Livelihoods Strengthened. Output 3.2: Technical Capacity for Climate Intelligence, NbS Management and Project Implementation Strengthened. Output 3.3: Knowledge Management, Learning and Dissemination Systems Operationalized.						

F. Project alignment with the Results Framework of the Adaptation Fund

Project Objective(s)	Project Objective Indicator(s)	Adaptation Fund Outcome	Adaptation Fund Outcome Indicator	Amount (USD)
To strengthen the resilience of vulnerable communities, ecosystems and institutions in Malaysia to increasing climate variability and change through improved climate-risk information, ecosystem restoration, water-security interventions, community participation and institutional capacity	1b. At least 1,870 ha of vulnerable ecosystems and urban NbS systems under improved climate-resilient management (Indicator 2)	Outcome 5: Increased ecosystem resilience in response to climate change and variability-induced stress	5. Ecosystem services and natural resource assets maintained or improved under climate change and variability-induced stress	5,200,000
	1c. At least 6 national and sub-national institutions applying climate intelligence, vulnerability assessment and adaptation-planning tools in planning and decision-making processes (Indicator 3)	Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	2.1. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	3,141,014
Total Objective-Level Grant Amount				8,341,014
Project Outcome(s)	Project Outcome Indicator(s)	Adaptation Fund Output	Adaptation Fund Output Indicator	Amount
Outcome 1: Institutions apply climate intelligence, vulnerability information and adaptation evidence in planning, investment and decision-making processes.	1c. At least 6 national and sub-national institutions applying climate intelligence, vulnerability assessment and adaptation-planning tools in planning and decision-making processes (Indicator 3)	2.1. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	2.1.2 No. of targeted institutions with increased capacity to minimize exposure to climate variability risks (by type, sector and scale)	2,114,014
Outcome 2: Ecosystems and climate-resilient infrastructure provide strengthened hydrological, buffering and adaptation functions.	2.1. 1,000 ha of peatland under improved hydrological management, fire resilience and monitoring systems (Indicator 5)	Output 5: Vulnerable ecosystem services and natural resource assets strengthened in response to climate change impacts, including variability	5.1. No. of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type and scale)	1,507,000
	2.2. 800 ha of watershed under improved climate-adaptive management and ecosystem restoration measures (Indicator 6)	Output 5: Vulnerable ecosystem services and natural resource assets strengthened in response to climate change impacts, including variability	5.1. No. of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type and scale)	1,764,000
	2.3. 71 ha of urban and peri-urban stormwater detention asset systems under improved climate-resilient NbS management (Indicator 7)	Output 5: Vulnerable ecosystem services and natural resource assets strengthened in response to climate change impacts, including variability	5.1. No. of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type and scale)	1,755,000

Outcome 3: Communities and institutions strengthen climate resilience through inclusive participation, enhanced capacities and application of adaptation knowledge.	3.1. 300 personnel trained in climate intelligence, adaptation planning, NbS implementation, monitoring and ecosystem management, and 1,400 community members actively engaged in ecosystem restoration, stewardship, monitoring, citizen-science, nursery and climate-adaptation activities (Indicators 8 and 9)	Output 2.1: Strengthened capacity of national and sub-national centres and networks to respond rapidly to extreme weather events	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events (by gender)	1,201,000
Total Outcome-Level Grant Amount				8,341,014

G. Budget

Total Budget and Work Plan				
Quantum Business Unit		UNDP-XXX		
Quantum Project ID:		00XXXXXXX	Quantum Project Title:	As in Quantum
Quantum Award ID:		XXXXXXX	Quantum Award Title:	As in Quantum
PIMS No.		XXXX		
Implementing partner		Forest Research Institute Malaysia (FRIM)		

Quantum Outcome (AF Component)	Quantum Output (AF Outcome)	Quantum Activity (AF Output)	Quantum Responsible Party	Budget Account Code	Quantum Budget Account Description	Amount Year 2027	Amount Year 2028	Amount Year 2029	Amount Year 2030	Amount Year 2031	Total (USD)	No
Component 1: Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning	Outcome 1: Institutions apply climate intelligence, vulnerability information and adaptation evidence in planning, investment and decision-making processes.	Output 1.1 (Integrated Climate-Forest Intelligence System – ICFIS)	UNDP	71400	Contractual Services - Individual	90,000	-	-	-	-	90,000	1
			UNDP	72100	Contractual Services - Companies	-	90,000	140,000	-	-	230,000	2
			UNDP	72800	IT Equipment	-	60,000	-	-	-	60,000	3
			Total UNDP			90,000	150,000	140,000	-	-	380,000	
		Output 1.2 (Forest-Climate Vulnerability Atlas)	Output 1.1 Total			90,000	150,000	140,000	-	-	380,000	
			UNDP	71400	Contractual Services - Individual	-	56,000	56,000	56,000	-	168,000	4
			UNDP	72800	IT Equipment	20,964	-	-	-	-	20,964	5
			Total UNDP			20,964	56,000	56,000	56,000	-	188,964	
			FRIM	71600	Travel	-	10,000	10,000	10,000	-	30,000	6
			FRIM	75700	Training, Workshops & Conferences	-	15,000	10,000	15,000	5,000	45,000	7
			FRIM	72100	Contractual Services - Companies	-	40,000	90,000	40,000	-	170,000	8
			Total FRIM			-	75,000	120,000	75,000	15,000	285,000	
			Output 1.2 Total			20,964	121,000	166,000	121,000	5,000	433,964	
		Output 1.3 (Institutionalization, Operational Guidance and	UNDP	72100	Contractual Services - Companies	-	-	30,000	30,000	30,000	90,000	9
			UNDP	71400	Contractual Services - Individuals	256,363	227,181	238,540	250,467	207,498	1,180,050	10
			Total UNDP			256,363	227,181	268,540	280,467	237,498	1,270,050	
			FRIM	75700	Training, Workshops & Conferences	-	-	10,001	10,000	10,000	30,001	11

		Scaling Frameworks)	Total FRIM			-	-	10,000	10,000	10,000	30,000	
					Output 1.3 Total	256,363	227,181	278,540	290,467	247,498	1,300,050	
Component 1 Total						367,327	498,181	584,541	411,467	252,498	2,114,014	
Component 2: Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience	Outcome 2: Ecosystems and climate-resilient infrastructure provide strengthened hydrological, buffering and adaptation functions.	Output 2.1 (Climate-Resilient Peatland Rewetting, Fire Resilience and Monitoring Systems Operationalized)	UNDP	71400	Contractual Services - Individual	192,000	48,000	48,000	28,000	28,000	344,000	12
			UNDP	71200	International Consultants	-	30,000	15,000	-	-	45,000	13
			UNDP	72100	Contractual Services - Companies	-	260,000	260,000	260,000	-	780,000	14
			UNDP	72200	Equipment and Furniture	-	45,000	115,000	35,000	-	195,000	15
			UNDP	71300	Local Consultant		7,000	7,000	7,000	7,000	28,000	16
			Total UNDP			192,000	400,000	445,000	330,000	35,000	1,392,000	
			FRIM	71600	Travel	10,000	20,000	15,000	10,000	10,000	65,000	17
			FRIM	75700	Training, Workshops & Conferences	10,000	10,000	10,000	10,000	10,000	50,000	18
			Total FRIM			20,000	30,000	25,000	20,000	20,000	115,000	
					Output 2.1 Total	212,000	430,000	470,000	350,000	55,000	1,507,000	
		Output 2.2 (Climate-Adaptive Watershed Management – Ulu Muda, Kedah)	UNDP	71400	Contractual Services - Individual	177,000	82,000	117,000	132,000	117,000	625,000	19
			UNDP	72100	Contractual Services - Companies	-	265,500	201,500	26,500	26,500	520,000	20
			Total UNDP			177,000	347,500	318,500	158,500	143,500	1,145,000	
			FRIM	72100	Contractual Services - Companies	21,500	32,000	17,500	19,000	2,500	75,000	21
			FRIM	72800	IT Equipment	61,500	25,000	-	-	-	86,500	22
			FRIM	71600	Travel	32,500	55,000	55,000	55,000	32,500	230,000	23
			FRIM	72300	Materials & Goods	-	10,000	15,000	10,000	-	35,000	24
			FRIM	72200	Equipment and Furniture	-	60,000	5,000	5,000	5,000	75,000	25
			FRIM	75700	Training, Workshops & Conferences	20,000	15,000	25,000	15,000	25,000	100,000	26
			Total FRIM			135,500	197,000	117,500	104,000	65,000	619,000	
				Output 2.2 Total	312,500	544,500	436,000	262,500	208,500	1,764,000		
		Output 2.3 (Urban and Peri-Urban NbS for Flood and Heat Resilience – Kubang Pasu, Kedah)	UNDP	75700	Training, Workshops & Conferences	39,000	34,000	34,000	27,000	10,000	144,000	27
			UNDP	72800	IT Equipment	18,000	-	-	-	-	18,000	28
			UNDP	72100	Contractual Services - Companies	162,000	172,000	162,000	152,000	112,000	760,000	29
			UNDP	71300	Local Consultants	150,000	-	-	-	-	150,000	30
			UNDP	71400	Contractual Services - Individuals	30,000	30,000	30,000	30,000	30,000	150,000	31
			UNDP	72200	Equipment and Furniture	160,000	62,000	-	-	-	222,000	32
			Total UNDP			559,000	298,000	226,000	209,000	152,000	1,444,000	
			FRIM	71800	Contractual Services - Implementing Partner	-	12,000	12,000	12,000	20,000	56,000	33
			FRIM	71600	Travel	10,000	-	-	-	-	10,000	34
	FRIM		75700	Training, Workshops & Conferences	5,000	7,000	7,000	5,000	10,000	34,000	35	
	FRIM		72200	Equipment and Furniture	100,000	25,000	25,000	15,000	15,000	180,000	36	
	FRIM		72800	IT Equipment	15,000	5,000	-	-	-	20,000	37	
	FRIM		72300	Materials & Goods	5,000	2,000	2,000	2,000	-	11,000	38	
	Total FRIM				135,000	51,000	46,000	34,000	45,000	311,000		
				Output 2.3 Total	694,000	349,000	272,000	243,000	197,000	1,755,000		

Component 2 Total						1,218,500	1,313,500	1,178,000	855,500	460,500	5,026,000	
Component 3: Institutionalizing Capacity and Sustainable Livelihoods	Outcome 3: Communities and institutions strengthen climate resilience through inclusive participation, enhanced capacities and application of adaptation knowledge.	Output 3.1 (Inclusive Community Participation, Capacity and Livelihoods Strengthened)	UNDP	71400	Contractual Services - Individual	35,000	30,000	30,000	30,000	15,000	140,000	39
			Total UNDP			35,000	30,000	30,000	30,000	15,000	140,000	
			FRIM	75700	Training, Workshops & Conferences	31,000	108,000	104,000	70,000	55,000	398,000	40
			FRIM	71600	Travel	10,000	5,000	10,000	5,000	5,000	35,000	41
			FRIM	72100	Contractual Services - Companies	35,000	50,000	47,000	22,000	16,000	170,000	42
			FRIM	74200	Audio Visual&Print Prod Costs	5,000	15,000	15,000	5,000	5,000	45,000	43
			Total FRIM			81,000	178,000	176,000	102,000	81,000	618,000	
					Output 3.1 Total	116,000	208,000	206,000	132,000	96,000	758,000	
		Output 3.2 (Technical Capacity for Climate Intelligence, NbS Management and Project Implementation Strengthened)	FRIM	75700	Training, Workshops & Conferences	25,000	44,000	74,500	62,500	49,000	255,000	44
			FRIM	71300	Local Consultants	-	-	1,500	-	1,500	3,000	45
			Total FRIM			25,000	44,000	76,000	62,500	50,500	258,000	
					Output 3.2 Total	25,000	44,000	76,000	62,500	50,500	258,000	
		Output 3.3 (Knowledge Management, Learning and Dissemination Systems Operationalized)	UNDP	71400	Contractual Services - Individual	20,000	20,000	20,000	20,000	20,000	100,000	46
			UNDP	72400	Communic & Audio Visual Equip	15,000	-	-	-	-	15,000	47
			Total UNDP			35,000	20,000	20,000	-	20,000	115,000	
			FRIM	75700	Training, Workshops & Conferences	-	-	-	20,000	50,000	70,000	48
			Total FRIM			-	-	-	20,000	50,000	70,000	
				Output 3.3 Total	35,000	20,000	20,000	40,000	70,000	185,000		
Component 3 Total						176,000	272,000	302,000	234,500	216,500	1,201,000	
Project Activities Cost (Components 1–3)						1,761,827	2,083,681	2,064,540	1,501,467	929,498	8,341,014	
Project Execution Cost												
			UNDP	64397	Support Services	6,224	6,224	6,224	6,224	6,224	31,120	49
			UNDP	74596	Direct Project Costs	12,000	12,000	12,000	12,000	12,000	60,000	50
			Total UNDP			18,224	18,224	18,224	18,224	18,224	91,120	
			FRIM	74200	Audio Visual&Print Prod Costs	7,000	7,000	7,000	7,000	7,000	35,000	51
			FRIM	71800	Contractual Services - Implementing partner	20,000	35,000	35,000	35,000	20,000	145,000	52
			FRIM	72800	IT Equipment	13,956	1,500	4,500	1,500	1,000	22,456	53
			FRIM	72200	Equipment and Furniture	15,000	-	-	-	-	15,000	54
			FRIM	72500	Supplies	2,000	2,000	2,000	2,000	1,000	9,000	55
			FRIM	75700	Training, Workshops & Conferences	63,000	28,000	58,000	38,000	58,000	245,000	56
			FRIM	71600	Travel	40,000	70,000	75,000	75,000	53,000	313,000	57
			Total FRIM			160,956	143,500	181,500	158,500	140,000	784,456	
					Total Project Execution Cost (EE)	179,180	161,724	199,724	176,724	158,224	875,576	
						1,941,007	2,245,405	2,264,265	1,678,191	1,087,722	9,216,590	
Implementing Entity Fee						412,354	114,516	115,478	85,588	55,474	783,410	
Total project grant						2,353,361	2,359,921	2,379,743	1,763,779	1,143,196	10,000,000	

No	Description
1	Specialist for existing methodologies/model mapping and assessment, 15,000 Y1. Deliverable: Existing system mapping, users' needs and ICFIS/Atlas design roadmap Budget: 15,000 (Y1 15,000) National expert for existing methodologies/model mapping and assessment, 15,000 Y1. Deliverable: Existing system mapping, users' needs and ICFIS/Atlas design roadmap Budget: 15,000 (Y1 15,000) National expert supporting CRVA assessment. Deliverable: CVRA assessment and alignment with MyNAP. Budget: 30,000 (Y1 30,000) National expert supporting hydrological assessments, 30,000 Y1. Deliverable: Hydrological project site assessments. Budget: 30,000 (Y1 30,000)
2	Firm contracted to design, develop and operationalize the Integrated Climate-Forest Intelligence System (ICFIS) Budget: 230,000 (Y2 90,000, Y3 140,000)
3	Procurement of servers, cloud storage, data management systems, computing equipment and related IT infrastructure for ICFIS budget: 60,000 (Y2 60,000)
4	National expert supporting climate-risk analysis, GIS mapping, vulnerability assessments, data harmonisation. Deliverable: Atlas development. Budget: 96,000 (Y2 32,000, Y3 32,000, Y4 32,000) GIS/Data Specialist supporting spatial data processing, GIS analysis, data harmonisation and Atlas preparation Budget: 72,000 (Y2 24,000, Y3 24,000, Y4 24,000)
5	IT equipment for FRIM project technical support across Components 1-3 (laptops, licences) Budget: 20,964 (Y1 20,964)
6	Travel supporting technical consultations, field validation and stakeholder engagement for Atlas development and planning protocol preparation Budget: 30,000 (Y2 10,000, Y3 10,000, Y4 10,000)
7	Stakeholder consultations and validation workshops supporting Atlas development, testing and coordination Budget: 45,000 (Y2 15,000, Y3 10,000, Y4 15,000, Y5 5,000)
8	Professional services supporting GIS processing, map preparation, graphic design, publication and dissemination of Atlas products and planning guidance materials Budget: 170,000 (Y2 40,000, Y3 90,000, Y4 40,000)
9	Professional services supporting preparation, design and publication of toolkits, operational guidance, SOPs and scaling products from component 2 Budget: 90,000 (Y3 30,000, Y4 30,000, Y5 30,000)
10	Specialist for Sustainable Finance assessment to assess financing sources, sustainability pathways and scaling investment opportunities Budget: 40,000 (Y1 40,000) Specialist for consolidation of NbS operational guidance and development of scaling and replication framework Budget: 50,000 (Y5 50,000) Technical Advisor to support technical project implementation Budget: 432,336 (Y1 78,242, Y2 82,154, Y3 86,262, Y4 90,575, Y5 95,104) Project Manager (4,278/month) Budget: 283,642 (Y1 51,332, Y2 53,899, Y3 56,594, Y4 59,423, Y5 62,394) Finance & Administrative Specialist (3,128/month) Budget: 161,785 (Y1 37,536, Y2 39,413, Y3 41,383, Y4 43,453) Monitoring, Evaluation and Knowledge Management Specialist (4,104/month Y1) Budget: 212,287 (Y1 49,253, Y2 51,715, Y3 54,301, Y4 57,016). 5% annual increase
11	Stakeholder consultations and validation workshops supporting development, testing, institutional coordination and uptake of ICFIS and Atlas Budget: 30,001 (Y3 10,001, Y4 10,000, Y5 10,000)
12	Peatland hydrologist support; deliverable: water-balance analysis and groundwater-retention design study Budget: 75,000 (Y1 75,000) Groundwater abstraction sustainability assessment; deliverable: safe abstraction limits, drawdown impacts and monitoring requirements Budget: 50,000 (Y1 50,000) Peatland ecological baseline and ESMP procedure; deliverable: biodiversity, hydrology and construction safeguards package Budget: 50,000 (Y1 50,000) Agricultural livelihood impact assessment; deliverable: livelihood risk and benefit-sharing recommendations Budget: 17,000 (Y1 17,000) Hydrological optimisation studies; deliverable: peatland water-retention thresholds and design recommendations Budget: 40,000 (Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000) Tropical peatland rehabilitation specialist; deliverable: restoration design and technical implementation guidance Budget: 40,000 (Y2 20,000, Y3 20,000) Technical field coordinator and monitoring officer for output 2.1, 18,000/year, year Y2-Y5 Budget: 72,000 (Y2 18,000, Y3 18,000, Y4 18,000, Y5 18,000)
13	Fire management specialist; deliverable: fire-readiness review, capacity audit with recommendation on equipment requirements and ToT package (Y2-Y3). Budget: 45,000 (Y2 30,000, Y3 15,000)
14	Engineering design and construction supervision firm; deliverable: clay dyke/canal-blocking design, QA and handover documents Budget: 50,000 (Y2 20,000, Y3 20,000, Y4 10,000) Civil and earthworks contractors; deliverable: clay dyke and peatland water-retention works (Y2-Y4). Budget: 730,000 (Y2 240,000, Y3 240,000, Y4 250,000)
15	IoT monitoring stations and piezometers; deliverable: operational peatland monitoring network (Y3-Y4). Budget: 105,000 (Y3 70,000, Y4 35,000) Peatland firefighting equipment; deliverable: three agency/community firefighting equipment sets (Y2-Y3). Budget: 90,000 (Y2 45,000, Y3 45,000)
16	Drone monitoring specialist; deliverable: aerial monitoring support and field verification outputs (Y2-Y5). Budget: 28,000 (Y2 7,000, Y3 7,000, Y4 7,000, Y5 7,000)

17	Technical missions and monitoring visits; deliverable: field verification, supervision and implementation support Budget: 65,000 (Y1 10,000, Y2 20,000, Y3 15,000, Y4 10,000, Y5 10,000)
18	Technical validation workshops; deliverable: engineering reviews and inter-agency technical decisions Budget: 50,000 (Y1 10,000, Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000)
19	Specialist for development of Native Tree Planting and Maintenance Regimes, Including Criteria for Site Selection. Deliverable: climate-smart planting, maintenance, and survival-monitoring regimes, including site selection criteria and native species mixes (safeguards) Budget: 60,000 (Y1 60,000) Economic valuation of watershed protection with SADA; deliverables: water-utility valuation report (Y4). Budget: 50,000 (Y4 50,000) National safeguards specialist for ESMP preparation and monitoring; deliverables: ESMP preparation, safeguards monitoring and compliance reports (Y1, Y3, Y5). Budget: 105,000 (Y1 35,000, Y3 35,000, Y5 35,000) Engineering Advisor for Component 2 technical implementation oversight, quality assurance and hydrological guidance across component 2 interventions (Y1-Y5). Budget: 260,000 (Y1 52,000, Y2 52,000, Y3 52,000, Y4 52,000, Y5 52,000) 2 Technical field officers for watershed implementation support, community engagement and monitoring (Y1-Y5). Budget: 150,000 (Y1 30,000, Y2 30,000, Y3 30,000, Y4 30,000, Y5 30,000)
20	Tree planting contractor for enrichment and ANR work, including site preparation, planting materials and construction of check dams (Y2-Y3) Budget: 390,000 (Y2 215,000, Y3 175,000) Community nursery establishment Budget: 30,000 (Y2 30,000) Community payment/labour for seedlings supply (13,000/year, Y2-5), sediment-management works for check-dam and protection work (7,500/year, Y2-5) and vegetation survival monitoring/maintenance (6,000/year, Y3-5) Budget: 100,000 (Y2 20,500, Y3 26,500, Y4 26,500, Y5 26,500)
21	Soil Survey and analysis by FRIM (16,500 Y1, 16,500 Y4) Budget: 33,000 (Y1 16,500, Y4 16,500) Cut-slope reinforcement and Com-pillow riverbank protection; deliverables: slope reinforcement and riverbank protection measures Budget: 42,000 (Y2 27,000, Y3 15,000) Satellite image acquisition Budget: 17,500 (Y1 5,000, Y2 5,000, Y3 2,500, Y4 2,500, Y5 2,500)
22	Equipment for spatial analysis, surveys and workstation (LiDAR, PLC4, GIS software and workstations) (Y1-Y2). Budget: 86,500 (Y1 61,500, Y2 25,000)
23	Enrichment planting field travel and transport; deliverables: field transport for planting, site verification and supervision (Y2-Y5). Budget: 100,000 (Y1 12,500, Y2 25,000, Y3 25,000, Y4 25,000, Y5 12,500) Transport, boat rental and field logistics for field assessments and forestry permit Budget: 130,000 (Y1 20,000, Y2 30,000, Y3 30,000, Y4 30,000, Y5 20,000)
24	FRIM nursery seedling supply Budget: 35,000 (Y2 10,000, Y3 15,000, Y4 10,000)
25	Hydrological sensors, raingauges, samplers and engineering equipment (Y1-Y5). Budget: 75,000 (Y2 60,000, Y3 5,000, Y4 5,000, Y5 5,000)
26	Stakeholder consultations, meetings, field work, community specialist Budget: 70,000 (Y1 10,000, Y2 15,000, Y3 15,000, Y4 15,000, Y5 15,000) Consultations and travel for Component 2 ESMP preparation (10,000/year, Y1, Y3, Y5). Budget: 30,000 (Y1 10,000, Y3 10,000, Y5 10,000)
27	NbS Opportunity Scan consultations, travel and technical training for NBSOS methodology transfer, review of district scans, interpretation of findings, Opportunities and investment framework review to produce 12 district NBSOS assessments maps and reports across Kedah Budget: 144,000 (Y1 39,000, Y2 34,000, Y3 34,000, Y4 27,000, Y5 10,000)
28	NbS spatial analysis and data infrastructure (GIS workstations, plotter, storage, GPS units and tablets) Budget: 18,000 (Y1 18,000)
29	Drone survey and field data collection support (site verification, field data collection and mapping support) Budget: 10,000 (Y1 2,000, Y2 2,000, Y3 2,000, Y4 2,000, Y5 2,000) Retention Pond inventory, typology and detailed engineering design (pond inventory, typology framework, prioritisation and detailed designs) Budget: 70,000 (Y1 50,000, Y2 20,000) NbS rehabilitation and habitat enhancement (wetlands, riparian buffers, mini-forests and habitat enhancement), including site preparation, machinery operation, maintenance Budget: 600,000 (Y1 50,000, Y2 150,000, Y3 150,000, Y4 150,000, Y5 100,000) Technical advisory support for monitoring system design, integration with MPKP systems, technical reviews and related capacity development Budget: 80,000 (Y1 60,000, Y3 10,000, Y5 10,000)
30	Hydrological and climate-risk assessment and technical design study; deliverables: hydrological baseline, flood-risk analysis and design recommendations Budget: 50,000 (Y1 50,000) Biodiversity, aquatic habitat and ecosystem-services assessment; deliverables: biodiversity, habitat and ecosystem-services baseline assessment Budget: 50,000 (Y1 50,000) Community health, safety and climate-risk targeted assessment; deliverables: public safety, accessibility and climate-risk assessment (Y1). Budget: 50,000 (Y1 50,000)
31	Citizen science and Ecowarden field community engagement coordinator Budget: 75,000 (Y1 15,000, Y2 15,000, Y3 15,000, Y4 15,000, Y5 15,000) Nursery field officer for community nurseries Budget: 75,000 (Y1 15,000, Y2 15,000, Y3 15,000, Y4 15,000, Y5 15,000)

32	Hydrological monitoring network equipment (water-level sensors, staff gauges, rainfall gauges and runoff sensors, weather/temperature sensors, communications infrastructure equipment, monitoring cameras), 160,000 Y3, and Bioacoustic monitoring. 62,000 Y2). Budget: 222,000 (Y1 160,000, Y2 62,000)
33	Municipal mentoring and technical support on NbS planning and replication pathways (Y2-Y5) and development of municipal NbS replication toolkit and municipal guidance materials (2,000/year, Y2-4, 10,000Y5). Budget: 16,000 (Y2 2,000, Y3 2,000, Y4 2,000, Y5 10,000) 2 Bioacoustic technical advisors for bioacoustic monitoring design, data interpretation and technical reporting Budget: 40,000 (Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000)
34	Technical support for BRAHMS database capacity by the University of Oxford BRAHMS experts to provide hands-on training, customize the database for MPKP's native nursery, and transfer technical knowledge to FRIM and MPKP staff. Budget: (Y1 10,000)
35	MASH knowledge sharing for Kubang Pasu urban NbS (Y2-5) and Kedah State NbS Symposium / Municipal Forum with all Kedah local authorities (Y5). Budget: 13,000 (Y2 2,000, Y3 2,000, Y4 2,000, Y5 7,000) Community consultation, stakeholder engagement, and implementation support activities (Y1-Y5). Budget: 21,000 (Y1 5,000, Y2 5,000, Y3 5,000, Y4 3,000, Y5 3,000)
36	Nursery Equipment and Irrigation equipment, plant materials and propagation stock, herbarium cabinets, operation and production support for 4 satellite community nurseries Budget: 180,000 (Y1 100,000, Y2 25,000, Y3 25,000, Y4 15,000, Y5 15,000)
37	Commercial botanical collection management system for restoration through BRAHMS Database Development (workstation, software licensing, system installation, technical configuration and specialised training) to develop FRIM and MPKP capacity for managing seed provenance, nursery inventory, planting records, restoration monitoring and replication. Budget: 20,000 (Y1 15,000, Y2 5,000)
38	Citizen scientist and Ecowardens monitoring kits and technical monitoring materials (Y1-Y5). Budget: 11,000 (Y1 5,000, Y2 2,000, Y3 2,000, Y4 2,000)
39	National Gender Equality and Social Inclusion (GESI) expert supporting GESI Action Plan, baseline mapping, beneficiary-selection criteria, GRM/PSEAH protocols, accessibility, gender reporting and sensitization Budget: 120,000 (Y1 15,000, Y2 30,000, Y3 30,000, Y4 30,000, Y5 15,000) National consultant for stakeholder/socio-economic mapping, community profiling and development of Community Participation and Monitoring Framework, including beneficiary-selection criteria, engagement methodologies and GRM awareness Budget: 20,000 (Y1 20,000)
40	Peat-fire prevention, early warning and sustainable peatland management training for KLSFR Budget: 38,000 (Y1 6,000, Y2 10,000, Y3 8,000, Y4 7,000, Y5 7,000) Community early warning and NbS buffer stewardship focal points training Budget: 22,000 (Y2 10,000, Y3 6,000, Y4 6,000) Community monitoring and stewardship support (participatory data collection) Budget: 50,000 (Y1 5,000, Y2 16,000, Y3 13,000, Y4 10,000, Y5 6,000) Community nursery stakeholder consultations, survey, study tours Budget: 25,000 (Y2 15,000, Y3 10,000) Community training programme related to community nurseries, enrichment planning, monitoring/stewardship and sustainability strategy development Budget: 55,000 (Y2 20,000, Y3 20,000, Y4 10,000, Y5 5,000) Community Nursery Training and Capacity Building Programme Budget: 45,000 (Y1 15,000, Y2 10,000, Y3 10,000, Y4 5,000, Y5 5,000) Consultations to develop Community nursery SOP Development and Training Materials Budget: 10,000 (Y3 5,000, Y4 5,000) Training of trainers for Ecowardens and bioacoustic field monitoring and reporting training for citizen scientists Budget: 53,000 (Y2 12,000, Y3 17,000, Y4 12,000, Y5 12,000) School and awareness engagement Programme and activities, annual events, citizen science forums, and final lessons learned workshop Budget: 70,000 (Y1 5,000, Y2 15,000, Y3 15,000, Y4 15,000, Y5 20,000)
41	Travel for stakeholder consultation, social profiling, field engagement, community outreach, monitoring Budget: 35,000 (Y1 10,000, Y2 5,000, Y3 10,000, Y4 5,000, Y5 5,000)
42	Community stewardship, awareness campaigns, and peat-fire resilience activities (KLSFR) Budget: 45,000 (Y1 15,000, Y2 15,000, Y3 15,000) Socio-Economic and Land Management Practices (UUM Sub-contract) Budget: 125,000 (Y1 20,000, Y2 35,000, Y3 32,000, Y4 22,000, Y5 16,000)
43	Design and print of training, awareness and educational materials Budget: 45,000 (Y1 5,000, Y2 15,000, Y3 15,000, Y4 5,000, Y5 5,000)
44	Capacity building related to ICFIS and Forest-Climate Vulnerability Atlas for 200 personnel Budget: 60,000 (Y3 20,000, Y4 20,000, Y5 20,000) Peatland restoration and fire-risk assessment training sessions for Bomba & JPNS Budget: 60,000 (Y1 5,000, Y2 20,000, Y3 15,000, Y4 15,000, Y5 5,000) Inter-institutional coordination and SOP inception workshop Budget: 45,000 (Y1 15,000, Y2 10,000, Y3 10,000, Y4 7,000, Y5 3,000) Restoration and hydrology training workshops Budget: 15,000 (Y2 10,000, Y3 3,000, Y4 2,000) Dashboard and adaptive management training — live-dashboard demonstration on commissioned IoT monitoring system. Budget: 10,000 (Y3 5,000, Y4 3,000, Y5 2,000) Consultations and capacity development of stakeholders (Forestry department, MADA, SADA) related to watershed management and forest enrichment Budget: 15,000 (Y3 5,000, Y4 5,000, Y5 5,000) SWAT modelling, reporting, and technical workshops/training for FRIM (Y3,Y5) Budget: 7,000 (Y3 3,500, Y5 3,500) Urban NbS planning, retention-pond management and adaptive maintenance training for municipal agencies Budget: 15,000 (Y3 5,000, Y4 5,000, Y5 5,000)

	Monitoring system operation training (Dashboard, sensor-system and monitoring-protocol) for MPKP staff Budget: 10,000 (Y3 5,000, Y4 2,500, Y5 2,500) Technical training related to BRAHMS database to provide hands-on training, customize the database for MPKP's native nursery, and transfer technical knowledge to FRIM and MPKP staff Budget: 5,000 (Y1 5,000) Bioacoustic and biodiversity monitoring technical training for municipal/technical personnel Budget: 13,000 (Y2 4,000, Y3 3,000, Y4 3,000, Y5 3,000)
45	SWAT modelling expert from Universiti Malaysia Terengganu (UMT) Budget: 3,000 (Y3 1,500, Y5 1,500)
46	Design, development of knowledge management strategy, NbS Knowledge Portal and NbS materials Budget: 40,000 (Y1 20,000, Y2 20,000) Design and development of knowledge products, policy briefs and case studies Budget: 60,000 (Y3 20,000, Y4 20,000 Y5 20,000)
47	Digital camera, projector, licenses and audiovisual equipment for communications Budget: 15,000 (Y1 15,000)
48	National dissemination event, three sub-national learning events Budget: 70,000 (Y4 20,000, Y5 50,000)
49&50	UNDP Operational Support Services costs with annual allocation of 18,224, totalling 91,120. The services include HR related process, procurement of goods and services, financial processing, administration supports, etc.
51	Journal publication fees, Printing of awareness and training materials, case studies and other project materials Budget: 35,000 (Y1 7,000, Y2 7,000, Y3 7,000, Y4 7,000, Y5 7,000)
52	Short term project support for data collection and field verification (4 people) Budget: 100,000 (Y1 20,000, Y2 20,000, Y3 20,000, Y4 20,000, Y5 20,000) Short-term project support for stakeholder consultations, validation activities, data checking and documentation support (1 person) Budget: 45,000 (Y2 15,000, Y3 15,000, Y4 15,000)
53	PMU workstations/laptops, IT equipment, software licences Budget: 22,456 (Y1 13,956, Y2 1,500, Y3 4,500, Y4 1,500, Y5 1,000)
54	Office set-up (furniture etc) Budget: 15,000 (Y1 15,000)
55	Office supplies and operational expenditures Budget: 9,000 (Y1 2,000, Y2 2,000, Y3 2,000, Y4 2,000, Y5 1,000)
56	Inception workshop (10,000 Y1), Project Board/TWG meetings (5,000/annually) Budget: 35,000 (Y1 15,000, Y2 5,000, Y3 5,000, Y4 5,000, Y5 5,000) Stakeholder consultations related to methodologies/model mapping and assessment Budget: 15,000 (Y1 15,000) Stakeholder consultations and validation workshops supporting sustainable finance assessment, institutional uptake, replication and scaling of project approaches Budget: 40,000 (Y1 10,000, Y3 10,000, Y4 10,000, Y5 10,000) Technical working group meetings, stakeholder consultations and validation workshops supporting ICFIS development, testing and coordination Budget: 55,000 (Y1 15,000, Y2 15,000, Y3 10,000, Y4 10,000, Y5 5,000) PMU, FRIM and key stakeholder capacity development workshops (project implementation, safeguards, monitoring, gender) Budget: 30,000 (Y1 10,000, Y3 10,000, Y5 10,000) PMU/FRIM workshops Y1-5 Budget: 40,000 (Y1 8,000, Y2 8,000, Y3 8,000, Y4 8,000, Y5 8,000) GESI, safeguards, grievance redress and inclusive-participation stakeholder consultation workshops and training for FRIM and key stakeholders Budget: 30,000 (Y1 10,000, Y3 10,000, Y5 10,000)
57	PMU and EE travel for project monitoring and implementation supervision Budget: 50,000 (Y1 10,000, Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000) Domestic travel for technical assessments, meetings with data providers, field verification, validation and system testing Budget: 50,000 (Y1 10,000, Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000) Travel costs for regional, national and sub-national learning events, regional exchange visits and cooperation Budget: 60,000 (Y2 20,000, Y3 20,000, Y4 20,000) Travel supporting institutional consultations, stakeholder engagement, knowledge exchange, validation activities and dissemination events under Output 1.3 Budget: 20,000 (Y1 5,000, Y3 5,000, Y4 5,000, Y5 5,000) Municipal exchange visits and site demonstrations (Y2-Y5). Budget: 18,000 (Y2 5,000, Y3 5,000, Y4 5,000, Y5 3,000) Field travel for implementation, including seed collection, wildling rescue and propagation programme Budget: 25,000 (Y1 5,000, Y2 5,000, Y3 5,000, Y4 5,000, Y5 5,000) Field implementation travel Budget: 50,000 (Y1 10,000, Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000) Field travel supporting stakeholder consultations, field verification and validation activities Budget: 40,000 (Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000)

IE fee breakdown

Category	Services Provided by UNDP	IE Fee (USD)
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Identification, Sourcing and Screening of Ideas	Provide information on substantive issues in adaptation and innovation associated with the purpose of the AF. Engage in upstream policy dialogue related to a potential application to the AF. Verify soundness & potential eligibility of identified ideas for AF.	39,171
Feasibility Assessment / Due Diligence Review	Provide up-front guidance on converting general ideas into a feasible project/programme. Source technical expertise in line with the scope of the project/programme. Verify technical reports and project conceptualization. Provide detailed screening against technical, financial, social and risk criteria and provide statement of likely eligibility against AF requirements. Determination of execution modality and local capacity assessment of the executing entity. Assist in identifying technical partners. Validate partner technical abilities. Obtain clearances from AF.	117,512
Development & Preparation	Provide technical support, backstopping and troubleshooting to convert the idea into a technically feasible and operationally viable project/programme. Source technical expertise in line with the scope of the project/programme needs. Verify technical reports and project conceptualization. Verify technical soundness, quality of preparation, and match with AF expectations. Negotiate and obtain clearances by AF. Respond to information requests, arrange revisions etc.	156,682
Implementation	Technical support in preparing TORs and verifying expertise for technical positions. Provide technical and operational guidance project teams. - Verification of technical validity / match with AF expectations of inception report. Provide technical information as needed to facilitate implementation of the project activities. Provide advisory services as required. Provide technical support, participation as necessary during project activities. Provide troubleshooting support if needed. Provide support and oversight missions as necessary. Provide technical monitoring, progress monitoring, validation and quality assurance throughout. Allocate and monitor Annual Spending Limits based on agreed work plans. Receipt, allocation and reporting to the AFB of financial resources. Oversight and monitoring of AF funds, including audit. Return unspent funds to AF.	352,535
Evaluation and Reporting	Provide technical support in preparing TOR and verify expertise for technical positions involving evaluation and reporting (including for the Mid-Term- and Terminal Evaluations). Participate in briefing / debriefing (including for the Mid-Term and Terminal Evaluations). Verify technical validity / match with AF expectations of all evaluation and other reports (including supervision/development of the Baseline Data Report, Project Performance Report, and Project Completion Report, the Mid-Term and Terminal Evaluations). Undertake technical analysis, validate results, and compile lessons Disseminate technical findings	117,512
Total IE Fee		783,410

H. Milestones and disbursement schedule

	Upon signature of Agreement	One Year after Project Start a)	Year 2b)	Year 3	Year 4 c)	Total
Scheduled date	1/2/2027	1/2/2028	31/1/2029	31/1/2030	31/1/2031	
Project Funds	1,941,007	2,245,405	2,264,265	1,678,191	1,087,722	\$9,216,590
Implementing Entity Fees	412,354	114,516	115,478	85,588	55,474	\$783,410
Total	2,353,361	2,359,921	2,379,743	1,763,779	1,143,196	\$10,000,000

a) Use projected start date to approximate first year disbursement

b) Subsequent dates will follow the year anniversary of project start

PART IV. ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government²

Provide the name and position of the government official and indicate the date of endorsement. If this is a regional project/programme, list the endorsing officials of all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:

DATUK NOR YAHATI AWANG Deputy Secretary General (Environmental Sustainability) Ministry of Natural Resources and Environmental Sustainability Malaysia	Date: 5 January 2026
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B. Implementing Entity certification *Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the Programme contact person's name, telephone number and email address*

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (Nationally Determined Contribution 3.0, National Climate Change Policy 2.0 and the Thirteenth Malaysia Plan) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy and the Gender Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.

Name & Signature Implementing Entity Coordinator

DocuSigned by:

3CC8A1CF23AF4F8...

Robin Merlier
Director a.i., Quality and Impact Hub and
Executive Coordinator a.i., Vertical Funds
Bureau for Policy and Programme Support
United Nations Development Programme

Date: 7 August 2026

Tel. and email:

robin.merlier@undp.org

nancy.bennet@undp.org

Project Contact Person: Aishath Azza, Regional Technical Specialist

Tel. and Email: aishath.azza@undp.org



CONFIDENTIAL

Ref: NRES.700-4/4/5 () (S)
Date: 5 January 2026

The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Dear Sir,

**ENDORSEMENT FOR STRENGTHENING RESILIENCE AND ADAPTIVE CAPACITY
BY PILOTING NATURE BASED SOLUTIONS FOR WATER MANAGEMENT IN
MALAYSIA**

In my capacity as designated authority for the Adaptation Fund in Malaysia, I confirm that the above proposed regional project/ programme aligns with Malaysia's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Malaysia.

2. Accordingly, I am pleased to endorse the above project/programme proposal with support from the Adaptation Fund. If approved, the project/programme will be implemented by United Nations Development Programme (UNDP) Malaysia, Singapore and Brunei Darussalam with the Forest Research Institute Malaysia (FRIM) as the national executing entity.

3. This endorsement is subject to the following conditions:

- (i) All project-related data are the property of the Government of Malaysia;
- (ii) Data security must comply with the Government's data classification requirements, including mandatory verification and approval processes prior to any use;

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NRES.700-4/4/5 () (S)

- (iii) The proposed project sites will be identified and mutually agreed upon during the consultation process; and
- (iv) for the avoidance of doubt, this endorsement does not create any obligation on the part of the Government of Malaysia with respect to legal or financial actions.

Sincerely,



(DATUK NOR YAHATI BINTI AWANG)

Designated Authority of Adaptation Fund

Deputy Secretary General (Environmental Sustainability)

Ministry of Natural Resources and Environmental Sustainability

Malaysia

Annex 5: Stakeholder Consultations Report

This annex summarizes the stakeholder consultations, technical discussions, field verification missions and engagement processes undertaken during the Adaptation Fund (AF) Concept Note and PFG stages of project development. The consultation process was led by the Forest Research Institute Malaysia (FRIM) in collaboration with UNDP and supported by gender, safeguards, technical and local stakeholder engagement consultants.

Consultations were conducted with national and sub-national government agencies, technical institutions, municipalities, civil society organizations, local communities and representatives of vulnerable groups, women and smallholder farmers. The consultation process supported refinement of the project design, including technical approaches, site prioritization, safeguards considerations, implementation arrangements, stewardship models, gender-responsive participation approaches and institutional coordination mechanisms. The consultations combined technical meetings, institutional coordination sessions, field visits, reconnaissance missions, focus group discussions, informal community engagement and targeted stakeholder discussions across the proposed project landscapes in Selangor and Kedah. Consultation depth and content vary across outputs and intervention areas; institutional and technical consultations were emphasised for Components 1 and 2, while safeguards-sensitive engagement, FPIC-related processes, community consultations and implementation arrangements were more relevant for Components 2 and 3.

During the full preparation phase, most of the stakeholder meetings, community consultations and field visits were conducted during four separate missions conducted between April and June 2026:

- **28-30 April 2026 in Kedah:** led by FRIM and UNDP and supported by gender, safeguards and local stakeholder engagement consultant involving community consultations in Kubang Pasu, a visit to the MPKP command centre being constructed, meetings with MPKP and JKM Kubang Pasu, and field visits to retention ponds in Kubang Pasu and the entry point to the Ulu Muda forest.
- **4-6 May 2026 in Kuala Lumpur and Selangor:** led by FRIM and UNDP and supported by gender, safeguards, technical and local stakeholder engagement consultants, involving focused meetings with FRIM component leads, stakeholder consultation with relevant government agencies on ICFIS and the Forest-Climates Vulnerability Atlas, online consultation with WWF-Malaysia on the forest enrichment planting at Ulu Muda, a field visit to fire prone sites at the Kuala Langat peatlands and a community consultation at Kampung Pasir in Kuala Lumpur.
- **19-21 May 2026 in Kedah and Selangor:** led by FRIM and UNDP and supported by technical and local stakeholder engagement consultants, involving a field visit to PKPS farms in the Kuala Langat peatlands, a meeting with Bomba team at Kuala Langat, a meeting with DID/JPS Kubang Pasu and Padang Terap Districts, a field visit into the Ulu Muda forest and a meeting with MADA and other Kedah State stakeholders involved in the management of water and agricultural resources.
- **4-12 June 2026 in Kedah, Kuala Lumpur and Putrajaya:** led by FRIM and UNDP and supported by the lead, gender, safeguards and local stakeholder engagement consultants involving technical review sessions with FRIM component leads, a stakeholder review/validation workshop at Putrajaya attended by about 60 participants, and a community consultation with representatives from villages in the vicinity of the Ulu Muda forest,

The table below summarizes the main stakeholders consulted, issues discussed, key project refinements resulting from consultations and remaining gaps or follow-up actions identified during proposal preparation. Detailed attendance records, consultation materials, photographs, consent forms and supporting documentation will be compiled separately where available.

Project Area / Component	Stakeholder Consulted	Date / Time frame	Total attendees (F/M)	Focus and issues discussed	Outcome and incorporation into project design
Overall / Institutional Consultations	FRIM	Ongoing since 17 Dec 2024	7 (7F/4M)	Executing Entity role, scientific oversight, technical design, methodology and implementation coordination	FRIM confirmed its role as Executing Entity responsible for overall project coordination and technical delivery across Components 1–3. FRIM validated the integrated ecosystem-based adaptation (EbA), climate-risk intelligence and adaptive-management approach underpinning the project design.
Overall / Institutional Consultations	NRES	30–31 Oct 2025; 5 Jan 2026	4 (2F/2M); 5 (3F/2M)	Institutional arrangements, governance structure and policy scaling	NRES confirmed support for the project and proposed that the Project Board be chaired by the Secretary-General of NRES, strengthening national ownership and alignment with adaptation and NbS priorities.
Overall / Institutional Consultation Workshop	FRIM, UNDP, Department of Wildlife and National Parks (PERHILITAN)-Kedah, DID, JPSM, MPKP, MET Malaysia, LSANK, Selangor State Forestry Department, JBPM, NAHRIM, WWF-Malaysia, GEC, Malaysian Nature Society, Universiti Utara Malaysia, Malaysian Agricultural Research & Development Institute, NRES, Ministry of Energy Transition and Water Transformation (PETRA)	8 June 2026	50 (23 F/ 27 M)	Introduction to proposal and activities, discussion on data collection, effectiveness of activities, concerns surrounding site selection, existing issues, sustainability of activities and system replication.	Overall: Discussions informed considerations for site selection, sizing of Aquavault, sustainability of components and IC-FIS and effectiveness of interventions. IC-FIS: Agencies are open to collaboration and data sharing subject to data requirements. Data granularity consideration and possibility of complementing MyNAP. Aquavault: Reframing of Aquavault from being an integrated solution to an additional water storage facility for fire prevention. Possible inclusion of initiatives for improving farming practices. Ulu Muda: Malaysian Agricultural Research and Development Institute (MARDI) involvement in climate-smart agriculture Kubang Pasu: Two priority areas have been identified by MPKP.

Cross-cutting GESI, Safeguards and Stakeholder Engagement	Gender specialists, SES consultants, stakeholder engagement consultants, FRIM and UNDP	Apr-Jun 2026	Multiple engagements	Gender-responsive implementation, safeguards requirements, FPIC-sensitive engagement, stakeholder engagement planning, community participation and social inclusion considerations	Preliminary GESI and safeguards considerations were integrated into the project design, including gender-responsive participation approaches, stewardship considerations and phased consultation approaches for safeguards-sensitive interventions.
Component 1 – ICFIS, Forest-Climate Vulnerability Atlas and Climate-Risk Intelligence Systems	FRIM, MET Malaysia, NAHRIM, PLANMalaysia, DID, NRES Climate Change Division	5 May 2026	10 (4F/6M) excluding consultants /UNDP	Introduction to Component 1, climate-risk intelligence systems, data-sharing requirements, institutional coordination, agency roles, monitoring systems and operational use of climate-risk information	Agencies expressed openness to collaboration subject to clarification of institutional roles, commitments and data-sharing requirements. Consultations helped refine the scope of Component 1 toward more realistic operational climate-risk intelligence and adaptive-management functions linked to forestry, watershed and urban resilience planning. Discussions also informed refinement of institutional coordination arrangements, operational expectations and potential agency roles related to ICFIS and the Forest-Climate Vulnerability Atlas.
Output 2.1 – Selangor Peatland / AquaVault Interventions	Selangor State Forestry Department	22 Jul 2025	13 (6F/7M)	Site suitability, peatland management, Indigenous Peoples considerations and water-related vulnerabilities	Selangor State Forestry Department highlighted peatland degradation, fire-risk concerns and community proximity issues. Output 2.1 evolved from a narrower technical water-storage concept toward a broader peatland hydrological stabilization and fire-risk reduction approach with stronger community and stewardship dimensions.
Output 2.1 – Selangor Peatland / AquaVault Interventions	GEC	16, 22 and 27 Apr 2026	3 (3M)	Technical advice on peatland restoration, site selection, Orang Asli (Temuan) engagement and phased consultation approaches	GEC emphasized that Kuala Langat Selatan Forest Reserve (KLSFR) presented more urgent degradation and fire-risk conditions than Raja Musa Forest Reserve and Kuala Langat Utara Forest Reserve. As a result, the project shifted the proposed AquaVault focus toward KLSFR where there are no Orang Asli community living nearby (unlike the earlier site) and no local communities dependent on the forest resources except for water for agricultural use (non-subsistence) downstream of KLSFR.

Output 2.1 – Selangor Peatland / AquaVault Interventions	Department of Orang Asli Development- Selangor / Department of Orang Asli Development Daerah Kuala Langat and Klang / Department of Orang Asli Development Headquarters	20 Apr – 4 May 2026	Multiple contacts; exact F/M not recorded	FPIC-sensitive procedures, Orang Asli engagement requirements and demographic data requests	The Department of Orang Asli Development clarified that formal Headquarters approval is required prior to direct Orang Asli consultation, research or data collection. Formal approval for direct community Orang Asli engagement was requested in writing and subsequently approved.
Output 2.1 – Selangor Peatland / AquaVault Interventions	Department of Orang Asli Development- Selangor secondary data engagement	27 Apr, 30 Apr and 4 May 2026	Email engagement	Requests for demographic, livelihood and vulnerable-group data	The Department of Orang Asli Development provided secondary demographic and socio-economic profiles for nearby Orang Asli communities, supporting preliminary beneficiary and GESI analysis.
Output 2.1 – Selangor Peatland / AquaVault Interventions	Selangor State Forestry Department (technical follow-up)	30 Apr 2026	3 (2F/1M)	AquaVault siting, KLSFR suitability, fire-risk relevance and site coordination	Forestry personnel reinforced that Raja Musa Forest Reserve and Kuala Langat Utara Forest Reserve already function as a successful restoration reference site, while KLSFR faces more urgent degradation and fire-risk pressures. KLSFR was therefore prioritized as the primary proposed intervention landscape.
Output 2.1 – Selangor Peatland / AquaVault Interventions	GEC technical follow-up	5 May 2026	2 (2M)	Technical clarification on peatland restoration, hydrological management and Orang Asli forest dependency	GEC emphasized that AquaVault should support broader peatland restoration functions including groundwater stabilization, canal management and ecological restoration rather than functioning as a stand-alone engineered system.
Output 2.1 – Selangor Peatland / AquaVault Interventions	Kuala Langat Forest Ranger Office (Pejabat Renjer Hutan Kuala Langat) and Klang Coastal Forest District Office (Daerah Hutan Pantai Klang), Selangor State Forestry Department	6 May 2026	11 (5F/6M)	Technical field verification in KLSFR, peat fire history, hydrological degradation and operational constraints	Site visit to farmlands and degraded forest adjacent to KLSFR confirmed severe peatland degradation, recurring fire risks and hydrological instability linked to drainage pressures and prolonged dry conditions. The field verification strengthened justification for preventive peatland rewetting and groundwater stabilization measures under Output 2.1.

Output 2.1 – Selangor Peatland / AquaVault Interventions	Kampung Sungai Kelambu community representatives	6 May 2026	15 (5F/10M)	Informal discussion on peat fires, haze impacts, livelihoods and local vulnerabilities	Community members highlighted recurring haze, health impacts, agricultural dependency and local fire pressures. Women’s participation in local governance structures was also discussed. Inputs informed the climate-risk narrative, GESI considerations and future stakeholder engagement planning.
Output 2.1 – Selangor Peatland / AquaVault Interventions	JBPM (Bomba)	19 May 2026	1F/5M	Discussion on the role of the fire and rescue department and other agencies in and methods for fighting peatland fires at Kuala Langat peatlands. Identification of causes of peatland fires.	JBPM KLIA is supportive of the project. Consideration of interventions for fire prevention amongst farmers in the Kuala Langat peatlands.
Output 2.1 – Selangor Peatland / AquaVault Interventions	GEC	22 May 2026	3F/ 7 M	Introduction to the work GEC is doing at Kuala Langat Utara Forest Reserve and Kuala Langat Selatan Forest Reserve, suggestions and feedback regarding Aquavault and way forward.	Suggestion on using canal blocking and focus on nature-based solution as it will provide more water retention at lower cost. Refer to the Kuala Langat South Forest Management plan developed by GEC and Forestry Department for managing peatland for agriculture.
Output 2.2 – Ulu Muda Watershed Interventions	MADA	30–31 Oct 2025; 18 Nov 2025	8 (2F/6M); 17 (2F/15M)	Upstream-downstream water security, flood management, and non-duplication with MADA investments	Consultations in 2025 documented that MADA confirmed plans to improve storage of excess water during extreme rainfall events. The project was refined to focus on upstream watershed resilience, forest restoration and erosion reduction functions supporting downstream agricultural and water-security systems.
Output 2.2 – Ulu Muda Watershed Interventions	MADA, JPS/DID, State Economic Planning Division, Kedah Development Authority, LSANK Universiti Utara Malaysia, Local community representative from Kampung Belantik Dalam (Ulu Muda area)	21 May 2026	14 (2F/12M)	Upstream-downstream water security, watershed management interventions (enrichment planting, erosion mitigation, check dams), food security (rice production), MADA farmers engagement and data sharing.	MADA reaffirmed their support for efforts to improve water quality of the reservoirs. MADA has comprehensive datasets they are willing to share. LSANK was identified as a key project partner. Further studies need to be done during the first year of project implementation in close collaboration with LSANK, the Kedah State Forestry Department and DID/JPS to determine the locations and designs of check dams.

Output 2.2 – Ulu Muda Watershed Interventions	Kedah State Forestry Department	30–31 Oct 2025; 18 Nov 2025	8 (2F/6M); 17 (2F/15M)	Ulu Muda forest management, watershed protection and erosion control	Kedah State Forestry Department supported restoration and enrichment planting approaches aimed at strengthening hydrological functions and reducing erosion and sedimentation pressures within the Ulu Muda catchment.
Output 2.2 – Ulu Muda Watershed Interventions	WWF-Malaysia	7 May 2026	4 (3F/1M)	Ulu Muda restoration experiences, operational constraints and possible synergies	WWF-Malaysia highlighted logistical challenges, contractor dependence, permitting delays and difficult terrain conditions affecting restoration implementation in Ulu Muda. As a result, the project is reconsidering earlier assumptions regarding large-scale community workforce deployment and moving toward a more hybrid contractor/community-supported restoration model.
Output 2.2 – Ulu Muda Watershed Interventions	MADA	11 Jun 2026	5 (2F/ 3M)	Discussion on the role of MADA in water management, flood mitigation, water control infrastructures (dams) and rainfall data collection. Dredging of the Muda reservoir might increase obstruction of water tunnels. A cascading water filtration system upstream was suggested as a potential approach for reducing sedimentation.	MADA is supportive of the project. Any data requests must be made formally to MADA.
Output 2.2 – Ulu Muda Watershed Interventions	Department for Women’s Development (JPW)	11 Jun 2026	7 (5F/2M)	Clarification on data availability, types of data, activities and programmes conducted by the Department for Women’s Development and experience.	The Department for Women’s Development does not collect or maintain any sort of data and data requests will need to be directed to the Social Welfare Department.
Output 2.2 – Ulu Muda Watershed Interventions	Local communities from the villages of Kampung Belantik Dalam, Kampung Belantik Luar, Kampung Bukit Berangan, Kampung Bukit Batu, Kampung Kota Aur and	11 June 2026	54 (36F/18M)	Community engagement on community nursery, forest enrichment and monitoring activities.	Communities are highly dependent on forest and water resources. Environmental changes have affected their income. The women possess strong interest in environmental stewardship and livelihood diversification but face significant structural and practical barriers to participation.

	Kampung Surau in the vicinity of the Ulu Muda Forest				
Output 2.3 – Kubang Pasu Urban and Peri-Urban NbS Interventions	MPKP	2 Jul 2025; 26 Oct 2025	2 (1F/1M); 2 (1F/1M)	Retention pond custodianship, local government roles and urban NbS opportunities	MPKP confirmed responsibility for a significant portion of retention ponds and expressed support for NbS upgrading approaches. Urban interventions were further aligned with existing municipal maintenance systems and O&M considerations.
Output 2.3 – Kubang Pasu Urban and Peri-Urban NbS Interventions	MPKP follow-up	29 Apr 2026	3 (3M)	Jurisdiction, retention pond management and Sustainable Development Goals alignment	Discussions clarified that custodianship and maintenance responsibilities for all relevant retention ponds will be assumed by MPKP. The project therefore strengthened its focus on realistic O&M arrangements, adaptive maintenance and municipal coordination mechanisms.
Output 2.3 – Kubang Pasu Urban and Peri-Urban NbS Interventions	Community members from Taman Pulasan, Taman Chermai and Taman Belimbing	28 Apr 2026	28 (14F/14M)	Community engagement on retention ponds, safety concerns and nursery initiatives	Community feedback emphasized safety, tree selection, maintenance and preserving the flood-buffering function of retention ponds. Community safety and low-maintenance species selection were strengthened within the urban NbS design approach.
Output 2.3 – Kubang Pasu Urban and Peri-Urban NbS Interventions	KEMAS, Kubang Pasu	30 Apr 2026	3 (3F) excluding consultants	Potential community involvement in nursery and livelihood activities	KEMAS highlighted the heavy burden on women following flood events, including prolonged cleaning responsibilities and livelihood disruption. The project strengthened women-focused nursery and stewardship activities and is exploring decentralized nursery models linked to women's participation and livelihood opportunities.
Output 2.3 – Kubang Pasu Urban and Peri-Urban NbS Interventions	DID/JPS	20 May 2026	9 (5F/ 4M)	Introduction of the project and justification of Kubang Pasu for site selection. Discussion on flood data availability, retention pond jurisdiction and issues.	DID/JPS fully supports the project and agrees to be a project partner. JPS agrees to share relevant data with the project team.

Output 2.3 – Kubang Pasu Urban and Peri-Urban NbS Interventions	Legal and Enforcement Division, Social Welfare Department (JKM) Kubang Pasu	10 June 2026	36 (F/ 3M)	Presentation of proposed project activities for Kubang Pasu, data availability and issues arising during crises	JKM is agreeable to the project activities. t JKM has data related to registered individuals and households and is open to sharing aggregated data (for Kubang Pasu) provided no personally identifiable information is disclosed.
Earlier Kuala Lumpur and Petaling Jaya Urban Concepts	Kuala Lumpur City Hall (DBKL) and C40 Cities	4 Nov 2025	2 (2F)	Urban resilience planning and alignment with existing climate frameworks	Existing Kuala Lumpur City Hall/C40 resilience planning approaches informed earlier urban NbS concepts and GESI integration approaches. Following feasibility discussions and community feedback, the originally proposed Kuala Lumpur interventions have been removed from the final design.
Earlier Kuala Lumpur and Petaling Jaya Urban Concepts	Selangor Climate Adaptation Centre	12 Nov 2025	1 (1M)	Adaptation governance, flood vulnerability and site prioritization	Selangor Climate Adaptation Centre supported earlier Selangor urban pilot concepts based on flood-risk and social-vulnerability considerations. Following subsequent technical and implementation discussions, the Petaling Jaya/Kampung Cempaka concepts have been removed from the project design.
Earlier Kuala Lumpur and Petaling Jaya Urban Concepts	Selangor State Economic Planning Unit (Local Authority Section)	12 Nov 2025	1 (1F)	Local authority coordination and NbS integration opportunities	Discussions highlighted opportunities for integrating NbS with urban resilience and green-employment objectives. Earlier Selangor urban concepts informed broader project thinking, although the interventions have now been refocused to sites in Kedah (Kubang Pasu dan Alor Setar) following further technical implementation discussions and community feedback .
Cross-cutting Knowledge Management, Learning and Scaling	FRIM, UNDP and technical partners	Apr-Jun 2026	Multiple engagements	Knowledge management, communication, education and public awareness (CEPA), learning systems, scaling approaches and institutional dissemination	Consultations supported development of the project's knowledge-management approach, including integration between Component 1 systems, operational learning, stewardship models and future scaling approaches.

Annex 10: GESI Assessment and Gender Action Plan (GAP)

1. Introduction

The purpose of this GESI assessment is to assess the impacts of climate change on women and to identify their needs and adaptation priorities. This assessment will

- Identify gender-differentiated climate vulnerabilities and adaptive capacities.
- Assess social inclusion challenges and barriers.
- Inform gender-responsive and socially inclusive project design.
- Support compliance with Adaptation Fund gender and social inclusion requirements.
- Strengthen proposed equitable participation and benefit-sharing mechanisms.

2. Methodology

2.1 Assessment Approach

The assessment adopted an inclusive approach, recognizing that climate vulnerability and adaptive capacity are shaped by intersecting factors such as gender, age, socioeconomic status, livelihood type, and geographic location. The methodology was designed to ensure that the perspectives and experiences of diverse stakeholder groups, particularly vulnerable and marginalized populations, were incorporated. Both qualitative and quantitative methods were applied to gather information from government stakeholders (score-card), local communities, civil society organizations (WWF) and technical agencies (DID, JPS etc.). This mixed-methods approach captured both quantitative information and lived experiences related to climate risks, social vulnerability, and resilience capacities within the project areas.

2.2 Data Collection Methods

(i) Literature and Policy Review: A comprehensive review of relevant literature, policies, and secondary data was undertaken to establish the contextual foundation for the assessment. This included an analysis of national policies and frameworks, demographic and socioeconomic data from national and state-level sources, livelihood patterns, poverty conditions, and vulnerability profiles within the target areas. This helped identify existing knowledge gaps, policy priorities, and institutional frameworks relevant to gender-responsive climate adaptation and resilience planning.

(ii) Focus Group Discussions and Other Meetings: a) Focus Group Discussions (FGDs) were conducted at Kampung Sungai Kelambu, Kuala Langat Selatan; Kampung Belantik, Ulu Muda; and Taman Belimbing, Kubang Pasu with separate groups of women and men community members. Conducting separate discussions helped create a more inclusive and comfortable environment for participants to openly share their experiences, concerns, and adaptation needs. b) Meetings with local stakeholders to capture diverse perspectives on climate impacts, vulnerabilities, coping strategies, gender and household impact and women's interest in participating in the NbS activities and the support needed for project participation. These also provided additional insights into governance challenges, existing resilience measures, and opportunities for improved coordination and community support.

(iii) Brief Survey: A brief survey was administered to collect indicative quantitative information related to household vulnerabilities, climate impacts, livelihood challenges, gender related and community perceptions of climate risks. This was conducted in Kampung Belantik, Ulu Muda; and Taman Belimbing, Kubang Pasu. The survey complemented the qualitative findings from the focus group discussions by providing additional data on patterns and trends across the target communities.

(iv) Site Observations: Field observations were conducted at selected locations to assess physical and environmental conditions relevant to climate vulnerability and resilience. Observations focused on accessibility challenges, and safety and mobility concerns affecting different community groups, and also provided an opportunity to validate information from consultations and identify practical considerations.

2.3 Limitations

The assessment faced several limitations that should be considered when interpreting the findings. There was limited availability of sex-disaggregated climate vulnerability data at the local level, which constrained more detailed gender analysis. Time limitations also affected the depth and breadth of community consultations and stakeholder engagement activities. In addition, fieldwork activities faced logistical and operational constraints that limited access to certain locations.

3. Policy and Institutional Context

3.1 National Policy Context

Malaysia's policy landscape reveals increasing recognition of gender equality, social inclusion, climate resilience, and sustainable development. However, the integration of GESI within climate adaptation and NbS policies remains sparse. Existing national development, climate, environmental, and women's empowerment policies provide a broad enabling framework for inclusive adaptation, but important gaps remain in translating these commitments into operational, gender-responsive climate action at local levels.

The National Women's Policy (Dasar Wanita Negara) 2025–2030 and the Women's Development Action Plan (PTPW) 2025–2030 constitute Malaysia's primary gender policy framework. The policy adopts a "Whole of Nation" and "Whole of Government" approach and prioritises women's economic empowerment, leadership, security, and wellbeing.[1] Although not climate-specific, the policy, through its four priority areas, creates an enabling environment for integrating women's participation and leadership into climate adaptation, disaster risk reduction, and natural resource management initiatives. However, it does not contain a standalone pillar on "gender and climate change."

The Thirteenth Malaysia Plan (RMK13) contains several references that relate to gender equality, women's empowerment, and inclusive development, although climate change and gender are not yet fully integrated as a single dedicated thematic framework.[2] However, the plan contains a substantial environmental sustainability and climate resilience agenda, including strengthening flood mitigation and climate adaptation, addressing rapid climate change and rising temperatures, improving water security, disaster management, strengthening biodiversity conservation, and advancing the green economy and energy transition.

The National Policy on Climate Change 2009[3] provides the main national framework for climate governance and aims to mainstream climate considerations into development planning. However, the policy was developed before gender-responsive climate governance became internationally mainstream and contains limited explicit references to gender equality, social inclusion, or differentiated climate vulnerabilities. This creates implementation gaps in ensuring the specific needs of women, and socially marginalised groups are addressed. However, its emphasis on stakeholder participation, community resilience, and quality of life, provides an enabling foundation for integrating gender-responsive and socially inclusive climate approaches within newer national policies and climate commitments.

Malaysia's Nationally Determined Contribution (NDC) 3.0[4] reflects stronger progress toward inclusive climate governance. NDC 3.0 demonstrates substantially stronger integration of GESI principles compared with earlier Malaysian climate policies, although the integration remains partial. NDC 3.0 incorporates several elements aligned with GESI climate governance, particularly within its adaptation and resilience components. It emphasizes inclusive and participatory decision-making, protection of vulnerable populations, community-based adaptation, local communities, equitable resilience-building, and multi-stakeholder engagement in climate action. The NDC also recognizes that climate change impacts are not experienced equally and that vulnerable and marginalized groups require targeted consideration in adaptation planning. This reflects a shift from purely technical mitigation-focused

climate policy toward a more people-centred resilience framework. However, the document does not yet include explicit gender-responsive adaptation targets, sex-disaggregated climate indicators, dedicated GESI implementation mechanisms, gender-responsive budgeting commitments, or a detailed framework for monitoring differentiated climate impacts across social groups. Gender considerations remain embedded within broader equity and inclusion language rather than through specific accountability measures.

Malaysia is also developing its first National Adaptation Plan (MyNAP) to strengthen adaptation planning between 2026–2035.[5] MyNAP is expected to incorporate significantly stronger GESI considerations compared with earlier climate policies, particularly because adaptation planning inherently focuses on vulnerability, resilience, and community-level impacts. Although MyNAP is still under development and not yet fully finalized, available policy directions and consultation materials indicate that the framework is being designed to support inclusive adaptation planning, protection of vulnerable populations, community resilience, locally led adaptation approaches, and improved climate governance across sectors and communities. Malaysia’s adaptation planning process has increasingly recognized that climate risks disproportionately affect socially vulnerable groups, including women, rural communities, low-income households, elderly persons, and persons with disabilities. MyNAP appears to be moving toward a more GESI-responsive adaptation framework, but the extent of operational integration will depend on the final implementation structure, financing mechanisms, monitoring systems, and institutional coordination arrangements.

Therefore, from a social inclusion perspective, Malaysia’s policy framework increasingly recognizes the importance of vulnerable and marginalized groups within national development and climate governance frameworks, although implementation challenges remain. Women’s representation in environmental governance and political decision-making structures also remains relatively limited despite ongoing national commitments to gender mainstreaming and women’s empowerment.[6] Civil society organisations and human rights groups have further highlighted continuing structural barriers faced by women, vulnerable groups, and minority communities in participating meaningfully in public policy and environmental decision-making processes.[7] Overall, Malaysia possesses a moderately supportive enabling policy environment for GESI but it requires a more responsive climate adaptation and NbS implementation. National policies increasingly emphasize inclusion, resilience, participatory governance, and protection of vulnerable populations, creating stronger alignment with international climate adaptation frameworks and Adaptation Fund requirements. However, significant gaps remain in translating broad policy commitments into operational gender-responsive climate action, particularly through measurable indicators, institutional accountability mechanisms, gender-disaggregated climate data systems, and targeted inclusion strategies for vulnerable and marginalized groups. The proposed project therefore presents an important opportunity to strengthen practical implementation by systematically embedding GESI considerations throughout project planning, stakeholder engagement, monitoring systems, benefit-sharing mechanisms, and community-based adaptation activities.

Although Malaysia has established a relatively strong policy framework[8] , one major challenge is the limited mainstreaming of gender considerations within climate and environmental policies. While the National Policy on Women promotes women’s empowerment and participation, climate-related policies such as the National Policy on Climate Change contain limited operational guidance on addressing gender-differentiated climate impacts. As a result, adaptation planning often remains gender-neutral rather than gender-responsive, with insufficient recognition of women’s specific vulnerabilities, unpaid care responsibilities, livelihood constraints, and adaptive capacities.[9]

3.2 Institutional Context

Multiple agencies are involved in climate adaptation, water management, gender mainstreaming, and social protection. There are challenges related to weak institutional coordination across ministries and agencies responsible for gender, climate change, water management, forestry, and disaster risk reduction. GESI responsibilities are frequently fragmented, with limited cross-sectoral coordination mechanisms and unclear accountability for implementing inclusive climate adaptation strategies.[10] Local government agencies and technical departments may also have limited technical expertise, financial resources, or institutional capacity to

operationalise gender-responsive adaptation planning and monitoring.[11] Another key issue is the lack of sex-disaggregated and socially disaggregated data to support evidence-based planning. Climate vulnerability assessments and environmental management programmes frequently do not adequately collect data on gender, age, disability, ethnicity, income level, or indigenous status. This limits the ability to identify differential vulnerabilities and monitor equitable outcomes for vulnerable populations, including women, older persons, persons with disabilities, and low-income households.

Participation and representation gaps also remain significant. Women, vulnerable groups and marginalised communities are often underrepresented in environmental governance, water management committees, land-use planning processes, and disaster decision-making structures.[12] Cultural norms, unequal access to information, time poverty, language barriers, and unequal power relations can further restrict meaningful participation, particularly among rural women.[13] The Sendai Framework specifically emphasises inclusive disaster risk governance and the leadership of women and vulnerable groups in disaster preparedness and resilience-building. However, disaster management systems in practice may still adopt top-down approaches, with limited community-led participation and insufficient integration of local knowledge, gender-sensitive early warning systems, and inclusive recovery planning.[14]

Climate adaptation financing and project implementation processes may also inadequately address social inclusion. Many adaptation interventions continue to prioritise physical infrastructure and technical outcomes without sufficiently integrating social resilience, livelihood diversification, unpaid care burdens, or differentiated adaptive capacities.[15] There is also limited use of gender-responsive budgeting and inclusive benefit-sharing mechanisms within environmental and climate projects.[16]

At the international level, Malaysia has ratified or endorsed major frameworks including the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), the Paris Agreement, the Sustainable Development Goals (SDGs), and the Sendai Framework for Disaster Risk Reduction. However, translating these commitments into local implementation remains an ongoing challenge. While national-level commitments are relatively strong, implementation at state, district, and community levels is often uneven due to institutional, financial, and capacity constraints. Similarly, although the SDGs and Paris Agreement promote the principle of “leaving no one behind,” climate adaptation programmes may still overlook intersectional vulnerabilities, particularly where gender intersects with poverty, disability, age, and geographic isolation.[17] This creates risks that adaptation benefits may not be distributed equitably unless deliberate GESI measures are integrated into project design and implementation.

Overall, the key challenge is not the absence of policies, but the gap between policy commitments and implementation. Strengthening institutional capacity, improving inclusive participation mechanisms, enhancing gender-responsive data systems, supporting community-led approaches, and embedding accountability measures will be essential to ensure that NbS and climate adaptation interventions deliver equitable and inclusive resilience outcomes. While institutional awareness of gender and inclusion issues exists, implementation capacity varies across agencies. Stakeholders (FRIM -executing entity) noted the need for stronger coordination, improved data systems, and more systematic inclusion of vulnerable groups in climate planning (FRIM meeting with stakeholders 5th May 2026).

4. Socioeconomic and Gender Context within the Intervention Landscapes

4.1 Kuala Langat Peatlands (Selangor)

4.1.1 Kampung Sungai Kelambu, Kuala Langat Selatan, Selangor

From a GESI perspective, the findings from Kampung Sungai Kelambu reveal several important dimensions of vulnerability, participation, livelihood dependence, governance inclusion, and differentiated climate risk exposure linked to peatland fires in the Kuala Langat South Forest Reserve (KLSFR) landscape.

Differential Climate and Health Vulnerability

The discussion session highlighted that peatland fires generate prolonged smoke and ash exposure affecting respiratory health, eye irritation, and overall wellbeing for nearby residents. Because the village is located only approximately 5 km from the peatland fire area, the community experiences direct exposure to haze impacts over extended periods. From a GESI lens, this raises several differentiated vulnerabilities:

- i. Older persons, children, and persons with pre-existing respiratory conditions are likely disproportionately affected by prolonged haze exposure.
- ii. Women, particularly housewives and caregivers, may experience increased unpaid care burdens during haze periods, including caring for sick children or elderly family members.
- iii. Female-headed households (approximately 68–80 households) may face heightened economic and caregiving stress due to reduced labour flexibility and limited income diversification.
- iv. Outdoor agricultural workers, including women farmers, are exposed to direct environmental and occupational health risks during haze episodes.

The findings suggest that peat fire risk should not be framed solely as an ecological issue, but as a public health, social protection, and livelihood resilience issue.

Gendered Livelihood Roles and Economic Participation

The community economy is highly dependent on agriculture, with both men and women involved in farming activities. However, gender roles within livelihood systems appear differentiated. Women reportedly engage more in small-scale vegetable cultivation (water spinach/kangkong, cucumber, aubergine, okra), household-based food production, supplementary income activities, state-supported home economy programmes such as soap making, cookies, keropok crackers, and food processing. Men appear more represented in larger-scale farming initiatives, youth agricultural programmes, commercial agricultural participation, the “largest chilli garden” youth project involving 40 participants, reportedly all male.

This indicates women’s economic contributions are active but may remain concentrated in lower-income, informal, or home-based sectors. Agricultural development opportunities may not be equitably distributed between young men and young women. Existing livelihood programmes for women may reinforce traditional domestic economic roles rather than enabling access to higher-value agricultural entrepreneurship or climate-resilient farming leadership.

The exclusion of women from the chilli project may indicate gendered recruitment pathways, informal bias in youth participation selection, time poverty constraints, care responsibilities limiting participation, perceptions of “commercial farming” as male-oriented work. This is important because climate adaptation and peatland resilience initiatives that engage only male agricultural actors risk overlooking women’s existing contributions to local food systems and household resilience.

Land Tenure, Informality and Climate Risk Exposure

Community members reportedly rent agricultural land from the government and in some cases build homes on agricultural plots. This may create tenure insecurity, limited incentives for long-term sustainable land management, potential vulnerability to displacement or enforcement action, increased pressure for land conversion near peatland areas. Women may experience disproportionate insecurity where land ownership or rental arrangements are primarily under male names, female-headed households have weaker access to formal agricultural support, women have limited decision-making power over land-use choices.

Governance Participation and Representation

The village governance structure includes 13 JKKK committee members and approximately 4 women representatives. Their roles in the JKKK are in administrative work, ICT/computer-related functions, and women’s bureau roles. This indicates women have some degree of formal representation in local governance, there is an institutional entry point for gender-responsive engagement, and women are not entirely excluded from village leadership structures. However, the type of portfolios assigned to women suggests possible gendered governance

segmentation, women appear concentrated in supportive, administrative, or “women-related” functions, strategic sectors such as land management, agriculture, fire prevention, natural resource governance, or economic planning may still be male dominated.

A GESI-sensitive interpretation would therefore distinguish between numerical participation (presence), and transformative participation (decision-making influence). The findings suggest partial inclusion, but not necessarily equal influence in environmental governance.

Social Inclusion and Demographic Diversity

The village appears relatively socially cohesive, with a majority Malay Muslim population, small Indian minority community, no identified Indigenous population, presence of migrant workers from Indonesia and Pakistan in plantations and farming. Potential inclusion concerns include migrant workers who may face exclusion from consultation processes despite being directly involved in agricultural activities linked to peatland landscapes. Minority households may have less influence in local governance or programme access. Female-headed households (68-80 single mothers – divorced or widowed) may require targeted outreach due to economic vulnerability. The presence of many young residents working outside the village also suggests changing livelihood transitions and potential intergenerational differences in climate awareness and participation.

Implications for Climate Adaptation and Peatland Governance

The findings suggest several key GESI implications for peatland fire management and NbS programming:

a. Fire-risk planning should integrate social vulnerability: Peatland fire response planning should include health preparedness, gender-responsive emergency communication, support for vulnerable households, and haze-sensitive livelihood planning.

b. Women should be included beyond “women’s programmes”: Women are already active economic actors in agriculture and household resilience. Future programmes should include women in climate-smart agriculture, peatland monitoring, fire prevention committees, community-based restoration, livelihood diversification, technical and leadership training.

c. Youth engagement requires gender balance: The all-male chilli project indicates the need for gender-inclusive youth recruitment, targeted outreach to young women, flexible participation models accounting for unpaid care work.

d. Governance strengthening should move toward meaningful participation: Women’s representation within JKKK structures provides an entry point for participatory planning, gender-responsive community consultations, inclusive stakeholder mapping, capacity-building on climate governance.

Overall GESI Interpretation

Overall, the findings indicate that Kampung Sungai Kelambu demonstrates moderate existing community organisation, emerging but still limited gender inclusion in governance, strong livelihood dependence on climate-sensitive agriculture, significant exposure to peat fire-related health and economic risks, potential vulnerability among female-headed households and informal agricultural workers, limited integration of women into higher-value or strategic agricultural initiatives.

The discussion session provides important preliminary qualitative evidence that peatland fire impacts intersect with gender roles, livelihood structures, governance participation, health vulnerability, and social inclusion dynamics. These insights can inform the design of a gender-responsive and socially inclusive baseline, stakeholder engagement strategy, climate vulnerability assessment, and peatland restoration planning process for the KLSFR landscape.

4.2 Ulu Muda Watershed (Kedah)

4.2.1 Ulu Muda Community Engagement – Kampung Belantik, Ulu Muda

Data from a brief survey (52 respondents from Kampung Belantik and surrounding villages (Kampung Belantek Dalam & Luar, Kampung Bukit Berangan, Kampung Bukit Batu, Kampung Kota Aur, Kampung Surau Daerah Sik), with 65% women and mostly older adults shows that communities are highly dependent on forest and water resources, with strong awareness of environmental change and its livelihood impacts. A majority (81%) reported that environmental

changes have affected their income, particularly through reduced agricultural productivity, inability to tap rubber during rain, declining fish catches, crop losses, and disrupted daily work.

Overall Participation Interest (Summary)

Activity	Women: “Yes”	Men: “Yes”	Key insight
Tree planting (enrichment)	29	13	Very high interest
Seed collection	26	13	Strong interest
Community nursery	26	13	High interest
Slope restoration	23	12	Moderate-high
Riverbank planting	24	12	High
Watershed monitoring	27	15	Very high

Participation Preference by Gender

Pattern	Women	Men	Interpretation
Strong interest in nurseries	Very high	High	Women-led opportunity
Interest in forest restoration	High	High	Balanced interest
Monitoring roles	High	Very high	Men slightly stronger
Community committees	High (67% support women participation)	Lower perception on women’s participation (38% agree)	Perception gap

There is no lack of willingness among women—but perception differences exist between men and women. The Ulu Muda survey demonstrates strong community readiness for ecosystem restoration and climate adaptation interventions, with particularly high participation interest among women. However, structural gender gaps persist in decision-making and benefit distribution. With targeted design adjustments, the project has strong potential to shift from GESI-responsive to fully GESI-transformative implementation, ensuring equitable participation, leadership, and benefits across all social groups.

Based on the focus group discussion at Kampung Belantik with women from several villages in Ulu Muda, reveal important gender and social inclusion dynamics relevant to the proposed NbS and EbA interventions. While women demonstrate strong interest in environmental stewardship and community participation, their ability to engage is constrained by unpaid care responsibilities, limited decision-making power, time poverty, and economic considerations. The findings suggest that women should not be viewed as passive beneficiaries but as potential environmental stewards whose participation requires targeted support and enabling conditions.

Gendered Impacts of Climate Change and Environmental Degradation: Women experience indirect and care-related climate impacts

Women generally perceived themselves as less directly affected by climate variability than men engaged in rubber tapping. However, their narratives reveal substantial indirect impacts through household management, caregiving, and family livelihoods. Heavy rainfall and drought affect rubber production, reducing household income and increasing economic insecurity. Women bear the secondary consequences through household budgeting, caregiving, and managing daily domestic activities during extreme weather conditions.

The second discussion provided stronger evidence of gender-differentiated impacts. Women linked extreme heat to increased cases of heat stroke and reported heightened stress associated with caring for children during hot weather. Flooding was associated with emotional distress, loss of assets and livelihoods, increased caregiving

burdens, and safety concerns, particularly for children. Women also highlighted the exhausting nature of post-flood clean-up activities.

Women's Economic Agency and Livelihood Opportunities: Strong interest in income-generating opportunities

A consistent theme across both discussions was that women's willingness to participate in community nurseries increased significantly when linked to income generation. Participants repeatedly noted that volunteer activities compete with existing livelihood and household responsibilities, whereas paid opportunities create stronger motivation and justification for participation.

Women described themselves as seeking supplementary income opportunities, particularly homemakers and those engaged in informal economic activities such as food preparation and small-scale sales. Participants expressed enthusiasm about nursery activities if they provided reliable financial returns. The proposed buy-back mechanism for seedlings was viewed positively because it offers a predictable income stream and reduces market risk. Women also valued the opportunity to gain new knowledge and skills.

Time Poverty and Unpaid Care Work: Time constraints are the primary barrier to participation

Across both datasets, the most significant barrier identified by women was lack of time. Participants described balancing multiple responsibilities, including childcare, household management, religious activities, community obligations, and income-generating work. Many women emphasized that they are effectively working throughout the day as homemakers. Women repeatedly indicated that participation would depend on available free time and flexible scheduling. They suggested weekend activities, shift arrangements, or home-based nursery activities as more feasible participation models. The discussions reveal classic manifestations of "time poverty," where women's unpaid care responsibilities reduce their ability to engage in community leadership, environmental management, and economic opportunities.

Gender Norms, Decision-Making and Leadership: Women remain excluded from environmental governance

Participants consistently reported that decisions relating to forests, water, and community development are primarily made by men. Although women are active in implementing community activities, their participation in strategic decision-making remains limited. Most village committee positions are held by men, with only limited female representation. Several women internalized prevailing gender norms by expressing beliefs that leadership is more suitable for men and that women may lack the energy, confidence, or capacity to take on leadership roles due to their existing responsibilities. Participants also reported low confidence when considering new opportunities.

Evidence of restrictive household power dynamics

An important finding is that some women require their husband's permission to participate in activities outside the home. One participant explicitly stated that women without husbands may find participation easier because they do not need to seek approval. This indicates that barriers are not only logistical but also socio-cultural, reflecting underlying gender power relations that influence women's mobility, participation, and access to opportunities.

Social Inclusion Considerations

a) Single mothers face distinct challenges: Single mothers were identified as a vulnerable subgroup within the community. While some participants viewed single mothers as having greater autonomy, others noted that their full-time work responsibilities make participation difficult. This highlights the diversity of women's experiences and the need to avoid treating women as a homogeneous group.

b) Youth outmigration: Participants reported significant youth migration to urban areas and declining interest among young people in traditional livelihoods such as rubber tapping. This may reduce the availability of youth participants for conservation activities while simultaneously creating opportunities to engage remaining youth in new green livelihood pathways.

Community Trust and Environmental Stewardship: Strong environmental commitment but concerns about effectiveness

Women strongly supported forest restoration and conservation activities. However, they expressed concerns that restoration efforts could be undermined by ongoing logging activities. Participants questioned whether planted trees

would ultimately be protected, reflecting concerns regarding accountability and sustainability. This indicates that women possess valuable environmental knowledge and a strong conservation ethic that can be leveraged through community stewardship approaches.

Men only Focus Group Discussion findings show recognition of the involvement of men, women, and youth, but does not specifically address participation of other vulnerable groups such as the elderly, single mothers and low-income households. Although women's participation is acknowledged by the men, their roles are mostly limited to "lighter" and less technical tasks, reinforcing traditional gender stereotypes. The men stated that when water supply is disrupted: washing clothes becomes difficult, household chores increase and women must search for alternative water sources. Environmental changes disproportionately affect women because they typically bear primary responsibility for household and caregiving duties. The men expressed interest in: seedling production, nursery maintenance and paid planting activities. However, participation is largely framed through traditional gender roles, with men associated with physically demanding fieldwork and women mainly assigned to nursery-based and supportive tasks. In addition, women's and youth participation in decision-making processes (e.g., site selection, species choice, and payment mechanisms) is not clearly established, raising concerns that benefits and influence may remain concentrated among more dominant actors.

Overall GESI Interpretation

The qualitative findings indicate that women in Ulu Muda possess strong interest in environmental stewardship and livelihood diversification but face significant structural and practical barriers to participation. The most important constraints are time poverty arising from unpaid care work, limited decision-making power, gender norms around leadership, and the need for economically meaningful incentives. A gender-responsive NbS approach that combines livelihood opportunities, flexible participation arrangements, leadership development, and targeted inclusion measures has strong potential to increase women's agency, strengthen household resilience, and improve the long-term sustainability of ecosystem restoration efforts. However, qualitative findings from the men shows awareness of gender roles and youth participation, but still largely reflects traditional gendered divisions of labour. With clearer targets, inclusive decision-making structures, and stronger economic empowerment strategies, the project could move towards being fully GESI-transformative.

4.2.2 GESI Analysis of WWF Ulu Muda Conservation and Restoration Programme

Women's Participation: Present but Peripheral

Women appear to be actively involved in community awareness activities and are described as "very involved" in engagement programmes. This indicates that women are already socially engaged and willing to participate in conservation-related activities when opportunities are accessible and culturally acceptable. However, women's participation currently appears concentrated in awareness activities, supporting roles, community events, school engagement, nursery maintenance assistance. Women do not appear to be substantially involved in restoration planning, technical restoration work, forest governance discussions, contractor roles, ecological monitoring, decision-making structures, water governance committees, wildlife conflict management. This suggests a pattern of gendered participation where women are included primarily in "soft" or community-facing activities rather than technical or leadership functions. Thus in the WWF project women are participating, but mostly as beneficiaries or supporters rather than as decision-makers or resource managers.

Structural Barriers to Women's Leadership

Several implicit structural barriers emerge from the discussion:

a. Gatekeeping Through Male Community Leadership: Participation pathways appear mediated through male authority structures, particularly the Penghulu (village head): *"Have to engage with the Penghulu first and if he agrees then can proceed."* This indicates that women's participation may remain dependent on male approval structures rather than direct engagement mechanisms.

b. Time-Sensitive and Contractor-Driven Activities: Forest restoration work was outsourced to contractors due to implementation urgency. While practical, this may unintentionally exclude women from paid restoration labour, nursery enterprises, seed collection, ecological monitoring, and restoration employment opportunities.

c. Limited Recognition of Care Roles: Women’s existing unpaid labour burdens are not yet integrated into programme design. For example, nursery watering is supported informally by “*a lady who helps us*,”. There was no indication of formal recognition, training, payment equity, or leadership progression. This reflects a common issue where women’s contributions are treated as supplementary rather than professionalized.

Social Inclusion Analysis

Equity Between Villages and Social Cohesion: A significant social inclusion issue identified is inter-village equity: “*If only involve one kampung, then other kampungs might have issues like jealousy.*” This reflects the importance of fair distribution of benefits, transparent engagement processes, rotational participation, inclusive communication. The concern highlights that conservation benefits can unintentionally create social tension if opportunities are unevenly distributed.

Forest Governance Constraints and Participation Challenges - The WWF project reveals strong institutional barriers affecting inclusive conservation:

a. Restricted Access to Critical Areas: The most degraded and sedimented areas are inaccessible due to: logging road dependence, safety concerns, forestry approvals. As a result restoration is occurring in more accessible but less degraded areas and community participation in deeper forest restoration is constrained.

b. Centralized Decision-Making: Approval authority appears concentrated within state government, forestry department, technical agencies. Community voices, including women appear to have limited influence over site selection, restoration priorities, species selection, enforcement decisions. This creates a top-down conservation model despite community empowerment objectives.

Overall GESI Interpretation

The WWF conservation programme in the Ulu Muda landscape demonstrates several positive elements relevant to GESI, particularly through its focus on community empowerment, ecosystem restoration, water security, and local livelihood engagement. However, the programme also reveals structural limitations in participation, decision-making, and equitable access to opportunities, especially for women. The project operates within a complex governance landscape involving forest reserves, water catchment forests, production forests, ecological linkages, and state-level approvals. These governance structures strongly influence who participates, who benefits, and who has authority over conservation decisions.

4.3 Kubang Pasu Urban Areas (Kedah)

Kedah – Taman Belimbing, Kubang Pasu

Working Age Population, Kubang Pasu (15–64 years)

Category	Female	Male	Total
Working age (15 - 64)	~84,100	~81,300	165,400

Source: DOSM age-sex distribution

The working-age population makes up ~65.8% of total population and female share is slightly higher in the working age group. Women form a major share of economically active population, but many are likely in informal work (retail, agriculture support, home-based work) and unpaid care work. Climate shocks (floods/heat) disproportionately affect women’s income continuity (DOSM district - age-sex distribution estimates for Kubang Pasu 2023–2024) and they also experience time poverty due to care and livelihood burden.

Ageing Population, Kubang Pasu (65 years and above)

Category	Female	Male	Total
Elderly (65+)	~12,300	~9,900	22,200

Source: DOSM district age structure and sex ratio trends

Elderly population is about 8.8 -- 9.1% of total population and women clearly outnumber men in older age groups (DOSM district, age structure and sex ratio trends 2023-2024). Older women are more likely to live alone or in widowhood, depend on family support, have lower lifetime savings due to past labour market inequality and higher vulnerability during floods (mobility, health, evacuation needs).

During an informal discussion held at KEMAS, Kubang Pasu the trainers and teachers mentioned that in their adult education classes about 50% are single mothers (ibu Tunggal), abandoned wives (ibu tertinggal) and widows. There is a potential large group of women who can benefit from the proposed capacity building, livelihood and climate adaptation related activities as proposed in the project.

Livelihood: Kubang Pasu comprises communities whose livelihoods are closely linked to agriculture, informal economic activities, small businesses, public sector employment, and ecosystem resources. Many households depend on climate-sensitive sectors, particularly agriculture and small-scale rural enterprises, making them vulnerable to flooding, drought, and changing rainfall patterns.[18] Women play important roles in household management, caregiving, food security, and informal income generation, particularly through home-based enterprises and agricultural support activities.[19] Demographic trends indicate that women make up a slightly larger share of both the working-age and elderly populations in Kubang Pasu, while the proportion of older persons is increasing.[20] Women and elderly persons are often more exposed to climate risks due to caregiving responsibilities, lower access to formal income and resources, mobility limitations, and greater dependence on local environmental conditions. Data from a brief survey conducted in Taman Belimbing, Kubang Pasu (17 females and 13 males) for the question on whether women in their households would participated in the NbS activities an overwhelming majority of women said yes to all 6 activities and men also predominantly said yes to the women in their households participating in these activities.

Would women in your household participate in the following activities?

Activity	Female				Male			
	Yes	No	Maybe	Blank	Yes	No	Maybe	Blank
i. Tree seedling nursery (community nurseries)	15 (88%)	1 (6%)	1 (6%)	-	10 (76%)	1 (8%)	1 (8%)	1 (8%)
ii. Tree planting for mini forests	16 (94%)		1 (6%)	-	8 (62%)	3 (23%)	2 (15%)	
iii. Maintenance of planted trees	13 (76%)	3 (18%)	1 (6%)	-	7 (54%)	3 (23%)	2 (15%)	1 (8%)
iv. Eco-warden	11 (64%)	2 (12%)	3 (18%)	1 (6%)	6 (47%)	2 (15%)	3 (23%)	2 (15%)
v. Decision-making committee for NbS management	12 (71%)	1 (6%)	4 (23%)	-	7 (54%)	2 (15%)	3 (23%)	1 (8%)
vi. Data collection & climate monitoring	11 (64%)	3 (18%)	3 (18%)	-	6 (47%)	2 (15%)	3 (23%)	2 (15%)

Gender Roles and Division of Labour - Consultations indicate that women are primarily responsible for household management, cleaning after floods, childcare and eldercare, food preparation, and household health management. In a brief survey conducted in Taman Belimbing, Kubang Pasu, the majority of female (76%) and male (70%) participants said they shared the additional household responsibilities equally but 18% of women and 15% of men said that it was mostly done by women.

During climate-related disasters, who manages additional household responsibilities?	Female	Male	Total
Shared equally	13 (76%)	9 (70%)	22
Mostly men	1 (6%)	2 (15%)	3
Mostly women	3 (18%)	2 (15%)	5
Total	17 (100%)	13 (100%)	30

Most women (94%) respondents said mostly men attend community meetings or receive information on climate disasters. Male respondents said mostly men (46%) and 54% said mostly women.

Who usually attends community meetings or receives information about climate disasters?			
	Mostly men	Mostly women	Total
Female	16 (94%)	1 (6%)	17
Male	6 (46%)	7 (54%)	13
Grand Total	22 (73%)	8 (27%)	30

The Focus Group Discussion (FGD) with the women highlighted several important gender-related dimensions of climate vulnerability in Taman Belimbing, Kubang Pasu.

- i. **Extreme Heat as Climate Stressor: Female** participants identified extreme heat (“panas melampau”) as the most frequent climate-related issue affecting the community. Unlike nearby areas in Jitra that experience recurrent flooding, participants explained that Taman Belimbing is located on relatively higher ground and therefore does not experience direct flood impacts. However, during flood events in surrounding areas, the settlement becomes relatively isolated, described by participants as “seperti pulau” (like an island), as access roads become surrounded by floodwaters. Although flooding is not the primary hazard within the community itself, climate variability in the surrounding areas still disrupts mobility and access.
- ii. **Impacts on Women’s Caregiving and Mobility Responsibilities:** Women participants highlighted that prolonged heat conditions significantly affect their caregiving responsibilities, particularly in relation to school-going children. Participants explained that travelling by motorcycle during periods of extreme heat is uncomfortable and potentially unsafe, especially for children who may be exposed to heat stress or heat stroke. Women, who are primarily responsible for transporting children to and from school, reported increased difficulties managing daily mobility during hot weather conditions. Although some households own cars, participants noted that rising fuel costs make regular car use financially burdensome. As a result, some families increasingly rely on e-hailing services such as Grab, which further increases household transportation expenses. These findings demonstrate how climate-related heat stress disproportionately intensifies women’s unpaid caregiving and mobility responsibilities.
- iii. **Restrictions on Daily Activities and Community Mobility:** Participants also reported that extreme heat limits outdoor activities and reduces daytime mobility within the community. Women noted that prolonged exposure to heat discourages movement outside the home and affects routine activities, social interaction, and daily errands. This reduction in mobility has broader implications for wellbeing, productivity, and social participation within the community.
- iv. **Increasing Household Financial Pressures:** Female participants further highlighted the growing economic burden associated with prolonged hot weather conditions. Households reported significantly higher utility costs due to increased use of air-conditioning and greater water consumption during periods of extreme heat. Despite rising living expenses, participants stated that household incomes have generally remained unchanged, creating additional financial stress for families.

The findings indicate that climate-related heat stress produces important gendered impacts, particularly through increased caregiving responsibilities, rising household expenditure management burdens, and mobility constraints experienced by women.

The Focus Group Discussion (FGD) with the men highlighted several important gender-related dimensions and demonstrated that women experience disproportionate burdens from flooding and climate-related stresses due to their socially assigned caregiving and household management responsibilities.

- i. **Women Carry a Disproportionate Burden During Flood Events:** Participants consistently noted that women are more heavily affected during floods because they are primarily responsible for household cleaning, caregiving, laundry, and restoring the home after floodwaters recede. Flooding was described as particularly exhausting for women because of the increased domestic workload associated with mud, damaged belongings, and repeated cleaning after recurrent flash floods. Women also experience indirect economic burdens. Rising household repair and cleaning costs occur without corresponding increases in household income, especially for families dependent on informal livelihoods or small businesses. Emotional and psychological stress was also highlighted, including anxiety, emotional pressure, and mental fatigue resulting from repeated flood exposure and loss of household items.
- ii. **Elderly Care Responsibilities Increase Women's Vulnerability:** The discussion highlighted that Kubang Pasu has a relatively large elderly population, and floods create serious mobility and safety challenges for older persons. Participants noted that elderly people often struggle to evacuate or move during flood events. As women are commonly responsible for caring for elderly family members, disasters increase the physical and emotional burden on women caregivers. This demonstrates how climate risks intersect with gender and ageing. Women's caregiving responsibilities increase during disasters, particularly in households with older persons or persons with disabilities.
- iii. **Women's Participation in Community Decision-Making Exists but Remains Structured Through Existing Social Roles:** Participants stated that women are involved in community discussions and decision-making processes related to Eco-Park development and local planning. Women were represented among local councillors and community leaders, and women-led community groups such as COMBI played active roles in local initiatives. The leadership of a woman chairperson in the Taman Belimbing Eco-Park project was cited as a positive example of women's participation. However, the discussion also suggested that women's participation is often mediated through socially accepted caregiving and community support roles rather than through technical or leadership positions alone.
- iv. **Domestic Responsibilities Continue to Shape Women's Ability to Participate:** A major theme emerging from the discussion was that women's participation in environmental or community projects is constrained by domestic responsibilities. Participants explained that women's involvement depends heavily on support and cooperation from husbands and family members. Household duties, childcare, and caregiving remain women's primary responsibilities, limiting the time and flexibility available for participation in project activities. At the same time, participants acknowledged that involvement in community projects can provide women with social interaction, emotional relief, and opportunities to reduce stress associated with domestic pressures. Participation was therefore viewed not only as economic or environmental engagement, but also as psychosocial support.
- v. **Childcare Support is Necessary for Women's Inclusion:** The FGD highlighted the importance of childcare support to enable women's participation in community nursery activities, Eco-Park programmes, and community-based environmental initiatives. Participants proposed family-friendly and community-supported spaces where children could be supervised while women participate in project activities. Examples such as playgrounds integrated into mosque compounds were discussed as practical community models. This suggests that gender-responsive project design should include childcare considerations, safe community spaces, and flexible participation arrangements.
- vi. **Different Age Groups of Women and Girls Require Different Engagement Approaches:** Participants identified different roles for women and girls across age groups. Youth and adolescent girls were considered suitable for Citizen Science activities, biodiversity monitoring, and environmental data collection because they are more mobile, technologically familiar, and available for volunteer activities. Meanwhile, middle-aged women, particularly those around their 40s, were identified as more likely to participate in community nursery and Eco-Park maintenance activities. Younger working mothers were seen as having more limited availability due

to formal employment and childcare commitments. These findings demonstrate the importance of age-responsive and gender-responsive engagement strategies rather than treating women as a single homogeneous group.

- vii. **Climate Adaptation Infrastructure has Social and Gender Co-Benefits:** Participants viewed retention ponds and mini forests not only as flood mitigation infrastructure, but also as community wellbeing assets. Well-maintained Eco-Parks and green spaces were seen as reducing local temperatures, improving biodiversity, creating recreational opportunities, and supporting healthier lifestyles. Importantly, elderly persons were identified as frequent users of Eco-Park facilities, especially during cooler morning and evening periods. Participants also noted efforts to improve accessibility for persons with disabilities (OKU). This demonstrates that nature-based solutions can generate broader social inclusion, health, and wellbeing benefits when designed with community needs in mind.

Overall GESI Interpretation

Overall, the findings show that climate risks in Kubang Pasu are strongly gendered. Women experience heightened domestic, caregiving, emotional, and economic burdens during climate-related events, while also playing critical roles in community resilience, environmental stewardship, and local adaptation initiatives. Gender-responsive adaptation planning should therefore integrate caregiving realities, childcare support, women's leadership opportunities, age-sensitive engagement strategies, and inclusive community participation mechanisms.

5. Gender Assessment of FRIM as Executing Agency (Score Card)

The assessment shows substantial variation among respondents, suggesting that GESI implementation is not yet institutionalized and is understood differently across staff. Scores range from very low (0.1–0.5) to moderate (2.5), indicating that GESI practices may depend on individual experience rather than organization-wide systems.

Overall Average Score by Assessor

Assessor	Approximate Average Score (0–4)	Rating
R	2.5	Moderate / Emerging
A	0.5	High Risk
N*	0.3–0.5	High Risk
S	0.2	High Risk

*Excluding "Not Relevant" responses.

Combined Organisational Score -The overall average across all assessors is approximately **0.9–1.1**, placing the organization in the **High Risk to Weak** category, indicating limited institutional integration of GESI and a need for substantial capacity strengthening.

Classification based on the aggregate assessment:

Category	Assessment
Overall Rating	Weak
Risk Level	Moderate–High
Readiness for GESI Requirements	Low
Recommendation	Engage as project partner with mandatory capacity strengthening plan

6. Gender Action Plan 2027-2031

Impact Statement

The project will strengthen gender equality, women's empowerment, and social inclusion in climate adaptation, ecosystem restoration, and water resource governance in Malaysia by ensuring that women, youth, low-income households, and other vulnerable groups can participate meaningfully in adaptation planning, implementation, monitoring, and benefit-sharing processes. Through inclusive NbS and EbA interventions, the project will increase access to climate knowledge, technical skills, leadership opportunities, decision-making platforms, and climate-resilient livelihood benefits, while reducing barriers related to gender norms, unpaid care responsibilities, limited access to information, and unequal representation. In the longer term, the project will contribute to more equitable and resilient communities where adaptation investments generate social, economic, and environmental benefits that are accessible to all members of society.

GAP Goal

Women, youth, and other vulnerable groups have increased agency, leadership, equitable access to benefits, and meaningful participation in climate adaptation, ecosystem restoration, and water resource governance, resulting in more inclusive, resilient, and climate-adaptive communities. The project seeks to support a transition from participation to leadership, from unpaid environmental stewardship to recognized economic opportunities, from male-dominated governance to shared decision-making, and from unequal adaptation benefits to equitable resilience outcomes for all social groups.

Outcome Statement

Women, youth, and vulnerable groups increase their knowledge, skills, leadership, and participation in climate adaptation, ecosystem restoration, and water governance, while community and institutional stakeholders apply gender-responsive and socially inclusive approaches that strengthen equitable access to benefits, resilience, and adaptive capacity.

Output Statement

Output 1: Gender-responsive climate governance and participation in climate adaptation strengthened

Women, youth and other vulnerable groups are meaningfully represented and actively participate in project governance, consultation, and decision-making processes related to climate adaptation, water management, and ecosystem restoration. Activities include gender-sensitive stakeholder mapping, establishment of gender-balanced committees and stewardship groups, implementation of inclusive consultation and FPIC-sensitive engagement procedures, leadership development for women, capacity building on GESI-responsive governance, and integration of disaggregated data into project monitoring systems. Targets are at least 40% women and 20% youth representation in project-supported governance structures, application of GESI-responsive participation guidelines in all consultations, and participation of at least 200 women and vulnerable group representatives in planning and consultation activities.

Output 2: Women's climate resilience, skills and livelihood opportunities enhanced through Nature-based Solutions

Women, youth, and vulnerable households gain technical skills, leadership competencies, and economic opportunities through participation in ecosystem restoration, community nurseries, citizen science, Eco-Warden programmes, and climate-resilient livelihood initiatives. Activities include gender-responsive training, targeted recruitment, entrepreneurship and leadership development, and measures to reduce participation barriers. Targets include a minimum of 50% women among trainees and citizen scientists, 40% women Eco-Wardens, four operational community nurseries with at least 50% women participation, and at least 150 women accessing livelihood opportunities.

Output 3: Equitable access to project benefits, ecosystem services, and climate resilience outcomes strengthened

Women, youth, and vulnerable households equitably benefit from adaptation investments, ecosystem restoration, and improved water security. Activities include inclusive benefit-sharing mechanisms, awareness programmes, accessible grievance systems, and monitoring of benefit distribution. Targets include at least 50% women, 20% youth

and 20% vulnerable groups among direct beneficiaries, implementation of inclusive grievance mechanisms at all project sites, and evidence of equitable access to project benefits and participation in environmental management processes.

Gender Action Plan 2027-2031

GAP Outcome 1: Gender-responsive governance and participation in climate adaptation strengthened

Activities	Indicators	Targets	Timeline	Responsibilities
Conduct gender-sensitive stakeholder mapping and social inclusion assessments.	Stakeholder mapping completed and informs project implementation.	Assessments completed in all project sites.	Year 1	FRIM, Gender Specialist, Implementing Partners
Establish gender-balanced community committees, stewardship groups and governance structures.	% women and youth represented in project-supported committees.	≥40% women; ≥20% youth representation.	Years 1–5	FRIM, Local Authorities, Community Organisations
Implement inclusive consultation and FPIC-sensitive engagement procedures.	% consultations applying GESI-responsive guidelines.	100% of consultations apply GESI guidelines.	Years 1–5	FRIM, Implementing Partners
Deliver leadership development and mentoring programmes for women.	Number of women trained and assuming leadership roles.	At least 100 women leaders trained.	Years 2–5	FRIM, NGOs, Women's Groups, Gender Specialist
Integrate sex-, age-, and socio-economic disaggregated data into monitoring systems.	Disaggregated data reported annually.	Annual reporting completed.	Years 1–5	FRIM, PMU, Gender Specialist
Gender-responsive capacity training for project staff (FRIM), government agencies, extension workers, JKKK members and community leaders.	All project staff involved in implementing agencies trained	80% of implementing project staff trained	Years 1–5	UNDP, FRIM, Gender Specialist

GAP Outcome 2: Women's climate resilience, skills and livelihood opportunities enhanced through Nature-based Solutions

Activities	Indicators	Targets	Timeline	Responsibilities
Deliver gender-responsive training on restoration, nurseries, biodiversity monitoring, citizen science and climate adaptation.	% women among trainees.	≥50% women participants.	Years 1–5	FRIM, Community Organisations, Gender Specialist
Establish and support community nurseries with targeted recruitment of women and youth.	Number of nurseries established; % women participants.	5 nurseries operational; ≥70% women participants and 20% from vulnerable group	Years 1–5	FRIM, Community Committees

Support Eco-Warden and citizen science programmes.	Number of Eco-Wardens and citizen scientists trained.	20 Eco-Wardens (≥50% women); 300 citizen scientists (≥50% women).	Years 2–5	FRIM, Local Partners
Deliver women's entrepreneurship and livelihood training (economic empowerment).	Number of women accessing livelihood opportunities.	At least 300 women benefit from project-supported livelihood opportunities.	Years 2–5	FRIM, NGOs, Government Agencies, Gender Specialist
Provide targeted outreach and support to female-headed households and vulnerable groups.	Number of vulnerable women participating.	Participation targets achieved across all project sites. (≥20% women).	Years 1–5	FRIM, Community Organisations, Relevant agencies (JKM, KEMAS)

GAP Outcome 3: Equitable access to project benefits, ecosystem services and climate resilience outcomes strengthened

Activities	Indicators	Targets	Timeline	Responsibilities
Integrate GESI criteria into beneficiary selection and benefit-sharing mechanisms.	% women and youth among direct beneficiaries.	≥50% women; ≥20% youth. ≥20% vulnerable group	Years 1–5	FRIM, PMU, Implementing Partners
Conduct awareness, environmental education and outreach programmes targeting women and youth.	Number of women and youth participating.	Participation monitored annually. ≥50% women ≥20% youth ≥20% vulnerable group	Years 1–5	FRIM, Community Organisations, NGOs
Support inclusive participation in watershed monitoring, restoration and stewardship programmes.	Participation rates of women and vulnerable groups.	Participation monitored annually. ≥50% women ≥20% youth ≥20% vulnerable group	Years 1–5	FRIM, Local Authorities
Establish accessible grievance redress and feedback mechanisms.	Functioning grievance mechanism established.	100% of project sites implement inclusive grievance mechanisms.	Years 1–5	FRIM, Safeguards Team
Monitor benefit distribution and document gender-responsive good practices.	Women reporting equitable access to benefits and decision-making opportunities.	≥70% report equitable access; ≥80% report improved ability to contribute to adaptation decisions.	Years 2–5	FRIM, Gender Specialist, PMU

7. Gender Equality and Social Inclusion (GESI) Budget

Activity / Budget Area	Activity Budget (USD)	GESI Attribution (%)	GESI Budget (USD)	Rationale
DIRECT GESI ACTIVITIES				

Output 3.1.1 – National GESI Specialist supporting implementation of the GAP, stakeholder engagement, monitoring, reporting and institutional capacity	120,000	100%	120,000	Dedicated GESI technical support throughout implementation.
Output 3.1.1 – Stakeholder mapping, social profiling and Community Participation Framework	20,000	100%	20,000	Gender-responsive stakeholder mapping, beneficiary selection and participation framework.
Output 3.1.1 – GESI, safeguards, GRM and inclusive participation workshops	30,000	100%	30,000	Capacity development on gender equality, safeguards, grievance mechanisms and inclusive participation.
Output 3.1.1 – Community consultations, outreach and participation support	35,000	100%	35,000	Inclusive consultations and targeted participation of women, youth and vulnerable groups.
Output 3.1.4 – Design and production of awareness and training materials	45,000	100%	45,000	Gender-responsive communication and awareness materials.
Subtotal Direct GESI Budget			250,000	
COMPONENT 1 – Climate Intelligence and Institutional Uptake				
Outputs 1.1–1.3	1,750,000	5%	87,500	Integration of social vulnerability analysis, sex-disaggregated information, inclusive planning guidance and GESI-responsive institutional uptake.
Subtotal Component 1			87,500	
COMPONENT 2 – Ecosystem-based Adaptation and Nature-based Solutions				
Output 2.1 – Climate-resilient peatland restoration	1,350,000	5%	67,500	Inclusive community engagement, livelihood participation and gender-responsive implementation.
Output 2.2 – Climate-adaptive watershed management	2,550,000	8%	204,000	Strong community participation, community nurseries, stewardship, benefit-sharing and livelihood opportunities.
Output 2.3 – Urban Nature-based Solutions	1,300,000	10%	130,000	Community nurseries, Eco-Wardens, citizen science, accessible design and inclusive public participation.
Subtotal Component 2			401,500	
COMPONENT 3 – Capacity, Stewardship and Knowledge Management				
Output 3.1 – Inclusive community participation, stewardship and livelihoods	788,000	35%	275,800	Primary community engagement component supporting women's leadership, nurseries, citizen science, stewardship and livelihood opportunities.
Output 3.2 – Technical capacity development	340,014	20%	68,003	GESI integrated across technical training, institutional capacity development and monitoring.

Output 3.3 – Knowledge management, learning and dissemination	260,000	20%	52,000	Gender-responsive knowledge products, communication, learning and dissemination.
Subtotal Component 3			395,803	
TOTAL ESTIMATED GESI-CONTRIBUTING BUDGET			1,134,803	

Summary

Item	Amount (USD)
Direct GESI Budget	250,000
Component 1 GESI-Contributing Budget	87,500
Component 2 GESI-Contributing Budget	401,500
Component 3 GESI-Contributing Budget	395,803
Total GESI-Contributing Budget	1,134,803
Total Project Budget	9,216,590
GESI Share of Total Project Budget	12.3%

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Annex 8: Environmental and Social Management Framework (ESMF)

1. Introduction

The project “Nature Based Solutions for Water Resilience in Malaysia” is classified as Moderate Risk as per UNDP’s Social and Environmental Screening Procedure (SESP). Since the project includes a range of activities and sub-projects with yet unknown design parameters and uncertain social and environmental risks that cannot be fully assessed during the project appraisal, this Environmental and Social Management Framework (ESMF) has been developed to guide further assessment and management of the expected environmental and social risks of the project based on the applicable UNDP’s SES requirements and the national law.

The ESMF presents the:

- social and environmental risks of the relevant project outputs/activities that require further attention;
- prohibited actions that the project cannot support;
- applicable UNDP SES requirements;
- applicable legislation;
- required stakeholder engagement and transparency measures; and
- integrated recommendations for meeting the UNDP requirements and country law during the project implementation through project-wide (horizontal) and targeted (outcome/activity-specific) S&E risk treatment measures.

2. Social and Environmental Risk Screening

The project involves potential social and environmental risks outlined in the table below. The SESP, updated at project design stage in June 2026, confirms the project’s Moderate Risk classification. Potential adverse social and environmental risks and impacts are largely site-specific, limited in scale, and can be addressed through recognised good international practice, targeted mitigation measures and stakeholder engagement.

The updated SESP confirms that neither a full Environmental and Social Impact Assessment (ESIA) nor a Strategic Environmental and Social Assessment (SESA) is required. The following UNDP SES Principles and Standards are triggered: P1 (Human Rights), P2 (Gender Equality), P3 (Sustainability), P4 (Accountability), S1 (Biodiversity Conservation), S2 (Climate Change and Disaster Risks), S3 (Community Health, Safety and Security), S5 (Displacement and Resettlement – low magnitude), S7 (Labour and Working Conditions), and S8 (Pollution Prevention and Resource Efficiency).

Assessments and stakeholder consultations conducted during project formulation confirmed no customary land claims, livelihood dependencies or distinct cultural associations between Indigenous Peoples and the intervention areas; UNDP SES Standard 6 (Indigenous Peoples) is not triggered (noting that the potential risk had been identified at Concept Note screening stage).

1: Outputs or activities proposed in the project (Risk Causes)	2: Specific S&E risks caused by these outputs/ activities (Risk Events) (see Checklist)	3: Comments	4: Risk Significance (L/M/S/H)	5: Assessments or management measures to address these risks during design and implementation of the relevant outputs or activities
Output 2.1: Peatland hydrological management and restoration at Kuala Langat Selatan Forest Reserve (KLSFR), Selangor	S1: Disturbance to peatland ecosystems, hydrology, or biodiversity during rewetting, dam/bund installation, or monitoring equipment placement. S2: Risk of maladaptation if hydrological interventions are not calibrated to local peat conditions. S3: Community safety risks from unstable peat surfaces, flooding, or fire events. S5: Disruption to land and agricultural livelihoods. S7: OHS risks for field workers. S8: Potential fuel/lubricant spills during equipment use; waste from construction materials.	Peatland ecosystems are sensitive; interventions are restorative but disturbance risk exists during work. Fire events during dry periods could affect workers.	M	Ecological and hydrological assessment prior to work. Minimize construction footprints. OHS plan for field workers including fire risk protocols. Spill prevention measures. Groundwater monitoring system. Conduct work during low-fire-risk periods where possible. Active planning and consultation to minimise impacts to agricultural land users. These measures, together with other relevant measures outlined in this ESMF, will be consolidated into a single, integrated site-specific ESMP.
Output 2.2: Climate-adaptive watershed management, enrichment planting and erosion control at Ulu Muda Watershed, Kedah	S1: Disturbance to natural forest habitat during enrichment planting. Potential invasive species introduction. S2: Risk of maladaptation if planting/erosion prevention measures not calibrated to projected rainfall. S3: Community Worker safety in remote watershed terrain and drowning risks. S5: Risk of access restrictions to land or water resources for local community. S7: OHS for field workers. S8: Sediment disturbance, chemical or fuel spills during earthworks.	Watershed terrain and sensitive habitat increase risk. Sediment management and field works require careful management. Participatory planning with MADA farmers required.	M	Use native/non-invasive species only for planting. Conduct ecological screening before planting sites finalized. OHS protocols for remote site workers. Participatory planning with MADA farmers and downstream communities. Spill prevention for earthworks. Gender-responsive engagement in community nurseries. These measures, together with other relevant measures outlined in this ESMF, will be consolidated into a single, integrated site-specific ESMP.

Output 2.3: Urban retention-pond enhancement and Nature-based Solutions – Kubang Pasu District, Kedah (peri-urban flood management areas)	S1: Disturbance to urban aquatic ecosystems, drainage habitat, or vegetation during pond enhancement and NbS installation. Risk of invasive species introduction. S2: Maladaptation risk if NbS design standards are not aligned with projected rainfall intensities. S3: Public safety risks during and after construction. S7: OHS for contractors and workers. S8: Construction waste, sediment, lubricant/chemical spills.	Urban setting increases public safety risk. Construction activities require careful waste and safety management. Integration with municipal DID drainage standards required.	M	Ecological screening of retention pond sites before work. Use native species only for planting. Construction safety plan and public access restrictions during works. Waste management and spill prevention. Gender-responsive community engagement. Liaison with Kubang Pasu local authority.
Outputs 2.1–2.3: S3 – Community Health, Safety and Security	Poorly sequenced or inadequately designed field interventions across peatland, watershed, and urban contexts create conditions for unintended environmental and social impacts; equipment risks near communities; peat fire risk during works.	Construction and infrastructure works generating physical, environmental, and public health risks including traffic hazards, erosion, poor surface water quality, vector-borne disease, hazardous material handling, and project worker influx.	M	Develop and enforce an Construction Environmental and Social Management Procedure (CESMP) with integrated measures addressing community safety, erosion and sediment control, surface water quality monitoring, vector-borne disease prevention, hazardous material management, and worker influx controls.
Outputs 2.1–2.3: S7 – Labour and Working Conditions	Inadequate labour governance frameworks for workers engaged in field, planting, rewetting, earthworks, construction, nursery, and Eco-Warden activities.	Non-compliance with labour laws and international standards, including risks of restricted freedom of association, child labour, discriminatory practices, and OHS hazards throughout the project lifecycle.	M	Develop and enforce a project-wide Labour Management Procedure incorporating OHS protocols, child labour screening, freedom of association, anti-discrimination and equal opportunity provisions, and accessible grievance mechanisms.

Outputs 2.1–2.3: S8 – Pollution Prevention and Resource Efficiency	Civil works, earthworks and equipment use during peatland rewetting, watershed restoration and urban NbS installation; nursery operations.	Potential fuel/lubricant spills, construction waste, sediment disturbance during field operations. Localized soil or water pollution; degradation of terrestrial and aquatic ecosystems.	L	Spill prevention and response plans for all civil and earthworks activities. Waste management plan for construction materials and nursery operations. Sediment and water quality monitoring during and after work.
Component 3 (Outputs 3.1–3.3): Institutionalizing Capacity, Community Stewardship and Knowledge Management	P1, P2: Risk of inadequate participation of women, youth, and vulnerable groups in training and stewardship activities. P4: Risk of grievance mechanisms being inaccessible or ineffective. S3: Community safety during Eco-Warden and citizen-science field activities. S7: Labour and OHS risks for Eco-Wardens and community nursery workers. P2: Risk of GBV/PSEA in field engagement settings.	Risks are primarily related to inclusion and participation. Field activities carry minor safety risks for community workers.	L-M	Implement Gender Action Plan (GAP) with minimum 40-50% women participation targets. Implement Stakeholder Engagement Plan (SEP) and establish accessible Grievance Redress Mechanism (GRM). Apply PSEA/GBV prevention measures and Code of Conduct. OHS protocols for Eco-Warden field activities. Training on worker rights and community safety.
All outputs: Human Rights and Accountability	Institutional capacity constraints, including limited capacity to ensure inclusive engagement and equitable benefit-sharing. Multi-agency initiative involving diverse stakeholder groups; risk of lack of transparency.	Marginalized, low-income, or vulnerable groups at risk of exclusion from decision-making or project benefits. Risk of unaddressed grievances.	L	Integrate Human Rights-Based Approach (HRBA) throughout design and implementation. Targeted outreach to marginalized groups. Establish accessible GRM. Stakeholder Engagement Plan (SEP) developed and applied.
All outputs: Gender Equality & Women's Empowerment	Gender-based differences in climate vulnerability; unequal access to training, resources and decision-making; GBV/PSEA risks in field settings.	Women underrepresented in project benefits; gender-based discrimination; GBV incidents. Disproportionate burden on women from water insecurity and flood recovery.	L	Gender Equality and Social Inclusion (GESI) Assessment and Action Plan prepared. GAP establishes minimum 40-50% women participation targets. Women-prioritized community nurseries provide livelihood opportunities. GBV/PSEA prevention and response measures integrated throughout implementation.

All outputs: S1 – Biodiversity Conservation and Sustainable Natural Resource Management	Physical works and planting in sensitive peatland, forest and urban aquatic ecosystems; inadequate biosecurity screening and monitoring protocols increase the risk of invasive alien species (IAS) introduction.	Adverse impacts to habitats and ecosystem services arising from activities in sensitive areas; risks of IAS introduction and hydrological alteration.	M	Develop and enforce site-specific ESMPs with hydrological safeguards, ecosystem restoration measures, integrated biosecurity, and IAS monitoring for all activities in sensitive habitats.
All outputs: S2 – Climate Change and Disaster Risks	Absence of forward-looking climate scenario analysis in NbS design leads to hydrological miscalibration and increased maladaptation risk.	Vulnerability of project outputs and outcomes to climate stressors; risk of maladaptive practices that increase long-term exposure to climate change impacts.	L	Integrate ICFIS and Forest-Climate Vulnerability Atlas tools for long-term adaptive planning. EbA and NbS interventions emphasize ecosystem-compatible approaches. Site-level climate risk assessments to be conducted prior to works under Outputs 2.1–2.3.

3. S&E Risk Treatment Measures

This section presents the:

- prohibited actions that the project cannot support;
- cross-cutting S&E risk treatment measures that apply to multiple activities or project-wide; and
- specific S&E risk treatment measures of sub-projects and other selected actions proposed for the project's support.

Prohibited Actions

The project's implementation arrangements and the measures specified in the following sub-sections must ensure that no supported action in this specific project will:

- have measurable adverse impacts on biodiversity values/criteria of critical habitats or ecological processes that support the biodiversity values of critical habitats.
- reduce the populations of any recognized Critically Endangered, Endangered, or Vulnerable species.
- introduce species known to be invasive into new environments.
- fail to comply with national law for community health and safety and international good construction risk and safety management practices.
- involve forced evictions or evictions that are not authorized by national law.
- potentially involve or lead to risks to the physical and cultural survival of indigenous peoples.
- potentially involve forced eviction or a physical or economic displacement of indigenous peoples (including through access restrictions to lands, territories, and resources).
- potentially involve or lead to the absence of culturally appropriate consultations carried out with the objective of achieving FPIC on matters that may affect the rights and interests, lands, resources, territories, and traditional livelihoods of the indigenous peoples concerned.
- involve any form of child labour or forced labour.

Any sub-project or project-supported action that would meet one or more exclusion criteria will be considered ineligible and either duly adjusted or disqualified from further consideration. For Output 2.1 (KLSFR peatland) and Output 2.2 (Ulu Muda watershed), official EIA screening will be conducted with the Department of Environment

during project inception, and where statutory thresholds are triggered, the required Schedule 1 or Schedule 2 EIA processes will be completed before implementation commences. For Output 2.3 (Kubang Pasu urban NbS), no statutory EIA is currently anticipated given the small-scale enhancement nature of activities; however, all interventions remain subject to SES screening, design review and good-practice environmental management requirements. The ESMF retains provisions for Free, Prior and Informed Consent (FPIC) where subsequent activities may affect local communities in ways requiring explicit consent.

Cross-Cutting S&E Risk Treatment Measures that Apply to Multiple Activities or Project-Wide

The project shall implement the following project-wide (horizontal) S&E risk treatment measures, consistent with the Adaptation Fund Environmental and Social Policy (2022) and UNDP's SES:

- Cross-cutting transparency measures
- Gender Action Plan (GAP)
- Grievance Redress Mechanism (GRM)
- Activity and/or site-specific Environmental and Social Management Plans

The ESMF is applied across all project components and all three intervention landscapes (KLSFR peatland, Ulu Muda watershed, and Kubang Pasu urban/peri-urban areas). It is complemented by a Stakeholder Engagement Plan (SEP) incorporating a Grievance Redress Mechanism (GRM), a Gender Action Plan (GAP) establishing minimum 40–50% women participation targets, and a Gender Equality and Social Inclusion (GESI) Assessment and Action Plan. The ESMF also incorporates a zero-tolerance approach to Sexual Exploitation and Abuse/Sexual Harassment and Gender-Based Violence (GBV), with PSEA/GBV prevention and response measures integrated throughout implementation.

The tables below describe key elements of these horizontal S&E risk treatment measures.

Horizontal measure	Cross-Cutting S&E Risk Treatment: Transparency, Stakeholder Engagement & Accountability
Key S&E risks	P1: Human rights; P4: Accountability
Relevant UNDP SES policy requirements	Stakeholder engagement and accountability at the central to the SES and a human-rights based approach – Key requirements include: - Stakeholder analysis and planning - Disclosure and dissemination of information - Consultation and meaningful participation (including differentiated measures to allow effective participation of disadvantaged or vulnerable groups) - Dispute resolution and grievance redress (project GRM and UNDP Accountability Mechanism) - Stakeholder involvement in monitoring and evaluation - Ongoing reporting to affected communities and other stakeholders
S&E risk rating	Moderate
Stakeholders concerned and required disclosure	All project-affected communities in Selangor and Kedah; women, youth, low-income households, persons with disabilities; local authorities (DID, State Forestry Departments, Kubang Pasu Municipal Council); FRIM; Eco-Wardens; community nursery workers. ESMF, SEP and GAP to be disclosed on UNDP Malaysia website.
Applicable country law	Environmental Quality Act 1974 (Act 127); Occupational Safety and Health Act 1994 (Act 514); Employment Act 1955 (Act 265); Industrial Relations Act 1967 (Act 177)

Recommended S&E risk management and transparency arrangements	The project shall implement cross-cutting S&E risk treatment measures including: (1) Stakeholder Engagement Plan (SEP) with targeted outreach to marginalized groups; (2) accessible Grievance Redress Mechanism (GRM); (3) ESMF disclosed on UNDP Malaysia website; (4) Human Rights-Based Approach (HRBA) integrated throughout; (5) Annual project performance reporting and Mid-Term Review to Adaptation Fund Board.
Implementation timing	Project Management Unit (PMU) and UNDP Malaysia Country Office. FRIM as Executing Entity for Component 2 technical oversight. Relevant line agencies (DID, State Forestry Departments, Kubang Pasu Municipal Council) for specific outputs.
Primary responsibility	SEP, GRM and GAP implementation costs budgeted under Output 3.2 and project management budget. Estimated cost for SEP/GRM/GAP: USD 50,000. ESMF compliance monitoring included in project management budget.
Direct costs (if any)	Number of stakeholder consultations held (disaggregated by gender); GRM complaints received and resolved (target: 100% within 30 days); percentage of women in project activities (target: 40–50%); ESMF/SEP/GAP disclosed and accessible; number of staff trained on ESMF requirements.
Monitoring indicator(s)	At least 80% of cross-cutting treatment measures are developed and implemented by Year 1, increasing to 100% implementation in all subsequent years.
Capacity development	Training for PMU, FRIM and local government staff on ESMF requirements, GRM operations, , and OHS. Eco-Warden orientation on community safety. Materials developed in Bahasa Malaysia and English.
Oversight by	UNDP Malaysia Country Office (Project Assurance function); Project Steering Committee (PSC); Adaptation Fund Board through Annual Performance Reports and Mid-Term Review.

Horizontal measure	Cross-Cutting S&E Risk Treatment: Gender Equality & Women's Empowerment
Key S&E risks	P2: Gender Equality and Women's Empowerment
Relevant UNDP SES policy requirements	UNDP's SES requirements vis-avis gender equality and women's empowerment are that projects: - are informed by gender analysis in their design and implementation - promote gender equality and the empowerment of women - do not discriminate against women or girls or reinforce gender-based discrimination and/or inequalities - ensure allocation of financial resources for gender equality - use sex-disaggregated data and gender sensitive indicators - address any risk of potential exposure of affected people to gender-based violence (GBV) and have zero-tolerance for SEAH
S&E risk rating	Low
Stakeholders concerned and required disclosure	All project-affected communities in Selangor and Kedah; women, youth, low-income households, persons with disabilities; local authorities (DID, State Forestry Departments, Kubang Pasu Municipal Council); FRIM; Eco-Wardens; community nursery workers. ESMF, SEP and GAP to be disclosed on UNDP Malaysia website.
Applicable country law	Constitution, Gender Equality Law etc.

Recommended S&E risk management and transparency arrangements	The project shall implement cross-cutting S&E risk treatment measures including: Gender Action Plan (GAP) includes the following key measures/arrangements: - Minimum 40–50% women participation targets - GRM to include specific channels for sensitive GBV/SEAH-related grievances and survivor-centric approach - Integrate GESI criteria into beneficiary selection and benefit-sharing mechanisms. - Conduct awareness, environmental education and outreach programmes targeting women and youth. - Gender-responsive capacity training for project staff and relevant stakeholder - Establish and support community nurseries with targeted recruitment of women and youth. - Integrate sex-, age-, and socio-economic disaggregated data into monitoring systems. - Deliver women's entrepreneurship and livelihood training. - Provide targeted outreach and support to female-headed households and vulnerable groups.
Implementation timing	Project Management Unit (PMU) and UNDP Malaysia Country Office. FRIM as Executing Entity for Component 2 technical oversight. Relevant line agencies (DID, State Forestry Departments, Kubang Pasu Municipal Council) for specific outputs.
Primary responsibility	SEP/GRM/GAP implementation costs budgeted under Output 3.2 and project management budget. Estimated cost for SEP/GRM/GAP: USD 50,000. ESMF compliance monitoring included in project management budget.
Direct costs (if any)	Number of stakeholder consultations held (disaggregated by gender); GRM complaints received and resolved (target: 100% within 30 days); percentage of women in project activities (target: 40–50%); GAP disclosed and accessible; number of staff trained on GAP requirements.
Monitoring indicator(s)	At least 80% of cross-cutting treatment measures are developed and implemented by Year 1, increasing to 100% implementation in all subsequent years.
Capacity development	Training for PMU, FRIM and local government staff on GAP requirements, GRM operations, GESI principles, PSEA/GBV prevention. Materials developed in Bahasa Malaysia and English.
Oversight by	UNDP Malaysia Country Office (Project Assurance function); Project Steering Committee (PSC); Adaptation Fund Board through Annual Performance Reports and Mid-Term Review.

Targeted S&E Risk Treatment Measures

The project-wide S&E risk treatment will be supplemented with the following targeted measures that are incorporated into site-specific ESMPs that shall aim to avoid, minimize, or offset the S&E risks of actions proposed during the implementation of the following project outputs/activities:

- Output 2.1 (KLSFR Peatland – Selangor): A Landscape Hydrological Modelling and Design Optimisation Study will be completed in Year 1 to optimise the configuration of clay dykes, swales, AquaVault tanks and canal blocks and to confirm that rewetting measures deliver peat moisture and fire-risk reduction benefits without creating

unacceptable off-site hydrological impacts (the study will include an assessment of impacts on adjacent smallholder farms e.g. drainage, irrigation and impacts on crop production, yields, incomes). A Groundwater Abstraction Sustainability Assessment will be conducted by an independent hydrogeologist to establish safe abstraction limits, assess potential drawdown impacts and define monitoring requirements. A Peatland Construction Environmental and Social Management Procedure will be prepared by an independent peatland/safeguards consultant to manage construction-related impacts on peat stability, hydrology, biodiversity, and worker and community safety, and to translate UNDP SES requirements into peat-specific siting rules, earthworks protocols, OHS standards and contractor supervision arrangements. Fire-management coordination mechanisms involving FRIM, JPNS, and JBPM/Bomba will be established.

- Output 2.2 (Ulu Muda Watershed – Kedah): Detailed hydrological, erosion-risk, ecological, climate-risk and socio-economic baseline assessments will be undertaken in Year 1, with safeguard screening and site-selection validation prior to any field interventions. Interventions will be focused within Ulu Muda State Park to benefit from strong land-tenure protections and to minimise risks from encroachment or competing land uses. Climate-smart Native Tree Planting and Maintenance Regimes will be designed by an independent forest/ecological consultant, incorporating site-selection criteria and native species mixes to stabilise slopes, protect water resources and improve ecosystem resilience. Catchment and river processes studies, including hydro-modelling and RUSLE mapping, will inform the design and placement of up to 30 check dams. Participatory planning with MADA farmers and downstream communities will be required prior to commencement of works.

- Output 2.3 (Kubang Pasu Urban NbS – Kedah): Three targeted assessments must be completed in Year 1 before any site-level NbS implementation proceeds: (i) a Hydrological and Climate Risk Assessment and Technical Design Study by an independent hydrologist or drainage engineer, verifying that pond enhancements reduce flood and climate risks without causing adverse upstream, downstream or site-level hydrological impacts; (ii) a Biodiversity, Aquatic Habitat and Ecosystem Services Assessment by an independent multidisciplinary ecology team, covering impacts on aquatic and riparian biodiversity, habitat condition, ecosystem services and human-wildlife interactions; and (iii) a Community Health, Safety and Climate-Related Risk Targeted Assessment by an independent public-safety and environmental-health team, addressing drowning hazards, vector breeding risks, wildlife encounters, sensor-related hazards, extreme rainfall and heat exposure. All interventions will use native species only, will incorporate public safety plans and access restrictions during construction, and will be implemented in liaison with Kubang Pasu Municipal Council (MPKP) and DID/JPS.

- Component 3 (Community Stewardship and Capacity): Community participation frameworks and GESI Action Plans will be developed and operationalised across all three intervention landscapes during Year 1. Community nurseries for the Ulu Muda watershed and Kubang Pasu urban NbS will target a minimum of 50% women participation in employment, training and capacity building, with a target of at least 40% women representation in management and coordination roles. Eco-Warden networks will be established in Kubang Pasu with minimum 50% women participation. Child safety considerations will be integrated into all public-facing activities, including parental consent requirements, adult supervision and prohibition of hazardous field tasks for participants under 18 years of age, consistent with Malaysia’s Child Act 2001.

The tables below outline the basic parameters of these targeted S&E risk treatment measures. Additional details, including site-specific ESMPs, technical design studies, Labour Management Procedure, and biodiversity and community health and safety assessments, are to be developed as required under each output and included as appendices to this ESMF. These documents must be completed and disclosed to affected communities prior to commencement of physical works under Outputs 2.1, 2.2, and 2.3.

Targeted S&E risk treatment	Outputs 2.1–2.3: Ecological Restoration and Nature-based Solutions (Peatland, Watershed, and Urban and Peri-Urban NbS)
Key S&E risks	S1: Biodiversity conservation and habitat disturbance; S2: Climate change and maladaptation risks; S3: Community health and construction safety; S7: Labour and OHS for field workers and contractors; S8: Pollution and spill risks from civil works.

Relevant UNDP SES policy requirements	In addition to the above-mentioned crosscutting measures, the UNDP SES standards include the following key requirements: SES Standard S1 (Biodiversity Conservation): application of the precautionary principle and mitigation hierarchy; avoidance of adverse impacts on critical habitats, endangered species, natural ecosystems and their services; no conversion of natural forests; avoid the spread of IAS; promote sustainable management of forests, protection of soils and integrated water resource management S2 (Climate Change): Projects are sensitive to climate change and disaster risks and do not contribute to increased vulnerability to climate change and natural hazards, and reduce GHG emissions S3 (Community Health, Safety): Projects anticipate and avoid adverse impacts on the health and safety of affected communities during the project life cycle from both routine and non-routine circumstances; ensure quality and safety in the design and construction of project-related infrastructure, preventing and minimizing potential safety risks and accidents; avoid or minimize community exposure to hazards, diseases and hazardous materials associated with project activities; ensure that the safeguarding of personnel and property minimizes risks to communities and is carried out in accordance with international human rights standards and principles; have in place effective measures to address emergency events, whether human-made or natural hazards. S7 (Labour and Working Conditions): Projects promote freedom of association and the effective recognition of the right to collective bargaining; prevent the use of child and forced labour; Prevent discrimination and promote equal opportunity of workers; protect and promote the safety and health of workers; ensure compliance with employment and labour laws, applicable rules and regulations and international commitments; leave no one behind by protecting and supporting workers in disadvantaged and vulnerable situations S8 (Pollution Prevention): Projects avoid or minimize pollution from project activities; promote more sustainable use of resources, including energy, land and water; avoid or minimize programming-related emissions of short and long-lived climate pollutants and ozone-depleting substances; avoid or minimize generation of hazardous and non-hazardous substances and wastes, and promote a human rights-based approach to the management and disposal of hazardous substances and wastes; promote safe, effective, environmentally sound pest management
S&E risk rating	Moderate
Stakeholders concerned and required disclosure	Project-affected communities in KLSFR Selangor (Output 2.1), Ulu Muda Watershed (Output 2.2) and Kubang Pasu District Kedah (Output 2.3); workers, contractors and Eco-Wardens; MADA farmers; DID; FRIM; State Forestry Departments. Site-level ESMPs to be disclosed to affected communities prior to commencement of works.
Applicable country law	Environmental Quality Act 1974 (Act 127); Occupational Safety and Health Act 1994 (Act 514); Employment Act 1955 (Act 265); National Forestry Act 1984; National Biosafety Act 2007; Street, Drainage and Building Act 1974; Town and Country Planning Act 1976; Water Services Industry Act 2006.
Integrated S&E risk management	PMU and FRIM for Output 2.1 (peatland restoration) and Output 2.2 (watershed management). PMU and DID/Kubang Pasu Municipal Council for Output 2.3 (urban and peri-urban NbS). Integrated management will be operationalised through site level ESMPs comprising: (i) CESMPs covering air, dust and noise control, water pollution prevention and waste management, traffic

	management, community health and safety (e.g. fencing, signage, protection of water infrastructure), and avoidance or minimisation of vegetation clearance, in line with the Environmental Quality Act 1974 and the Street, Drainage and Building Act 1974; (ii) Labour Management Procedures detailing OHS protocols, child labour screening, protection of freedom of association and worker grievance mechanisms, consistent with the Occupational Safety and Health Act 1994, Employment Act 1955 and Industrial Relations Act 1967 (Act 177); and (iii) Technical Guidelines on Nurseries and Reforestation (Output 2.2) specifying native and non-invasive species selection, planting and maintenance regimes, and biosecurity protocols, in accordance with the National Forestry Act 1984 and the National Biosafety Act 2007.
Implementation timing	Site-level ESMPs to be developed for Outputs 2.1, 2.2 and 2.3 prior to commencement of works, incorporating: ecological and hydrological assessments; OHS and fire risk protocols for peatland (Output 2.1); CESMP for traffic, erosion, sediment control, water quality, hazardous materials, and worker influx; invasive species biosecurity protocols; Labour Management Procedure with OHS, child labour screening and grievance mechanisms; spill prevention and waste management; participatory community engagement for Output 2.2 with MADA farmers and Output 2.3 with Kubang Pasu communities - all to be implemented in Year 1.
Primary responsibility	Ecological and hydrological impact indicators per output (biodiversity surveys, peat water table levels, water quality); OHS incidents reported and resolved; ESMP compliance audit findings; number of IAS monitoring surveys; sediment and water quality measurements; community access restrictions documented and resolved.
Direct costs (if any)	Ecological assessments and ESMP preparation: estimated USD 30,000 per output. ESMP supervision and monitoring: included in project management budget. Labour Management Procedure: included in project management. Total estimated ESMP costs: USD 90,000 across Outputs 2.1–2.3.
Monitoring indicator(s)	At least 80% of the targeted S&E risk treatment measures are developed and implemented by Year 1, increasing to 100% implementation in all subsequent years.
Capacity development	Technical training for FRIM ecologists, PMU staff and local authority partners on ESMP preparation, ecological monitoring, OHS, IAS identification, and CESMP implementation. Contractor induction on labour rights, OHS and spill response. Annual refresher training.
Oversight by	UNDP Malaysia Country Office (Project Assurance); Project Steering Committee; Adaptation Fund Board through Annual Performance Reports and Mid-Term Review. Independent environmental and social audit recommended at mid-term.

4. Responsibilities and Resources for the S&E Risk Management

The table below presents:

- the key roles and responsibilities of project staff and associated agencies for the application of social and environmental risk treatment measures;
- any budgets allocated for these tasks; and
- schedule of their envisaged implementation.

Horizontal and targeted S&E risks treatment measures	Responsibility	Direct costs [USD] (and project budget codes)	Monitoring indicators
ESMF implementation and monitoring (all outputs)	PMU / UNDP Country Office	Included in project management budget	ESMF compliance review completed annually
Stakeholder Engagement Plan (SEP) – all outputs	PMU; FRIM; government partners (DID, State Forestry, Kubang Pasu MC)	USD 20,000 (Output 3.2 and project management)	Number of consultations held; marginalized group participation rates; stakeholder satisfaction
Grievance Redress Mechanism (GRM) – all outputs	PMU with UNDP oversight	USD 10,000 (Output 3.2)	Number of grievances received and resolved; average resolution time (target: 30 days)
Gender Action Plan (GAP) – all outputs	PMU; FRIM; community facilitators	USD 20,000 (Output 3.2; approx. 12–15% GESI-attributed budget)	Women participation rate (target: 40–50%); gender-disaggregated data reported
Site-specific ESMPs – Outputs 2.1, 2.2, 2.3	PMU; FRIM (technical lead); contractors	USD 30,000 per output (ecological assessments and ESMP preparation)	ESMP prepared and disclosed prior to works; ESMP compliance audit findings; environmental incidents
Construction ESMP (CESMP) – Outputs 2.1, 2.2, 2.3	Contractors supervised by PMU and FRIM	Included in contractor mobilization costs	OHS incidents reported; water quality and sediment measurements; CESMP compliance
Labour Management Procedure – all outputs	PMU; contractors; Eco-Warden coordinators	Included in project management and contractor costs	Labour audits conducted; OHS training completion; child labour incidents (target: zero)
Ecological and hydrological assessments – Outputs 2.1, 2.2, 2.3	FRIM (lead); PMU	USD 30,000 (within output activity budgets)	Assessments completed before commencement of works; biodiversity baseline established
Invasive species biosecurity protocols – Outputs 2.1, 2.2, 2.3	FRIM; PMU; nursery supervisors	Included in ESMP and nursery operation budgets	IAS monitoring surveys conducted; no new IAS introductions confirmed

PSEA/GBV prevention measures – all field activities	PMU; FRIM; UNDP SEAH focal point	Included in training and project management budget	PSEA training completed; GBV/PSEA incidents reported and referred; Code of Conduct signed
Capacity development on ESMF and OHS – PMU, FRIM, partners	PMU (training coordination); UNDP Country Office	USD 15,000 (project management)	Number of staff trained; training completion rates
Total costs	USD 245,000 (estimated; see individual line items above). Indicative total: SEP/GRM/GAP USD 50,000; Site-specific ESMPs USD 90,000; Ecological/hydrological assessments USD 90,000; Capacity development USD 15,000. ESMP supervision and labour management costs included in project management and contractor budgets. USD 245,000 (estimated; see individual line items above). Indicative total: SEP/GRM/GAP USD 50,000; Site-specific ESMPs USD 90,000; Ecological/hydrological assessments USD 90,000; Capacity development USD 15,000. ESMP supervision and labour management costs included in project management and contractor budgets.		Annual monitoring of ESMF compliance included in PPR reporting to AF Board.

In addition to the above tasks, UNDP, in its ‘project assurance’ function, provides independent project oversight, fiduciary accountability and quality assurance for the ESMF, including ensuring compliance with UNDP and AF fiduciary standards, the AF Environmental and Social Policy (ESP) and the Gender Policy. A designated UNDP Programme Officer or M&E Officer performs the Project Assurance function, attends Project Board meetings as a non-voting member, and provides independent oversight of project performance, risk management, safeguards compliance, fiduciary management and reporting. The Project Steering Committee (PSC) reviews safeguards and gender performance, including the GAP and SEP, at biannual meetings. A dedicated Technical Working Group (TWG) Workstream on Monitoring, Evaluation, Safeguards, GESI, Sustainability and Scaling coordinates cross-cutting safeguards compliance across all project components. Independent Mid-Term Review and Final Evaluation assessments will include evaluation of environmental and social performance and compliance with AF and UNDP safeguards requirements. Monitoring and reporting on ESMF implementation will be included in Annual Project Performance Reports (PPRs) submitted to the Adaptation Fund Board.

5. Project-Level Grievance Redress Mechanism

Scope

This Project-level GRM is established to address grievances related to the project’s compliance with the UNDP SES in a timely and efficient manner. Grievances related to other topics should be referred to the appropriate mechanisms[1]. The Project-level GRM is an additional mechanism to the UNDP stakeholder response mechanism operated by the UNDP Country Office and the UNDP corporate level[2] which the relevant complainants may access too.

Mandate and Functions

The GRM will:

- (i) Receive and address any concerns, complaints, notices of emerging conflicts, or grievances (collectively “*Grievance*”) alleging actual or potential harm to the affected person(s) (the “*Claimant(s)*”) arising from Project;
- (ii) Assist in the resolution of Grievances between and among Project Stakeholders; as well as the various government ministries, agencies and commissions, CSOs and NGOs, and others (collectively, the “*Stakeholders*”) in the context of the Project; and
- (iii) Conduct itself at all times in a flexible, collaborative, and transparent manner aimed at problem-solving and consensus-building.

When doing so, the GRM will:

- (i) Receive, Log and Track all Grievances received;
- (ii) Provide regular status updates on Grievances to Claimants, Project Board (PB) members and other relevant Stakeholders, as applicable;
- (iii) Engage the PB members, Government institutions and other relevant Stakeholders in Grievance resolution;
- (iv) Process and propose solutions and ways forward related to specific Grievances *within a period not to exceed sixty (60) days* from receipt of the Grievance;
- (v) Identify growing trends in Grievances and recommend possible measures to avoid the same;
- (vi) Receive and service requests for, and suggest the use of, mediation or facilitation;
- (vii) Elaborate bi-annual reports, make said reports available to the public, and more generally work to maximize the disclosure of its work (including its reports, findings and outcomes);
- (viii) Ensure increased awareness, accessibility, predictability, transparency, legitimacy, and credibility of the GRM process;
- (ix) Collaborate with Partner Institutions and other NGOs, CSOs and other entities to conduct outreach initiatives to increase awareness among Stakeholders as to the existence of the GRM and how its services can be accessed;
- (x) Ensure continuing education of PB members and their respective institutions about the relevant laws and policies that they will need to be aware of to participate in the development of effective resolutions to Grievances likely to come before the GRM; and
- (xi) Monitor follow up to Grievance resolutions, as appropriate.

Eligible Complaints

To be eligible for the Project-level GRM, the complaint must pertain to a Project and its activities after the signature of the Project Document and before the Project closure, indicate how the Project has/may contribute to social or environmental harm, and be made by people who could be affected by the harm referenced (or by an authorized representative). The Project-level GRM cannot respond to anonymous grievances. However, complainants may request and receive confidentiality.

If the complaint is related to Sexual Exploitation and Assault (SEA), the record-keeping and information sharing about SEA survivor assistance will adhere to the 'do no harm' and confidentiality principles, and the survivor's personally identifiable information will remain confidential unless the victim expressly consents to it being shared. Such cases should be referred to relevant investigative/assistance bodies.

With the complainant’s agreement, the Project-level GRM will refer requests alleging non-compliance with UNDP fraud or corruption to the UNDP Office of Audit and Investigations (OAI) or the relevant national authority(ies). The complainant may also decide to refer the case to the Stakeholder Response Mechanism (SRM) at the Country Office Level or Global level.

Steps for Submission and Review of the Complaint

The complaint may be submitted to the GRM in person to the Project Manager or other Project team member or using any of the following means:

- Email: To be confirmed at project inception (dedicated GRM inbox, monitored by the Project support staff member and accessible also by the Project Manager)

- Phone: To be confirmed at project inception and posted at all intervention sites (KLSFR – Selangor; Ulu Muda Watershed – Kedah; Kubang Pasu – Kedah). A dedicated GRM hotline number will be established within the PMU at FRIM headquarters, Kepong, Kuala Lumpur.
- Messaging app: WhatsApp (number to be confirmed at project inception and shared with all project communities via the Stakeholder Engagement Plan). Complaints may be submitted in Bahasa Malaysia or English. Voice messages are accepted to accommodate complainants with limited literacy.
- Regular post: Project Manager, NbS Water Resilience Malaysia PMU (address to be confirmed at project inception. (Envelope should be marked: “CONFIDENTIAL – GRM Complaint”). Complaints may also be submitted in person at the PMU office or through community focal points / Eco-Wardens established under Component 3 activities, who will forward them to the PMU within two (2) working days.

The Project support staff member[3] shall register the complaint immediately in a dedicated Registry; the registration number sample is as follows: NbS-MYS/[YEAR]/[NUMBER] (e.g. NbS-MYS/2027/001). The Registry shall be maintained in both English and Bahasa Malaysia where relevant.

The Project support staff member shall inform the complainant about the registration immediately but no later than five (5) days from submitting the complaint.

The Project Manager shall review the eligibility of the complaint within five (5) days after the registration. If eligibility cannot be evaluated based on the submitted complaint and accompanying documents, the Project manager or the Project support staff member may request the complainant's submission of additional documents that will be registered in the Registry. The complainant shall be given 10 days to submit additional documents.

The decision on eligibility shall be made within five (5) days in line with Attachment 1 (below).

If the complaint is considered non-eligible, the Project Manager shall inform the complainant about the decision and advise about available options for the complaint review, including national dispute resolution mechanisms. The case is closed, and the relevant information is recorded in the Registry and the UNDP Deputy Resident Representative and/or SES Focal Points is informed by the Project Manager.

If the complaint is eligible, the Project Manager shall:

- inform the UNDP Deputy Resident Representative and/or relevant UNDP CO SES Focal Point;
- begin the complaint review process; and
- ensure that the response to the complainant is processed through a direct and good faith engagement to clarify issues, develop and seek agreement on options for resolution, and address and remedy risks and harms that the Project is causing or contributing to (with the option to provide technical assistance to the complainant to support the complainant's effective engagement).

Registry for Complaints

The Project support staff member shall maintain a GRM Registry in line with Attachment 2 (below). All information should be filled promptly and maintained together with the project documents even after the Project's completion.

GRM Attachment 1: Sample of A Decision on the Eligibility of A Complaint

Complaint #	
Name and Surname of the Complainant <i>If the complainant is an organization, registration number and official name should be included.</i>	
Contact details of the Complainant	
Complaint submission date	
Project title	Nature Based Solutions for Water Resilience in Malaysia (Adaptation Fund, UNDP / FRIM, 2027–2032)

The complaint satisfies the following criteria:

Criteria	Yes	No
The complaint is pertained to this UNDP Project and its activities after the signature of the Project Document and prior to the Project closure.		
It is indicated that how the Project has/may contributed to social or environmental harm		

Justification, If The Case Is Considered Non-Eligible:

[To be completed by the Project Manager for each case. State concisely why the complaint does not meet the eligibility criteria set out in Section 3. For example: “The complaint relates to a matter outside the scope of the Project’s activities and occurred prior to the signature of the Project Document ([MONTH] 2027)” ; or “The complaint relates to fraud/corruption and has been referred to the UNDP Office of Audit and Investigations (OAI) per Section 3.4”; or “The complainant has not indicated how the Project has or may contribute to the alleged social or environmental harm.” Where a complaint is non-eligible, the Project Manager shall advise the complainant of available national dispute resolution mechanisms, including the relevant District Office, the Department of Environment (DOE), the Department of Irrigation and Drainage (DID/JPS), or civil society grievance channels.]

Justification for the Need to Create A Panel:

[To be completed by the Project Manager where a Review Panel is considered necessary. A Review Panel may be warranted in cases involving: (i) complex or multi-party grievances that cannot be resolved through direct engagement between the Project Manager and the complainant; (ii) grievances implicating significant biodiversity, hydrological or community health and safety risks at one of the three project landscapes (KLSFR peatland – Selangor; Ulu Muda watershed, Kedah; Kubang Pasu urban and peri-urban NbS, Kedah); (iii) grievances related to gender-based harm, PSEA or GBV which require a multi-stakeholder response consistent with the project’s zero-tolerance policy; (iv) grievances not resolved within the sixty (60) day standard processing period; or (v) unresolved cases referred by UNDP Country Office. The panel should include at minimum the Project Manager, UNDP SES Focal Point, and a community representative from the affected area. Gender balance in panel composition is required.]

Composition of the Panel (If Created):

Name	Position
	Project Manager
	Project support staff member
	UNDP Malaysia SES / Programme Officer (Project Assurance)
	Community Representative from affected landscape (to be designated per case; gender balance required)
	Additional panel member as required by the nature of the grievance (e.g. FRIM technical specialist, local authority representative, independent facilitator)

Name of the Project Manager:	Signature	Date
Name of the Project support staff member	Signature	Date

GRM Attachment 2. Registry Sample

[illegible]

[2] <https://www.undp.org/accountability/audit/secu-srm/stakeholder-response-mechanism>[3] The Project support staff member who will administer the GRM shall be defined by the Project Manager.

FULLY DEVELOPED PROPOSAL FOR SINGLE COUNTRY

PART I: PROJECT/PROGRAMME INFORMATION

Title of Project/Programme: Enhancing the Adaptation and Climate Resilience of Urban and Natural Forests in Malaysia

Country: Malaysia

Thematic Focal Area: Nature Based Solutions, Flood/ Heat Management & Freshwater security

Type of Implementing Entity: Multilateral Implementing Entity

Implementing Entity: United Nations Development Programme Malaysia, Singapore and Brunei Darussalam

Executing Entities: Forest Research Institute Malaysia (FRIM)

Amount of Financing Requested: \$10,000,000 (in U.S Dollars Equivalent)

Project Formulation Grant Request: Yes ☒ No ☐

Amount of Requested financing for PFG: \$150,000 (in U.S Dollars Equivalent)

Letter of Endorsement (LOE) signed: Yes ☒ No ☐

NOTE: LOEs should be signed by the Designated Authority (DA). The signatory DA must be on file with the Adaptation Fund. To find the DA currently on file check this page: <https://www.adaptation-fund.org/apply-funding/designated-authorities>

Stage of Submission:

- ☒ This proposal has been submitted before including at a different stage (concept, fully-developed proposal)
- ☐ This is the first submission ever of the proposal at any stage

In case of a resubmission, please indicate the last submission date:

Concept note submissions: First submission: 6 Jan 2026, 1st technical review: 6 Feb 2026, 2nd technical review 3 March 2026, 3rd Technical review 2026: 13 March 2026

Please note that fully-developed proposal documents should not exceed 100 pages for the main document, and 100 pages for the annexes.

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List of acronyms

AF	Adaptation Fund	MADA	Muda Agricultural Development Authority
CFIL	Climate Finance Innovation Lab	MASH	Malaysian Adaptation Sharing Hub
CSO	Civil Society Organisation	METMalaysia	Malaysian Meteorological Department
DID/ JPS	Department of Irrigation and Drainage	MPKP	Kubang Pasu Municipal Council
DOE	Department of Environment	MSMA	Urban Stormwater Management Manual
DOSM	Department of Statistics Malaysia	MyNAP	Malaysia National Adaptation Plan
EbA	Ecosystem-based Adaptation	MYSA	Malaysian Space Agency
EE	Executing Entity	NADMA	National Disaster Management Agency
EIA	Environmental Impact Assessment	NAHRIM	National Water Research Institute Malaysia
ESMF	Environmental and Social Management Framework	NbS	Nature-based Solutions
ESMP	Environmental and Social Management Plans	NC4	Fourth National Communication
ESP	Environmental and Social Policy	NRES	Ministry of Natural Resources and Environmental Sustainability
FE	Final Evaluation	OHS	Occupational Health and Safety
FPIC	Free, Prior, and Informed Consent	PFG	Project Formulation Grant
FRIM	Forest Research Institute Malaysia	PLANMalaysia	Department of Town and Country Planning
GAP	Gender Action Plan	PMU	Project Management Unit
GBV	Gender-based Violence	PPR	Project Performance Report
GEC	Global Environment Centre	PSEA	Prevention of Sexual Exploitation and Abuse
GESI	Gender Equality and Social Inclusion	PSEAH	Protection from Sexual Exploitation, Abuse and Harassment
GIS	Geographic Information System	RCP	Representative Concentration Pathway
GRM	Grievance Redress Mechanism	RP	Responsible Party
IC-FIS	Integrated Climate- Forest Intelligence System	SADA	Syarikat Air Darul Aman Sdn Bhd (Kedah State Water Company)
IE	Implementing Entity	SEP	Stakeholder Engagement Plan
IPCC	Intergovernmental Panel on Climate Change	SES	Social and Environmental Standards
JPBM	Fire and Rescue Department (Bomba)	SESA	Strategic Environmental and Social Assessment
JMG	Mineral and Geoscience Department	SESP	Social and Environmental Screening Procedure
JPSM	Forestry Department of Peninsular Malaysia	TWG	Technical Working Group
KEMAS	Community Development Department	UNDP	United Nations Development Programme
KLSFR	Kuala Langat Selatan Forest Reserve	UNFCCC	United Nations Framework Convention on Climate Change
LSANK	Kedah State Water Resources Board	WWF	World Wide Fund for Nature

I. Project Background and Context

A. National Context and Project Landscapes

Geography, Development and Economic context

Malaysia is a rapidly urbanizing upper-middle-income country with a population of approximately 34.2 million people and a diversified economy that has evolved from an agriculture-based system into a major manufacturing and services hub.¹ Continued economic growth, urbanization and infrastructure development have contributed significantly to national development and poverty reduction, while increasing demand for water resources, land and ecosystem services.¹

Malaysia is one of the world's most biologically diverse countries, with extensive forests, river basins, wetlands and peatland ecosystems that provide essential ecosystem services, including water regulation, flood attenuation, biodiversity conservation and carbon storage.² These ecosystems support domestic water supply, agricultural production, industrial development and the functioning of major urban and economic centres.

Balancing economic development with environmental sustainability is becoming increasingly challenging as urban expansion, infrastructure development and land-use change continue to place pressure on environmentally sensitive landscapes³. Development within flood-prone areas, water-source catchments and peatland ecosystems has increased exposure to hydrological instability and climate-related risks affecting communities, infrastructure and productive sectors. Maintaining the integrity of critical watersheds, peatlands and river systems is therefore increasingly important for sustaining long-term water security, agricultural productivity and climate resilience.

Climate-related disasters already impose significant costs on Malaysia. The Department of Statistics Malaysia (DOSM) estimates that floods caused RM 7.9 billion (USD 1.87 billion) in damages between 2021 and 2023⁴. The World Bank's Country Climate and Development Report warns that climate change could cost Malaysia up to 8.3% of GDP by 2050, and that by 2100 up to a third of Malaysian towns and cities could be at risk of flash floods⁵. Beyond direct disaster losses, increasing climate variability is placing growing pressure on water resources, agricultural production and infrastructure systems that underpin national economic development. Water-security challenges affecting major irrigation systems and water-supply reservoirs have highlighted the increasing economic importance of maintaining resilient watersheds, wetlands and other natural systems that support water regulation and reduce climate-related risks. These impacts place growing demands on public expenditure for emergency response, infrastructure and disaster recovery.

Climate risks increasingly threaten sectors important for Malaysia's long-term development objectives, including water resources, agriculture, food security, infrastructure and urban development. Agriculture could see production value decline by up to 18% by mid-century, with cascading effects on food security and rural livelihoods.⁵ As climate variability intensifies, strengthening the resilience of natural systems that regulate water, reduce flood risks and support livelihoods is becoming an increasingly important component of sustainable economic development and climate adaptation.

Social Vulnerability and Gendered Climate Impacts

Climate change impacts are unevenly distributed and disproportionately affect low-income households, women, youth, persons with disabilities and other vulnerable groups with more limited adaptive capacity

¹ Sources: Department of Statistics Malaysia (DOSM) (2025). <https://www.dosm.gov.my>

² Ministry of Natural Resources and Environmental Sustainability (NRES), 2022. Malaysia's Fourth National Communication to UNFCCC. https://unfccc.int/sites/default/files/resource/NRES_NC4_To%20UNFCCC_2024%20v1.0.pdf

³ Climate Adaptation and Resilience in Malaysia: Policy, Practice and Pathways. 2026. <https://www.iseas.edu.sg>

⁴ Statistics on Flood Damages in Malaysia 2021-2023 (DOSM). <https://www.dosm.gov.my>

⁵ World Bank Malaysia Country Climate and Development Report 2021. <https://openknowledge.worldbank.org/handle/10986/36554>

and fewer financial resources to absorb and recover from climate shocks⁶. Climate vulnerability is also gender-differentiated, influencing exposure, adaptive capacity, access to information and participation in adaptation planning and decision-making⁷. Existing inequalities in labour-force participation, income security and unpaid care responsibilities influence women's adaptive capacity and recovery potential following disasters. Women's participation in the formal labour force in Malaysia remains significantly lower than men's (56.5% compared to 83%), reducing access to financial resources and economic resilience during periods of crisis⁷. Evidence suggests that climate shocks and floods can further disrupt livelihoods, particularly for low-income households with limited savings or social protections⁷.

Women in Malaysia also undertake substantially higher levels of unpaid domestic and care work, contributing to time poverty and limiting participation in paid employment, training and decision-making processes⁸. Flood events frequently increase household recovery burdens, including cleaning, caregiving and water-related responsibilities, which disproportionately affect women and female-headed households. Water insecurity can further intensify these burdens, particularly in rural and agricultural areas where households may face seasonal water shortages or climate-related service disruptions.⁸

In peatland, forest-edge and climate-sensitive agricultural landscapes, women and lower-income households may also face differentiated exposure to haze pollution, livelihood disruption, reduced access to natural resources, and constraints on mobility and participation during climate-related emergencies. These impacts may be particularly significant where livelihoods are linked to ecosystem services, informal economic activities or natural-resource-based production systems. Climate change therefore acts as a threat multiplier, amplifying existing inequalities related to environmental exposure, income security, access to resources and adaptive capacity.⁶

Project Landscapes

The project focuses on three priority adaptation landscapes in the state of Selangor and Kedah. Each landscape addresses a distinct adaptation challenge and has been selected to demonstrate the implementation of Nature-based Solutions (NbS) with potential for learning, replication and scaling. Together, the three landscapes address complementary adaptation priorities related to peatland resilience, watershed management and flood risk reduction across nationally important ecosystems and production landscapes. The project combines site-based demonstration with state-level planning and institutional strengthening to support wider replication and future investment.

The selected landscapes are strategically important because of their contribution to water regulation, agricultural production, peatland resilience and flood management, supporting water services, economic activities and settlements that collectively affect millions of people across Peninsular Malaysia. The project spans two nationally important states: Selangor, one of Malaysia's principal economic and urban centres, and Kedah, Malaysia's primary rice-producing state, where climate resilience underpins national food security, water security and flood management.

Peatland: Kuala Langat Selatan Forest Reserve (KLSFR), Selangor (approx. 2.78 N, 101.68 E)

Malaysia has approximately 2.8 million hectares of tropical peatlands, about 6% of the world's tropical peatland area and 12% of the global peat carbon pool.⁹ The project focuses on Kuala Langat Selatan Forest Reserve (KLSFR), a degraded peatland landscape in the southern Selangor peatland complex. Kuala Langat District covers approximately 85,776 ha and has an estimated population of 362,300 people¹⁰. Located near major population centres, industrial corridors and Kuala Lumpur International Airport (KLIA), the landscape contributes to groundwater regulation, fire-risk reduction and ecosystem

⁶ IPCC. Climate Change 2022: Impacts, Adaptation and Vulnerability. <https://www.ipcc.ch/report/ar6/wg2/>

⁷ World Bank Malaysia Country Climate and Development Report 2021. <https://openknowledge.worldbank.org/handle/10986/36554>

⁸ UNDP 2020. Gender and Climate Change in Malaysia. <https://www.undp.org/malaysia>

⁹ Frontiers in Ecology and the Environment 10, 2012, p. 124. *Two decades of destruction in Southeast Asia's peat swamp forests*. <https://doi.org/10.1890/100236>

¹⁰ DOSM. District Statistics 2023. <https://www.dosm.gov.my>

resilience in one of the most densely populated and economically significant regions of Malaysia.¹¹

KLSFR has been prioritized due to its degraded hydrological condition, recurring peat-fire incidents, extensive legacy drainage networks, continued pressures from surrounding land-use, and limited existing water-retention efforts. Approximately 55% of the reserve is at high fire risk, while the Selangor Forestry Department's Integrated Management Plan (2025–2034) identifies part of KLSFR as a priority restoration zone, highlighting its strategic importance for peatland rehabilitation. The reserve also contains a Virgin Jungle Reserve and High Conservation Value Area, with an estimated 7.7 million tonnes of below-ground carbon, underscoring its ecological significance. Selangor peat-fires have the potential to generate haze impacts affecting large urban populations, transport infrastructure and economic activities, highlighting the broader regional importance of maintaining peatland hydrological integrity¹¹. Maintaining peatland hydrological integrity is therefore important not only for ecosystem resilience but also for reducing peat-fire and haze risks that may affect nearby communities, transport infrastructure, economic activities and regional connectivity. Experience and lessons generated at KLSFR are also expected to inform peatland restoration and climate adaptation efforts across Malaysia's wider peatland estate.

Ulu Muda Watershed, Kedah (6.13 N, 100.82 E)

Part of the Greater Ulu Muda Forest Complex, covering approximately 163,000 ha in northern Peninsular Malaysia. The landscape comprises a network of forest reserves and protected areas that provide critical ecosystem services, biodiversity values and freshwater resources.³

The landscape functions as one of Malaysia's most important water-catchment systems, supporting downstream irrigation, water supply and ecosystem services across Kedah, Penang and Perlis. The watershed supplies water to the Muda Agricultural Development Authority (MADA) irrigation scheme and contributes to raw-water supply for multiple water-treatment facilities serving both agricultural and domestic users. The broader system provides water services relied upon by an estimated 4.2 million people and supports one of Malaysia's most important rice-production systems, contributing significantly to national food security.¹²

The strategic importance of Ulu Muda extends well beyond the watershed. Catchment conditions influence water availability, water quality, reservoir performance and irrigation reliability across northern Peninsular Malaysia. The watershed combines national significance for water security and food production with opportunities to demonstrate climate-adaptive watershed management in a largely intact forest landscape that supports multiple downstream users and sectors. The importance of maintaining healthy watershed functions has been reinforced by increasing attention to reservoir water levels, water-security pressures and the long-term resilience of water supplies supporting domestic use, irrigation and agricultural production across northern Peninsular Malaysia. Lessons generated through integrated watershed management are expected to inform future management of other forested catchments that support Malaysia's strategic water resources. The project therefore focuses on Ulu Muda as a nationally significant water-security landscape where strengthened watershed functions can generate adaptation benefits across a large downstream service area.

Urban and Peri-Urban NbS: Kubang Pasu Demonstration Landscape, Kedah (6.43 N, 100.42 E)

Kedah, Malaysia's primary rice-producing state, faces increasing climate risks associated with more frequent and intense rainfall events, localized flooding, prolonged inundation, rising temperatures and increasing pressure on urban drainage systems. These hazards increasingly affect interconnected urban, peri-urban and agricultural landscapes across the state, placing growing pressure on flood

¹¹ Selangor State Forestry Department (2025). Integrated Management Plan for South Selangor Peat Swamp Forest (IMP-SSPSF) 2025–2034. Selangor State Forestry Department

¹² Muda Agricultural Development Authority (MADA) Annual Report 2023. <https://www.mada.gov.my>

management systems, water resources, critical infrastructure and ecosystem functions.

Kubang Pasu is a strategically important district in northern Kedah with an estimated population of 237,759 people.¹⁰ It contains an extensive network of retention ponds, drainage corridors, wetlands and associated infrastructure that perform important stormwater-management, flood-regulation and water-retention functions. These interconnected assets also provide a strong foundation for demonstrating how existing municipal infrastructure can support climate adaptation through NbS. It also includes major agricultural areas linked to the MADA irrigation system and the Bukit Kayu Hitam trade and transport corridor connecting Malaysia and Thailand. The district experiences recurrent flooding that affects settlements, agricultural production, transport connectivity and local economic activities. Recent flood events have highlighted increasing pressures on municipal drainage systems, particularly during periods of intense rainfall and prolonged inundation¹³.

Within Kedah, Kubang Pasu was selected as the demonstration landscape because it combines recurrent flood exposure with an extensive network of retention-pond, wetlands and drainage corridors, which provide strong opportunities for demonstrating NbS within an existing urban stormwater system. The district is also undergoing rapid urban and industrial development associated with the Bukit Kayu Hitam Special Border Economic Zone and northern growth corridor, increasing the importance of integrating climate resilience into future urban planning. Strong municipal leadership through the Kubang Pasu Municipal Council (MPKP) and its Smart City initiative provides an enabling environment for testing, refining and demonstrating scalable approaches that can inform replication across Kedah and other rapidly developing urban areas in Malaysia.

Broader Coverage Across Peninsular Malaysia

While physical Ecosystem-based Adaptation (EbA) and NbS interventions are concentrated in the states of Selangor and Kedah, the project is designed to generate knowledge, climate-risk information and practical implementation experience that can inform adaptation planning and decision-making across Malaysia. This includes methods for assessing climate risks, systems for monitoring water and ecosystems, and ways to integrate NbS into state planning and key agencies. Priority areas for replication will be identified to support scaling beyond the initial project sites.



Kedah:

Output 2.2 Ulu Muda watershed
Output 2.3 Kedah urban areas

Selangor:

Output 2.1 Kuala Langat Selatan Forest Reserve

Peninsular Malaysia:

Component 1: Strengthening Institutional Governance and Evidence-Based Decision-Support Systems

B. Problem Statement and Non-Climatic Barriers

¹³ National Disaster Management Agency (NADMA). (2024). Flood Incident Report: Kedah 2023-2024.

While Malaysia has established a comprehensive policy framework for climate action and adaptation, several institutional, technical and socio-economic barriers continue to constrain the transition from localized adaptation initiatives to coordinated and scalable climate resilience efforts. These barriers limit the ability of institutions and stakeholders to anticipate climate risks, manage interconnected landscapes and sustain adaptation investments over time. They also reduce the effectiveness of adaptation efforts across peatland, watershed and flood-prone landscapes where climate pressures interact with existing environmental and socio-economic vulnerabilities.¹⁴

Systemic Institutional and Technical Barriers

- **Policy, Institutional and Jurisdictional Fragmentation** Malaysia's governance framework for forests, water resources, agriculture, drainage and urban development spans multiple agencies and administrative levels. Land-use planning, watershed management, irrigation, forestry, drainage and municipal development are implemented under different institutional mandates across federal, state and local jurisdictions³. While these arrangements provide sector-specific expertise, coordination challenges, uneven technical capacity and fragmented information-sharing can constrain integrated landscape management and slow the adoption and scaling of adaptation approaches across sectors and jurisdictions.¹⁴
- **Growing Stress on Water, Flood-Management and Urban Systems** Climate variability, extreme weather events and rapid urbanization are placing increasing pressure on Malaysia's water resources, drainage systems and urban infrastructure. With approximately 77% of Malaysia's population living in cities (expected to reach 85-90% by 2050), urban expansion has significantly intensified climate risks.⁵ Expansion of impervious surfaces has reduced natural infiltration and flood-buffering functions in many urban and peri-urban areas, increasing exposure to flash flooding, drainage overload and localized heat stress. The World Bank Country Climate and Development Report highlights growing flood exposure and climate-related risks across Malaysian cities and economic corridors.⁵ These trends increase the need for approaches that complement conventional infrastructure with measures that strengthen ecosystem functions and improve resilience across the wider landscape.
- **Knowledge Gaps in Tropical EbA and NbS Implementation** Despite increasing interest in EbA and NbS, there remains limited operational evidence and applied technical guidance regarding their long-term performance under tropical conditions. Many adaptation models and design assumptions have been developed in non-tropical environments and may not fully reflect Malaysia's rainfall intensity, hydrological dynamics, peatland conditions and ecological processes.¹⁵ As a result, government agencies and practitioners often face uncertainty regarding design standards, maintenance requirements, performance monitoring and long-term effectiveness, limiting confidence in wider adoption and replication.
- **Landscape Degradation and Hydrological Instability** The resilience of critical peatland and watersheds is increasingly affected by erosion, sedimentation and hydrological disturbance. In Ulu Muda watershed erosion and sediment transport contribute to sedimentation pressures affecting reservoirs, irrigation systems, agricultural productivity, water-treatment requirements and downstream water management. In peatland landscapes, drainage-related hydrological changes can accelerate groundwater decline, peat drying and fire susceptibility, increasing environmental, economic and haze-related risks. These pressures reduce the capacity of natural systems to regulate water flows and buffer climate-related shocks.¹⁴
- **Fragmented Information Systems and Predictive Planning Capacity** Climate-related planning and operational management remain constrained by fragmented datasets, institutional information silos and limited integration between ecological monitoring, hydrological observations and climate projections.³ While important climate and hydrological information exist across multiple agencies, integrated systems that support predictive risk assessment, adaptive management and long-term planning remain limited. Basin-scale analyses linking future climate

¹⁴ Climate Adaptation and Resilience in Malaysia: Policy, Practice and Pathways. ISEAS 2026. <https://www.iseas.edu.sg>

¹⁵ International Journal of Wildland Fire. 2025. *Adapting fire danger indices for tropical peatlands: A case study from Malaysia*.

conditions with hydrological processes, sediment dynamics and ecosystem responses are often fragmented across institutions and landscapes, reducing the ability of decision-makers to anticipate future risks and prioritize adaptation investments.¹⁴

Socio-Economic and Capacity Barriers

- **Socio-Economic Vulnerability** Socio-economic conditions influence the ability of households and communities to prepare for, adopt and sustain adaptation measures. Within the project landscapes, many households depend directly on climate-sensitive natural resources and sectors, including irrigated rice cultivation, forestry, ecosystem services and local water resources. Recurrent flooding, drought, peat fires and environmental degradation can disrupt livelihoods, reduce household income and incur recovery costs, while limited financial resources and competing livelihood priorities constrain the capacity of households and communities to invest in long-term adaptation. These challenges are particularly relevant in flood-prone urban and peri-urban communities in Kubang Pasu, agricultural communities dependent on reliable water supplies downstream of the Ulu Muda watershed, and communities affected by peat fires and haze in the Kuala Langat landscape. Strengthening local adaptive capacity therefore requires adaptation approaches that are technically appropriate, economically accessible and responsive to local livelihood contexts.
- **Gender-Differentiated Vulnerability** Women, Indigenous Peoples, youth, persons with disabilities and other vulnerable groups often face barriers to accessing information, participating in climate planning and decision-making, and benefiting equitably from adaptation investments. Climate-related risks disproportionately affect low-income households, women, youth, persons with disabilities and other vulnerable groups with fewer resources available to prepare for, cope with and recover from climate-related shocks. Women remain underrepresented in many formal water-governance and climate-planning structures despite often carrying significant responsibilities related to household water management, caregiving and post-disaster recovery.⁷ Vulnerable households in peatland, watershed and climate-sensitive agricultural landscapes may also face heightened exposure to flooding, haze events, water insecurity and environmental degradation. Addressing these challenges requires strengthened gender-responsive planning, inclusive participation mechanisms and safeguards-sensitive engagement approaches.⁶ Capacities such as empowering women to lead nurseries that will feed into the NbS intervention in Kubang Pasu and the Ulu Muda upstream area will be introduced under Component 2. Women and youth will also be engaged and trained in monitoring risks pertaining to heat, flood, fire and water security risks through citizen science programme and trainings.
- **Capacity and Financing Constraints for Scaling Adaptation** Scaling adaptation requires sustained technical capacity, institutional learning and long-term financing. While Malaysia has made substantial investments in climate resilience, the scale of future adaptation needs remains significant. Recent government assessments estimate that approximately RM 392 billion (~USD 83 billion) may be required for flood mitigation and climate-resilience investments through 2100.¹⁶ At the same time, institutions responsible for implementing adaptation measures often face constraints related to climate risk assessment and planning, technical design, implementation and monitoring of NbS, cross-sector coordination, long-term monitoring and maintenance, and access to sustainable financing mechanisms. These constraints can limit the pace at which innovative adaptation approaches are adopted, institutionalized, maintained and replicated beyond individual project cycles, highlighting the need for strengthened institutional capacity, operational coordination, long-term stewardship and sustainable financing to support climate-resilient development.¹⁴

Baseline Adaptation Context

Under the current scenario, climate adaptation efforts are expected to continue through a combination

¹⁶ Department of Irrigation and Drainage (DID/JPS). 2024. National Flood Mitigation and Climate Resilience Investment Requirements 2024-2100.

of sector-specific programmes, conventional infrastructure investments and routine management activities.¹⁴ While these measures provide important services and localized benefits, they are not designed to address the interconnected climate risks affecting peatland, watershed and flood-prone landscapes.¹⁴

In peatland areas, management is expected to remain focused primarily on fire monitoring, suppression and routine land-management activities. Limited resources are available for hydrological management, water-retention measures, integrated monitoring systems and other measures that address the underlying drivers of peat-fire vulnerability. As climate variability increases, degraded peatlands may remain vulnerable to groundwater decline, peat drying and recurrent fire risk.¹¹

In the Ulu Muda watershed, existing investments are likely to continue focusing on reservoir operations, water infrastructure and routine watershed management. While these investments support water supply and irrigation services, inadequate financing is available for climate-adaptive watershed management, erosion control, sediment management, assisted natural regeneration and enrichment planting that address upstream drivers of sedimentation, declining water quality and hydrological instability.

In urban and peri-urban areas, local authorities are expected to continue relying primarily on conventional drainage and retention systems designed around historical hydrological conditions. As rainfall intensity, runoff patterns and urban development pressures increase, these systems may face growing challenges in managing flood risks and maintaining service performance. Opportunities to enhance existing assets through NbS and ecological retrofitting are likely to remain limited under current financing arrangements.

At the institutional level, climate, hydrological and ecosystem information will continue to be generated by multiple agencies, but the integration of these datasets into practical planning and management tools is expected to remain uneven. This may constrain the ability of institutions to undertake forward-looking risk assessments, prioritize investments and respond proactively to evolving climate conditions.¹⁴ Community participation in adaptation is also likely to remain limited to short-term consultation and awareness activities. Existing programmes provide comparatively little support for long-term stewardship systems, community monitoring initiatives, citizen-science programmes, community nurseries or other mechanisms that can help sustain adaptation investments beyond individual projects.

Taken together, these constraints suggest that adaptation efforts will continue to address immediate risks and operational needs but may be insufficient to support the coordinated, landscape-scale adaptation required to respond to increasing climate variability and long-term climate change.¹⁴

C. Climate Rationale

Malaysia is experiencing increasing climate-related hazards that are directly relevant to the project's peatland, watershed and urban landscapes. These include more frequent and intense flooding, changing rainfall patterns, prolonged droughts, increasing temperatures, hydrological instability and associated ecosystem degradation. Together, these trends increase risks to water security, agriculture, urban infrastructure and ecosystem services, reinforcing the need for integrated adaptation approaches that combine climate information, ecosystem management and NbS.

Climate impacts and hazards

Climate change is altering Malaysia's hydrological systems, ecosystems, and settlements through a projected temperature increase of up to 2.0°C and a 16.9% rise in rainfall volatility by mid-century.¹⁷ Because 97% of the nation's water supply relies heavily on surface runoff and river systems, these shifts

¹⁷ Malaysian Meteorological Department (METMalaysia), 2023. Climate Change Scenarios for Malaysia 2021-2100. <https://www.met.gov.my>

drive cascading socio-economic and environmental impacts—manifesting as depleted water storage, reservoir sedimentation, and degraded water quality. To build long-term adaptive capacity, this project deploys NbS addressing five climate-related hazards directly relevant to the target landscapes:

- **Intensifying Flooding and Extreme Rainfall** Flooding has become one of Malaysia's most significant climate-related hazards, contributing to increasing economic losses, infrastructure disruption and displacement. Approximately 10.1% of Malaysia's land area (around 33,000 km²) is classified as flood-prone.¹⁸ Climate projections indicate that rising temperatures are likely to increase atmospheric moisture-holding capacity, contributing to more intense rainfall events and increasing flood risk. The National Water Research Institute of Malaysia (NAHRIM) projects that flooded areas are expected to increase by up to 18.2% in Peninsular Malaysia, while extreme rainfall intensity is projected to increase by 16% to 20%.¹⁹ These trends are increasingly reflected in recurring and multi-wave flood events affecting the same communities multiple times during a single monsoon season.
- **Drought and Water Stress** Droughts, prolonged dry periods and increasing temperatures are placing growing pressure on Malaysia's water resources, peatlands and climate-sensitive ecosystems. In peatland landscapes, declining groundwater levels increase peat drying and fire susceptibility, while prolonged dry periods reduce ecosystem resilience and water-regulation functions. FRIM analysis in Selangor indicates that peat-fire risk increases significantly when groundwater levels decline beyond approximately 40–50 cm below the peat surface, creating conditions favourable for persistent smouldering peat fires.²⁰
- **Peat Drying and Fire Risk** Human-induced drainage lowers water tables and renders naturally waterlogged peatlands highly susceptible to smouldering underground fires. Climate projections of prolonged droughts and higher temperatures amplify this risk, turning carbon-rich peat swamp forests into massive greenhouse gas emitters and becoming the primary driver of severe regional smoke haze, recurrent public health crises, affecting airport and school operations. In peatland landscapes, declining groundwater levels increase peat drying and fire susceptibility, directly threatening dense human settlements, critical highway networks, and heavy infrastructure. FRIM analysis indicates that peat-fire risk increases significantly when groundwater levels fall below approximately 40–50 cm beneath the peat surface, creating conditions that favour persistent smouldering fires during extended dry periods.¹¹
- **Increasing Temperatures and Heat Stress** Projections indicate that mean surface temperatures across Malaysia will rise by 1.2°C to 1.5°C by mid-century¹⁹, dramatically amplifying ambient heat stress. Because the nation's water security is 97% reliant on surface water systems, this thermal escalation directly threatens critical hydrological assets and sensitive ecosystems. Elevated ambient temperatures accelerate evapotranspiration rates, rapidly depleting surface storage reserves and lowering river baseflows during dry seasons. Thermally stressed water bodies suffer from reduced dissolved oxygen levels and accelerated algal blooms, severely compromising raw water quality and escalating treatment costs. Furthermore, heat stress disrupts riverine and forest ecosystems, causing canopy dieback and reducing the natural water-retention capacity of watersheds.

Hydrological Variability, Soil Erosion and Siltation Pressures Climate-driven shifts in monsoon patterns are accelerating extreme hydrological variability across Malaysia's river basins. Regional climate downscaling by NAHRIM projects that annual rainfall volumes will increase by 9% to 25% by 2100.¹⁹ Crucially, this volume expansion is driven by a 30% surge in extreme rainfall intensity rather than evenly distributed rainy days, shifting the baseline toward rapid, high-velocity surface runoff over vulnerable watersheds. This intensified runoff triggers severe land degradation, localized riverbank destabilization, and accelerated topsoil erosion. The resulting siltation pressures create a cascading crisis for water security: eroded sediment chokes natural river channels, drastically reduces natural flood-carrying capacities, and causes massive siltation in critical reservoirs. Increased turbidity and

¹⁸ National Disaster Management Agency (NADMA), 2021. National Flood Risk Assessment Report.

¹⁹ National Water Research Institute of Malaysia (NAHRIM), 2024. Climate Change Projections for Malaysia: Rainfall and Flood Analysis. <https://www.nahrim.gov.my>

²⁰ Ministry of Natural Resources and Environmental Sustainability (NRES), 2022. Water Resource Management Report.

suspended solids severely degrade raw water quality, spiking municipal water treatment costs and accelerating infrastructure wear.

The implications of these hazards differ across the three project landscapes owing to differences in ecosystem characteristics, hydrological processes, socio-economic conditions and exposed assets as summarized in the table below:

Table: Summary of climate hazards, vulnerabilities and adaptation rationale for the project

Project landscape	Main climate hazards & trends	Key vulnerabilities	Main exposed people, assets & sectors	Adaptation rationale
Kuala Langat Selatan Forest Reserve (Selangor)	- Rising temperatures and prolonged dry periods - Groundwater decline - Peat drying and increased peat-fire risk	- Degraded peat hydrology - Peat oxidation and fire susceptibility - Loss of ecosystem functions, carbon storage and biodiversity	- Nearby communities - Greater Kuala Lumpur - KLIA and transport corridors - Peatland ecosystem services	Peatland hydrological restoration and rewetting to reduce peat-fire risk and strengthen ecosystem resilience
Ulu Muda Watershed (Kedah)	- Increasing rainfall intensity - Greater runoff variability - Drought periods - Erosion and sedimentation	- Watershed degradation - Reservoir sedimentation - Reduced water storage and water quality	4.2 million water users downstream - MADA irrigation scheme - Domestic water supply - Agriculture	Watershed restoration, enrichment planting and erosion control to strengthen water security and reduce sedimentation
Kubang Pasu / Urban & Peri-urban Kedah	- More intense rainfall - Flooding - Higher temperatures and urban heat Increasing frequency and intensity of extreme rainfall; recurrent flooding and prolonged inundation; increasing temperature and urban heat stress; pressure on drainage systems	- Drainage & stormwater system overload - Flood-prone settlements - Reduced infiltration & increasing runoff - Urban infrastructure and agricultural areas	- Communities & settlements - Businesses and Bukit Kayu Hitam economic corridor - Roads and public infrastructure - Paddy production and agricultural livelihoods - Transport and logistic networks	NBS for flood attenuation, urban cooling and improved water regulation, supported by state-wide NbS planning. Transformation of retention ponds and drainage assets into multifunctional NbS to reduce flood risks, improve water regulation, urban cooling, and biodiversity, and demonstrate a replicable blue-green infrastructure model for climate-resilient municipal development.

Vulnerability assessment

The impacts of climate hazards in Malaysia are not evenly distributed across geographic areas, economic sectors and population groups. Vulnerability is particularly concentrated in climate-sensitive urban areas, peatland and watershed landscapes, irrigated agricultural systems, and among communities with more limited adaptive capacity and financial resilience.⁵ The principal climate vulnerabilities associated with each project landscape are also summarised in the table above.

- Urban Exposure and Infrastructure Vulnerability** Approximately 75% of Malaysia's population resides in urban areas, where exposure to flash flooding, drainage-system overload and urban heat stress is increasing.⁵ Rapid urbanization, expansion of impermeable surfaces and loss of natural drainage functions have increased runoff intensity and reduced flood-buffering capacity across many urban and peri-urban areas. Urban heat-island effects commonly increase local temperatures by 2–3°C above surrounding areas, further increasing exposure to heat-related impacts.¹⁴ As a result, extreme rainfall events increasingly lead to localized flooding, infrastructure disruption, economic losses and prolonged recovery periods in densely populated settlements.¹⁴

- **Climate-Sensitive Ecosystems and Dependent Communities** Peatland and watershed ecosystems are particularly vulnerable because climate change compounds existing pressures associated with drainage, erosion, land-use change and urban expansion. Reduced ecosystem resilience affects water regulation, flood attenuation, sediment control, biodiversity conservation and other ecosystem services that support communities, agriculture and economic activities. Environmental degradation reduces the capacity of these systems to buffer climate impacts and support the communities that depend upon them.
- **Water Security, Agricultural Livelihoods and Food Security** Malaysia's agricultural production and water security are closely linked to climate-sensitive watershed systems and reliable water availability. Approximately 97% of Malaysia's national water supply is derived from surface-water systems, making water security highly dependent on rainfall patterns, watershed condition and reservoir performance.⁵ Increasing temperatures, rainfall variability, erosion and sedimentation place growing pressure on reservoirs, irrigation infrastructure and downstream water users. Between 2018 and 2022, flood and extreme-weather events affected approximately 19,672 hectares of rice-production areas, illustrating the increasing vulnerability of climate-sensitive agricultural systems.²¹
- **Economic Vulnerability** Climate-related disasters are generating increasing economic losses across infrastructure, agriculture, businesses and households. Between 2021 and 2023, flood-related losses alone were estimated at approximately RM 7.9 billion (USD 1.87 billion).⁵ Within the project landscapes, these economic impacts are reflected through recurrent flood damage to urban infrastructure and businesses in Kubang Pasu, increasing pressure on water-dependent agricultural production linked to the Ulu Muda watershed, and the economic consequences of peat fires, haze events and ecosystem degradation in Kuala Langat. Increasing climate variability is expected to place additional pressure on public expenditure associated with emergency response, recovery, infrastructure rehabilitation and disaster-risk management, while also affecting productivity and local livelihoods.⁵
- **Community and Livelihood Vulnerability** Climate-related impacts are not experienced uniformly across affected populations. Within the project landscapes, climate-related impacts are not experienced uniformly across affected populations. In the Kuala Langat landscape, peat fires and haze events may affect public health, livelihoods and access to natural resources. In the Ulu Muda landscape, communities and downstream economies depend on reliable watershed functions that support domestic water supply and irrigated agriculture. In Kubang Pasu, recurrent flooding affects households, businesses and agricultural production, disrupting livelihoods and increasing recovery costs. These socio-economic conditions influence exposure to flooding, water insecurity, haze events and environmental degradation and reinforce the need for inclusive, community-based adaptation approaches.⁶

Climate trends and projections

The need for long-term adaptation action in Malaysia is supported by observed climate trends and projected increases in temperatures, rainfall variability, extreme rainfall intensity, drought risk and hydrological variability. Evidence from the METMalaysia, Malaysia's Fourth National Communication (NC4) to the United Nations Framework Convention on Climate Change (UNFCCC) and the IPCC Sixth Assessment Report (AR6) indicates that Malaysia is already experiencing a warming climate accompanied by increasing climate variability and more frequent extreme weather events.³

Observed records indicate warming trends of approximately 0.13°C-0.24°C per decade across different parts of Malaysia since the 1980s.¹⁷ Crucially, historical records from MetMalaysia indicate that this warming is asymmetric: surface minimum temperatures (nighttime lows) are escalating nearly twice as fast as maximum temperatures, rising by up to 0.32°C per decade compared to 0.22°C per decade for daytime highs. This lack of nocturnal cooling prevents thermal recovery across watersheds, driving elevated overnight evapotranspiration and locking surface water systems into continuous, 24-hour ecological stress. While regional downscaling by NAHRIM projects a mean maritime temperature rise

²¹ Ministry of Agriculture and Food Security, 2023. Agricultural Statistics. <https://www.mafs.gov.my>

of 1.7°C to 2.1°C by 2100, this baseline increase interacts destructively with localized Urban Heat Island effects to spike city temperatures by an additional 2°C to 8°C. This combined thermal stress accelerates evaporation over surface water assets, triggering severe ecological flow deficits. National climate projections indicate that average temperatures will continue to increase through mid-century under both medium-emission (RCP4.5) and high-emission (RCP8.5) scenarios, while changes in rainfall patterns are expected to contribute to more intense rainfall events, increasing hydrological variability and greater seasonal water stress.³

These trends are expected to place increasing pressure on water resources, agricultural systems, peatland and watershed ecosystems, urban drainage infrastructure and climate-sensitive communities. Projected impacts are likely to vary across regions and landscapes. Northern Peninsular Malaysia is projected to experience increasing dry-season variability, water stress and hydrological instability affecting reservoirs, irrigation systems and watershed functions, while urbanized areas may face increasing flood exposure, drainage-system pressure and urban heat stress associated with intensified rainfall, rising temperatures and expanding impermeable surfaces.¹⁹

Table: Summary of observed climate trends, projections and relevance for the project landscapes

Climate hazard	Observed trends	Future climate projections	Relevance to project landscapes
Rising temperatures and heat stress	Increasing temperatures have been observed across Malaysia at rates of approximately 0.13–0.24°C per decade since the 1980s. ¹⁷	In medium (RCP4.5) and high-emission (RCP8.5) scenarios, mean temperatures projected to increase by 1.1–1.5°C by 2050 and 1.7–2.1°C by 2100. ¹⁹ Rising temperatures are to increase evapotranspiration, water demand and heat stress, while contributing to more intense rainfall via higher atmospheric moisture. ^{17 19}	Increasing temperatures will exacerbate peat drying and wildfire risk in Kuala Langat, increase evapotranspiration and irrigation demand in Ulu Muda, and intensify urban heat stress and climate impacts in Kubang Pasu. ^{3 14}
Extreme rainfall and flooding	Increasing frequency and intensity of heavy rainfall events have been observed across Peninsular Malaysia, contributing to recurrent flooding, infrastructure disruption and economic losses. ¹⁸	Under the medium (RCP4.5) and high-emission (RCP8.5) scenarios, NAHRIM projects extreme rainfall intensity will increase by 16–20% in Peninsular Malaysia, while flood-prone areas may increase by up to 18.2% by 2100. ¹⁹	More intense rainfall will increase flood risk in Kubang Pasu, accelerate runoff, erosion and sediment transport in the Ulu Muda watershed, and contribute to greater hydrological variability across project landscapes. ^{3 14}
Drought and water stress	More pronounced dry periods and increasing seasonal rainfall variability have been observed across Peninsular Malaysia, particularly during El Niño periods. ¹⁸	Under both RCP4.5 and RCP8.5 scenarios, climate projections indicate greater dry-season variability and increasing water stress by the 2050s, placing growing pressure on reservoirs, irrigation systems and water resources. ^{3 19}	Increasing drought and water stress will reduce water available for irrigation and domestic supply in Ulu Muda, while prolonged dry periods amplify risks to groundwater decline and ecosystem stress in Kuala Langat. ^{3 14}
Peat drying and fire risk	Recurrent peat fires and declining groundwater levels observed in drained peatland landscapes, particularly in dry periods. FRIM monitoring indicates that peat-fire risk increases significantly if groundwater levels fall below ~40–50 cm beneath the peat surface. ¹¹	Higher temperatures and prolonged droughts are expected to increase peat drying, oxidation and fire susceptibility under both RCP4.5 and RCP8.5 scenarios, increasing greenhouse gas emissions and the likelihood of severe haze events by 2050–2100. ^{17 19}	This hazard is particularly relevant to Kuala Langat, where restoring peat hydrology is essential to reduce wildfire risk, protect ecosystem functions and reduce haze impacts affecting nearby communities, transport infrastructure and economic activities. ^{11 14}

Hydrological variability, erosion and sedimentation	Increasing rainfall variability and more intense runoff are contributing to erosion, sediment transport and reservoir sedimentation in Malaysian watersheds. ¹⁹	Under RCP4.5 and RCP8.5 scenarios, NAHRIM projects increasing rainfall variability, more intense runoff and greater hydrological instability by 2050–2100, increasing erosion, sediment mobilisation and pressure on reservoirs and water-management systems. ¹⁹	In Ulu Muda, erosion and sedimentation threaten reservoir performance, downstream irrigation, water supply and long-term watershed resilience, while also contributing to flood management challenges in Kubang Pasu. ^{14 24 25}
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The following sections describe the climate risks, vulnerabilities and projected climate changes affecting each project landscape, and present the climate rationale for the proposed adaptation interventions.

Site-Specific Climate Risks, Vulnerabilities and Adaptation Rationale

Peatland Landscape (Selangor)

The Selangor peatland landscape is increasingly vulnerable to prolonged dry periods, hydrological disturbance and peat-fire risk associated with pronounced seasonal rainfall variability, rising temperatures and groundwater decline. The landscape experiences a tropical monsoon climate, with rainfall concentrated during the Northeast Monsoon and substantially drier conditions during the Southwest Monsoon and El Niño years. In intact peatlands, groundwater levels fluctuate seasonally while remaining close to the peat surface. However, in Kuala Langat Selatan Forest Reserve (KLSFR), an extensive legacy drainage network amplifies these seasonal fluctuations, resulting in substantially lower groundwater levels and increased peat drying during dry periods.

FRIM monitoring and peatland studies indicate that peat-fire susceptibility increases substantially when groundwater-table levels decline beyond 40–50 cm below the peat surface during extended dry periods, increasing peat drying, oxidation and the risk of persistent peat fires. Research using IoT-based monitoring systems at the Raja Musa Forest Reserve in Selangor has demonstrated that groundwater level is a critical predictor of peatland fire risk, with correlations above 0.84 between monitored data and METMalaysia observations, and a correlation of 0.91 between calculated Duff Moisture Code using proposed models and actual fire occurrence data²². Historical drought periods, including the 2019 El Niño event, recorded substantial groundwater decline in the Selangor peatland landscape, illustrating the sensitivity of these ecosystems to prolonged dry conditions and hydrological disturbance.¹⁴

Projected increases in temperature and seasonal rainfall variability are expected to increase the frequency and duration of groundwater drawdown during dry periods, even where annual rainfall increases overall, as a greater proportion of precipitation is projected to occur in more intense rainfall events. These changes are expected to increase peat drying and oxidation, affecting ecosystem resilience, carbon-storage functions, biodiversity and water-regulation services. Studies on tropical peat compaction in Selangor indicate that peatland degradation significantly alters physicochemical properties and carbon emissions, with CO₂ emissions from degraded secondary forest peat measured at 275.4 mg m⁻² hr⁻¹, reducing to 182.0 mg m⁻² hr⁻¹ under compaction conditions²³. Peatland degradation and fire events can also contribute to haze exposure, reduced water quality and broader environmental-health impacts affecting nearby settlements, transport infrastructure and economic activities. The landscape is located within the wider Greater Kuala Lumpur region and in proximity to Kuala Lumpur International Airport (KLIA), increasing the significance of preventing recurrent peat-fire and haze events that may affect public health, economic activity and regional connectivity.

²² Environmental Monitoring and Assessment, 195, 2023. *IoT-based groundwater monitoring for peatland fire risk prediction in Selangor, Malaysia*. <https://doi.org/10.1007/s10661-023-11234-5>

²³ Soil Science Society of America Journal 88, p. 15–28, 2024. *Effect of compaction on tropical peat properties and CO₂ emissions in Selangor, Malaysia*. <https://doi.org/10.1002/saj2.20532>

These risks highlight the importance of maintaining peatland hydrological integrity and groundwater conditions under increasingly variable climatic conditions. The proposed intervention focuses on peatland hydrological stabilization and rewetting measures to maintain peat moisture conditions, reduce fire susceptibility and improve resilience to prolonged dry periods and climate variability.

Ulu Muda Watershed (Kedah)

Ulu Muda is highly sensitive to changing rainfall intensity, hydrological variability and erosion processes because its forested upper catchments regulate runoff, sediment transport and downstream water supply. Increasing rainfall intensity and more variable precipitation patterns are expected to increase surface runoff, soil erosion and sediment transport within upper catchments, affecting downstream reservoirs, irrigation infrastructure, water-treatment requirements and agricultural water management.

The watershed forms a critical component of the regional water-resource system supporting domestic water supply, irrigation and agricultural production across the states of Kedah, Penang and Perlis. The broader watershed system provides water services relied upon by an estimated 4.2 million people and supports the MADA irrigation scheme, one of Malaysia's most important rice-production systems and a key contributor to national food security. Recent reports of declining water levels in the Muda and Pedu reservoirs have highlighted growing concerns regarding water availability, irrigation reliability and the resilience of downstream water users during prolonged dry periods.

NAHRIM projects increases in annual rainfall (9–25%) and extreme rainfall intensity (16–20%) across Peninsular Malaysia under future climate scenarios, together with increasing temperatures. These changes are expected to increase runoff variability, soil erosion and the frequency of extreme precipitation events affecting northern Peninsular Malaysia, particularly within steep forested catchments and downstream reservoir systems.²⁴ These changes are expected to increase soil erosion, sediment mobilisation and watershed degradation, particularly within vulnerable slopes, riparian areas and disturbed catchment zones. Logging in the Ulu Muda upper catchments results in high rates of sedimentation and movement of forest debris into rivers, threatening reservoir lifespan and the ability of forests to regulate water flow.²⁵ Sedimentation studies in the Muda catchment area have shown that bedload sediment thickness can reach up to 0.75 metres in some locations, with reservoirs containing fine sediments (silt and clay sizes <63 µm) that affect water-storage capacity.²⁶ Increased sedimentation threatens downstream reservoirs, irrigation infrastructure and water-treatment systems, including the Muda Dam and MADA irrigation network, while increasing operational costs for water-service providers.

At the same time, increasing temperature, rainfall variability and drought risk may place additional pressure on reservoir storage, irrigation reliability, irrigation efficiency and agricultural productivity. Ongoing erosion and sediment transport within upper catchments may contribute to sedimentation pressures affecting reservoir capacity, water-treatment requirements and overall water-management efficiency. These interacting pressures have the potential to increase competition among domestic, agricultural and other water users under future climate conditions.

Given the strategic role of the Ulu Muda watershed in supporting regional water security, domestic water supply and national food production, maintaining watershed functions that regulate runoff, reduce erosion and sediment transport, sustain reservoir performance and protect downstream water quality is therefore an important climate adaptation priority for northern Peninsular Malaysia.

The proposed intervention focuses on climate-adaptive watershed management, enrichment planting, assisted natural regeneration, erosion-control and sediment-management measures designed to

²⁴ National Water Research Institute of Malaysia (NAHRIM), 2024. Climate Change Projections for Malaysia: Rainfall and Flood Analysis. <https://www.nahrim.gov.my>

²⁵ WWF-Malaysia, 2024. Ulu Muda Forest Complex: A Critical Water Catchment for National Food Security. <https://www.wwf.org.my>

²⁶ Malaysian Institute for Nuclear Technology Research, 2000. Sedimentation Studies in the Muda Catchment Area.

strengthen watershed resilience and reduce climate-related risks and pressures on downstream water systems, downstream water users, agricultural production and water-dependent livelihoods under future climate conditions.

Urban and Peri-Urban Landscapes (Kedah)

Kedah, Malaysia's primary rice-producing state, is experiencing increasing climate risks associated with more frequent and intense rainfall events, localized flooding, prolonged inundation, rising temperatures and increasing pressure on urban drainage systems. These climate hazards affect urban centres, peri-urban settlements, agricultural landscapes and critical infrastructure across the state, highlighting growing challenges for flood management, water regulation and climate resilience. Between 2023 and 2025, approximately 90 recurrent flood hotspots were identified across Kedah, with significant concentrations occurring in districts including Kubang Pasu, Kota Setar, Pendang, Baling and Langkawi, illustrating the widespread nature of flood risks across the state.¹⁴

Flood losses during the Northeast Monsoon 2024/2025 were estimated at RM136.7 million (approximately USD 32.8 million), including RM97.8 million (approximately USD 23.5 million) in agricultural losses, highlighting the increasing vulnerability of communities, infrastructure and economic sectors to climate variability and extreme weather events. According to the Special Survey on the Impact of the 2024/2025 Northeast Monsoon Floods, Kubang Pasu district recorded total flood losses of RM2.1 million (approximately USD 0.5 million), comprising RM2.1 million (approximately USD 0.5 million) in residential damages, RM28,800 (approximately USD 6,900) in vehicle losses, and RM39,600 (approximately USD 9,500) in business premises damages.²⁷

Within Kedah, Kubang Pasu is particularly exposed to compound flood risks associated with intense rainfall events, upstream runoff accumulation, drainage-system overload and localized waterlogging, while rising temperatures contribute to increasing urban heat exposure. Recurrent and multi-wave flood events have affected settlements, agricultural areas, public infrastructure, transport connectivity and local economic activities. Repeated inundation within short recovery periods may reduce infiltration capacity, increase runoff accumulation and prolong localized drainage stress, placing additional pressure on vulnerable populations and municipal infrastructure.

Under the medium-emission (RCP4.5) and high-emission (RCP8.5) scenarios, NAHRIM projects temperature increases of 1.7°C to 2.1°C by 2100, alongside a 9% to 25% increase in rainfall. The intensity of extreme rainfall is projected to increase by 16% to 20% in Peninsular Malaysia, and flooded areas are expected to increase by up to 18.2%.¹⁹ These projections suggest that flood frequency, drainage pressure, urban heat exposure and infrastructure risks are likely to increase under future climate scenarios. Low-lying agricultural and settlement areas may face increasing challenges associated with repeated inundation, delayed recovery periods and cumulative impacts on livelihoods, public amenities and local infrastructure systems. Given Kedah's importance for national food production and its role as a major agricultural and transport corridor in northern Peninsular Malaysia¹², increasing flood frequency and drainage stress have implications extending beyond individual districts to regional economic resilience, food security and connectivity.¹⁶

Urban retention ponds, wetlands, drainage corridors and associated blue-green infrastructure represent important components of Kedah's flood-management system. Beyond their conventional drainage functions, these assets provide opportunities to enhance flood attenuation, water regulation, biodiversity, urban cooling and other ecosystem services when managed to maintain and strengthen their ecological functions. Strengthening the resilience and multifunctionality of these interconnected urban and peri-urban landscapes is therefore an important climate adaptation priority for Kedah under increasingly variable future climate conditions.

²⁷ Department of Statistics Malaysia (DOSM), 2025. Special Survey on the Impact of the 2024/2025 Northeast Monsoon Floods.

Adaptation and Climate Resilience Pathways

To address the identified climate risks and vulnerabilities, the project applies an integrated adaptation approach that combines improved climate information, ecosystem-based adaptation measures, adaptive water management and locally embedded stewardship mechanisms. Building on lessons from previous adaptation initiatives in Malaysia, including the Adaptation Fund (AF) Penang Nature-based Climate Adaptation Programme,²⁸ the project seeks to strengthen resilience by addressing both the underlying drivers of climate vulnerability and the institutional conditions for sustained adaptation.

Pathway 1: Strengthened Climate Intelligence, Governance and Scaling Capacity

Reliable climate information and decision-support systems are fundamental to effective adaptation planning. The project strengthens the availability and practical application of climate, hydrological and ecosystem information through the Integrated Climate–Forest Intelligence System (ICFIS), Climate Vulnerability Atlas and associated planning tools.

These systems are intended to improve the availability and use of climate-risk information across sectors and administrative levels, supporting more informed planning, prioritization and management decisions. The pathway also strengthens institutional coordination, operational guidance and knowledge-sharing processes needed to support wider uptake and scaling of adaptation approaches within national and sub-national planning systems.

Pathway 2: Improved Ecosystem, Hydrological and Water-System Resilience

Reducing climate risk in the target landscapes requires interventions that address the underlying drivers of hydrological instability, ecosystem degradation and flood vulnerability. The project supports targeted interventions designed to improve hydrological stability, strengthen ecosystem functions and reduce climate-related flood, erosion, sedimentation, drought, urban heat and peat-fire risks.

Measures include peatland rewetting and hydrological stabilization, climate-adaptive watershed management, enrichment planting, assisted natural regeneration, erosion- and sediment-management interventions, and enhancement of selected urban retention ponds using NbS approaches. Together, these interventions intend to improve water regulation, reduce climate-related risks and strengthen the resilience of landscapes that support water security, agricultural production and local livelihoods.

Pathway 3: Strengthened Local Capacity, Livelihoods and Inclusive Adaptation

Long-term adaptation outcomes depend not only on infrastructure and ecosystem investments but also on the capacity of institutions and communities to sustain them over time. The project supports community stewardship mechanisms, community nurseries, Eco-Warden and citizen scientist programmes, climate-resilience awareness activities and inclusive participation processes involving women, youth and other vulnerable groups.

Activities are designed to increase local engagement in ecosystem stewardship and monitoring, increase awareness of climate risks and adaptation options, and support participation in climate-related planning and management processes. The pathway also promotes learning and knowledge exchange to support replication and adaptation of successful approaches beyond the project sites.

Project Objective

The Project Objective is to strengthen the climate resilience and adaptive capacity of vulnerable communities and national/sub-national institutions in Malaysia through the integration of evidence-based policy frameworks, the implementation of Ecosystem-based Adaptation (EbA) and integrated Nature-Based Solutions (NbS) for enhanced water security, and targeted capacity building and gender-responsive livelihood empowerment.

²⁸ Adaptation Fund (AF). Penang Nature-based Climate Adaptation Programme: <https://www.adaptation-fund.org/project/nature-based-climate-adaptation-programme-for-the-urban-areas-of-penang-island-2/>

Project/Programme Components and Financing

Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount (US\$)
Component 1: Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning	1.1: Integrated Climate-Forest Intelligence System (ICFIS) Developed and Operationalized.	Outcome 1: Institutions apply climate intelligence, vulnerability information and adaptation evidence in planning, investment and decision-making processes.	380,000
	1.2: Forest-Climate Vulnerability Atlas Developed and Applied.		433,964
	1.3: Institutionalization, Operational Guidance and Scaling Frameworks Developed.		1,300,050
Component 2: Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience	2.1: Climate-Resilient Peatland Rewetting, Fire Resilience and Monitoring Systems Operationalized.	Outcome 2: Ecosystems and climate-resilient infrastructure provide strengthened hydrological, buffering and adaptation functions	1,507,000
	2.2: Climate-Adaptive Watershed Management through Nature-based Solutions implemented in the Ulu Muda Watershed.		1,764,000
	2.3: Urban and Peri-Urban Nature-based Solutions for Flood and Heat Resilience Implemented.		1,755,000
Component 3: Institutionalizing Capacity, Stewardship and Sustainable NbS Management	3.1: Inclusive Community Participation, Capacity and Livelihoods Strengthened.	Outcome 3: Communities and institutions strengthen climate resilience through inclusive participation, enhanced capacities and application of adaptation knowledge	758,000
	3.2: Technical Capacity for Climate Intelligence, NbS Management and Project Implementation Strengthened.		258,014
	3.3: Knowledge Management, Learning and Dissemination Systems Operationalized.		185,000
	Total component cost		8,341,014
	Project Execution cost		875,576
	Total Project Cost		9,216,590
	Project Cycle Management Fee charged by the Implementing Entity		783,410
	Amount of Financing Requested		10,000,000

Projected Calendar and milestones

Milestones	Expected Dates
Start of Project/Programme Implementation	1 February 2027
Mid-term Review (if planned)	1 August 2029
Project/Programme Closing	31 January 2032
Terminal Evaluation	1 May 2032

Theory of Change

The Theory of Change is based on the premise that climate resilience can be strengthened when decision-makers have access to reliable climate and environmental information, landscapes are managed to maintain critical ecosystem and water-regulation functions, and communities and institutions have the capacity to sustain adaptation actions over time.

The project addresses increasing climate vulnerability associated with flooding, drought, peat drying, fire risk, erosion, sedimentation, water insecurity and urban climate pressures across peatland, watershed and urban landscapes. It also recognizes that fragmented information systems, uneven technical capacity, limited cross-sector coordination and insufficient long-term management arrangements can constrain effective adaptation implementation and scaling. The project therefore combines improved climate and vulnerability information, planning and coordination mechanisms in Component 1; implementation of EbA and NbS interventions that strengthen ecosystem and water-management functions in Component 2; and capacity development, stewardship mechanisms and knowledge-sharing in Component 3.

Together, these investments are expected to strengthen climate resilience by improving planning and decision-making, reducing climate-related risks across vulnerable landscapes, enhancing water security and supporting the long-term sustainability and replication of adaptation interventions.

Component	Logic Statement	Causal Link to Outcome	Key Assumptions
Component 1: Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning	IF climate-risk information and planning tools are operationalized and used by decision-makers, THEN national and sub-national institutions will be better equipped to assess climate risks, prioritize adaptation actions and support climate-informed planning and management.	LEADING TO strengthened integration of climate-risk information into planning, coordination and adaptation decision-making processes under Outcome 1.	Participating agencies support technical coordination, operational collaboration and data-sharing arrangements sufficient for implementation and long-term use of Component 1 systems and tools.
Component 2: Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience	IF ecosystem restoration, hydrological management and urban NbS measures are implemented and maintained, THEN ecosystem functions, water security and resilience to climate-related hazards will be strengthened across vulnerable landscapes.	LEADING TO improved hydrological resilience, reduced peat-fire vulnerability, strengthened watershed functions and enhanced flood resilience under Outcome 2.	EbA and NbS interventions remain effective and can be adaptively managed under changing climate conditions, and implementing agencies maintain support for long-term management and maintenance.
Component 3: Institutionalizing Capacity, Stewardship and Sustainable NbS Management	IF technical capacity, stewardship arrangements and knowledge-sharing mechanisms are strengthened, THEN communities, local stakeholders and institutions will be better positioned to support implementation, monitoring, management and long-term sustainability of adaptation interventions.	LEADING TO strengthened stewardship systems, improved sustainability of adaptation investments and increased participation of communities and institutions in adaptation implementation and maintenance under Outcome 3.	Community participation and support for EbA and NbS approaches can be strengthened through inclusive engagement, locally appropriate implementation models and demonstrated adaptation benefits.

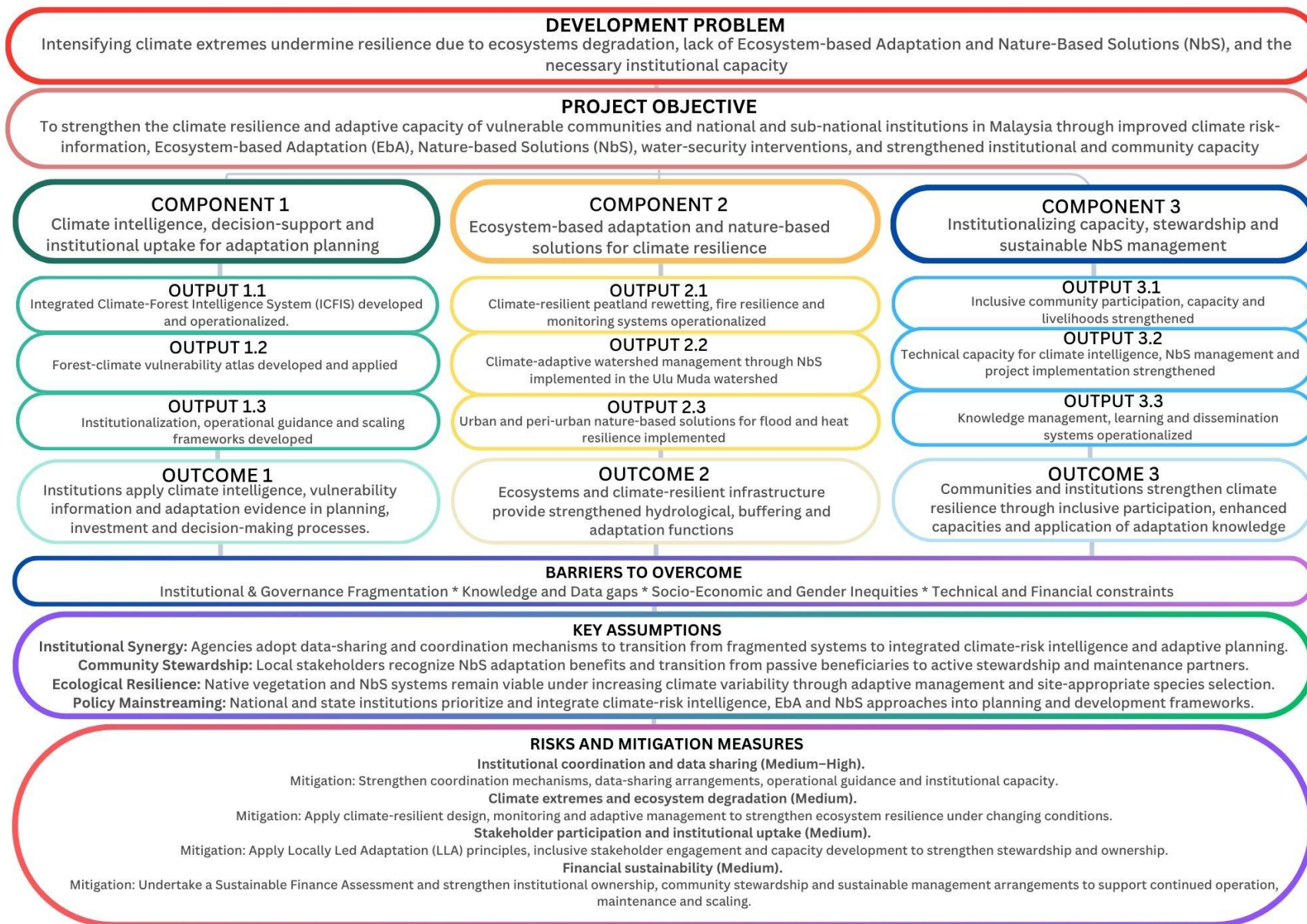
Key Assumptions, Risks and Mitigation Considerations

The Theory of Change assumes continued institutional collaboration, stakeholder participation and long-term commitment to integrating climate intelligence, EbA and NbS into planning, investment and management decisions. It further assumes that climate information, ecosystem restoration and strengthened local stewardship will collectively improve adaptation decision-making and resilience under increasingly variable climate conditions.

Critical Risks and Mitigation Measures

- **Institutional coordination and data sharing (Medium–High):** Fragmented mandates and limited information sharing may constrain climate-informed planning and implementation. **Mitigation:** Strengthen coordination mechanisms, data-sharing arrangements, operational guidance and institutional capacity under Component 1.
- **Climate extremes and ecosystem degradation (Medium):** Floods, droughts, peat fires and other climate hazards may affect intervention performance. **Mitigation:** Apply climate-resilient design, monitoring and adaptive management to strengthen ecosystem resilience under changing conditions.
- **Stakeholder participation and institutional uptake (Medium):** Limited community participation or institutional ownership may reduce long-term sustainability. **Mitigation:** Apply Locally Led Adaptation (LLA) principles, inclusive stakeholder engagement and capacity development to strengthen stewardship and ownership.
- **Financial sustainability (Medium):** Limited resources for operation and maintenance could reduce long-term sustainability. **Mitigation:** Undertake a Sustainable Finance Assessment and strengthen institutional ownership, community stewardship and sustainable management arrangements to support continued operation, maintenance and scaling.

Theory of change



PART II. PROJECT/PROGRAMME JUSTIFICATION

A. Description of programme components

The project is designed to strengthen Malaysia's long-term climate resilience by linking targeted EbA and NbS with stronger climate-risk intelligence, institutional uptake, adaptive management and community capacity. The project applies an integrated model in which field-level interventions generate evidence and operational lessons that inform planning tools, maintenance approaches and scaling pathways for wider replication.

The project is organized around three interconnected components that combine climate-risk intelligence, EbA, adaptive management and long-term institutional and community resilience. Together, the components support a systems-oriented adaptation approach linking forest-climate intelligence, field-level EbA/NbS implementation and sustainable operational uptake.

Component 1: Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning

Outcome 1: Institutions apply climate intelligence, vulnerability information and adaptation evidence in planning, investment and decision-making processes.

Alignment with the Adaptation Fund Results Framework: Component 1 contributes primarily to **AF Outcome 2 and Output 2.1** by strengthening the capacity of national and sub-national institutions to understand, manage and reduce climate-related risks. Through development and institutionalization of the ICFIS, the Forest-Climate Vulnerability Atlas, and associated planning and decision-support tools, the component enhances institutional capacities to apply climate-risk information, vulnerability assessments and adaptation evidence in planning, investment prioritization and climate-resilient decision-making across forest, peatland, watershed and urban landscapes.

Malaysia possesses substantial climate, hydrological, geospatial, remote-sensing and forest-related datasets across multiple institutions. However, these datasets are often managed across separate systems and are not yet systematically integrated into adaptation planning, restoration prioritization and climate-resilient landscape management processes.

Component 1 focuses on strengthening the generation, application and institutional uptake of climate intelligence and adaptation evidence to support climate-informed planning, investment prioritization and decision-making. It is structured around three complementary outputs:

- **Output 1.1: Integrated Climate-Forest Intelligence System (ICFIS) Developed and Operationalized.** This output establishes a climate-intelligence platform that integrates climate, hydrological, ecological, geospatial and remote-sensing information to support climate-risk assessment, vulnerability analysis, restoration prioritization and adaptation planning.
- **Output 1.2: Forest-Climate Vulnerability Atlas Developed and Applied.** This output translates climate-risk information into practical spatial products, vulnerability assessments and planning tools that support adaptation planning, restoration prioritization and climate-resilient landscape management by national and sub-national institutions.
- **Output 1.3: Institutionalization, Operational Guidance and Scaling Frameworks Developed.** This output supports long-term institutional uptake of climate intelligence tools and adaptation approaches through operational frameworks, technical guidance, NbS toolkits, sustainable finance analysis and scaling pathways that facilitate replication and future investment.

Together, the outputs establish a climate intelligence-to-action pathway that generates climate-risk information, translates evidence into planning and decision-support products, and embeds adaptation approaches within institutional systems, policies and investment processes.

Activities under Component 1 operate primarily at national and sub-national levels across Peninsular Malaysia, while testing, validation and learning are linked to the project intervention landscapes in Selangor and Kedah.

Output 1.1: Integrated Climate-Forest Intelligence System (ICFIS) Developed and Operationalized

This output will establish an ICFIS to strengthen climate-informed forest management, ecosystem restoration planning and adaptation decision-making in Malaysia. The output provides the analytical foundation for the project by strengthening the generation, integration and application of climate-risk information relevant to forest, peatland and watershed ecosystems.

The project will establish ICFIS as an integrated climate-risk assessment and analytical platform that consolidates and analyses climate, hydrological, ecological, geospatial, remote-sensing and field-monitoring information. Building on national Climate Risk and Vulnerability Assessment approaches and ongoing MyNAP processes, ICFIS will support analysis of climate hazards, exposure, vulnerability and adaptive capacity across forest, peatland and watershed landscapes.

The system will provide the analytical basis for identifying climate-risk hotspots, prioritizing adaptation investments, supporting implementation of Component 2 interventions, monitoring ecosystem conditions and assessing adaptation outcomes. Particular attention will be given to interoperability with existing national systems and strengthening coordination across institutions responsible for climate, forestry, water and land management.

Activity 1.1.1: ICFIS Scoping, Systems Assessment and Design

A comprehensive assessment will be undertaken during the inception phase to establish the technical, institutional and operational foundations for ICFIS and the Forest-Climate Vulnerability Atlas.

The activity combines systems mapping, climate-risk assessment and stakeholder consultations to identify priority climate hazards, vulnerable ecosystems, adaptation planning needs, decision-making processes and information gaps across the project intervention landscapes. The assessment will review available climate, hydrological, ecological, geospatial and socio-economic information and identify priority indicators, datasets and analytical methodologies required to support climate-risk assessment, adaptation planning and monitoring of adaptation outcomes.

The assessment will also review existing information systems and identify opportunities for interoperability, data harmonization and institutional coordination while avoiding duplication. Outputs will include a climate-risk assessment, systems assessment, interoperability framework and ICFIS roadmap. The assessment will also identify opportunities to incorporate gender-responsive and socially inclusive indicators where relevant, including information that supports understanding of differentiated climate vulnerabilities, exposure and adaptation priorities among women, men and vulnerable groups.

Activity 1.1.2: ICFIS Development and Integration

Based on the assessment findings, ICFIS will be developed through integration of priority datasets, analytical functions and climate-risk assessment methodologies.

The system will consolidate climate, hydrological, ecological, geospatial and remote-sensing information and generate analytical outputs supporting climate-risk assessment, vulnerability

analysis, restoration prioritization, adaptation planning and monitoring of ecosystem conditions and adaptation outcomes. Outputs may include climate-risk indicators, vulnerability assessments, adaptation-priority analyses and other decision-support products identified through Activity 1.1.1.

Activity 1.1.3: Validation and Operationalization

The system will be tested, validated and refined through application in project intervention landscapes and engagement with intended users.

Validation activities will assess the usefulness, functionality and applicability of ICFIS outputs for adaptation planning and decision-making and will include testing against observed conditions, stakeholder review and application within project intervention landscapes.

The activity will also support development of operational procedures, user guidance, hosting arrangements and sustainability mechanisms required for long-term operation, maintenance and updating of the system beyond the project period.

A mechanism for data sharing and coordination protocol among agencies will be developed under the guidance of NRES through the relevant Technical Working Group that will be established in Year 1.

Output 1.1 Milestones

- **Year 1** Climate-risk assessment, systems mapping, user-needs assessment and ICFIS design roadmap completed.
- **Year 2** Priority datasets consolidated and integrated; indicator framework and analytical methodologies finalized; prototype system developed.
- **Year 3** ICFIS operational and generating climate-risk assessment outputs for selected intervention landscapes.
- **Year 4** ICFIS refined through validation and user feedback; interoperability arrangements and operating procedures established.
- **Year 5** ICFIS fully operationalized and institutional arrangements for long-term hosting, maintenance and updating formalized by at least six institutions; technical guidance packages finalized.

Activity	Key Stakeholders	Targets and Beneficiaries
A.1.1.1 ICFIS Scoping, Systems Assessment and Design	FRIM, NRES, JPSM, State Forestry Departments, DID/JPS, NAHRIM, METMalaysia, MYSA, PLANMalaysia and relevant agencies	Target: Climate-risk assessment, systems assessment, interoperability framework and ICFIS roadmap completed and validated by key institutions. Beneficiaries: National and sub-national agencies involved in climate-risk assessment and adaptation planning.
A.1.1.2 ICFIS Development and Integration	FRIM, JPSM, DID/JPS, NAHRIM, METMalaysia, MYSA and relevant agencies	Target: ICFIS operationalized integrating climate, hydrological, ecological and geospatial datasets and generating climate-risk and vulnerability assessment products for forest, peatland and watershed landscapes Beneficiaries: Forest managers, planners and technical agencies supporting climate-resilient management of landscapes benefiting vulnerable communities under Component 2.
A.1.1.3 Validation and Operationalization	FRIM, JPSM, State Forestry Departments and relevant agencies	Target: ICFIS tested and applied in at least 3 intervention landscapes and institutional arrangements established for long-term operation and maintenance. Beneficiaries: National and sub-national institutions applying climate intelligence in planning and decision-making.

Output 1.2: Forest-Climate Vulnerability Atlas Developed and Applied

This output will develop a Forest-Climate Vulnerability Atlas to translate climate-risk information into practical spatial products supporting adaptation planning, restoration prioritization and climate-resilient landscape management.

Building on analytical outputs generated through ICFIS, the Atlas will provide a common evidence base for identifying climate-vulnerable landscapes, prioritizing adaptation investments and supporting implementation of forest, peatland and watershed adaptation strategies. The Atlas will serve as the decision-support interface for planners and decision-makers powered by the analytical engine of ICFIS.

The Atlas will consolidate relevant climate, ecological, hydrological and landscape information into accessible spatial products and planning tools that can be used by national and sub-national institutions. Particular attention will be given to supporting implementation of MyNAP, forest adaptation planning, ecosystem restoration and climate-resilient landscape management.

Activity 1.2.1: Atlas Scoping, Data Assessment and Design

A detailed assessment will identify priority datasets, indicators, analytical approaches and user requirements for the Atlas. The activity will review existing climate-risk assessments, vulnerability mapping products, forest inventories and geospatial information systems and identify opportunities to harmonize and consolidate information into practical adaptation-planning tools.

Activity 1.2.2: Atlas Development and Vulnerability Analysis

The Atlas will be developed using climate-risk outputs generated through ICFIS together with historical observations, climate projections, ecological information and hydrological datasets. It will generate spatial products supporting assessment of climate-related risks, ecosystem vulnerabilities, restoration priorities and adaptation investment opportunities across forest, peatland and watershed landscapes.

Atlas products may include climate exposure maps, drought-risk maps, extreme-rainfall risk maps, ecosystem vulnerability maps, restoration-priority maps and adaptation-priority maps identified through stakeholder consultations and the design process. Where data availability permits, vulnerability analyses will incorporate socio-economic and demographic dimensions relevant to adaptation planning, including information supporting identification of differentiated climate vulnerabilities affecting women, vulnerable groups and climate-sensitive livelihoods.

Activity 1.2.3: Forest Risk Planning Guidance and Protocols

Guidance and planning protocols will be developed to support application of Atlas products within forest management planning, restoration prioritization, adaptation planning and adaptation reporting processes. The activity will strengthen institutional capacity to apply climate-risk information and support integration of Atlas products into planning and decision-making processes at national and sub-national levels.

Output 1.2 Milestones

- **Year 1** Atlas framework, datasets, indicators and user requirements agreed and validated.
- **Year 2** Initial climate-risk and vulnerability datasets compiled; draft Atlas products developed.
- **Year 3** Atlas completed and tested in project intervention landscapes.
- **Year 4** Forest Risk Planning Guidance and Protocols prepared and piloted.
- **Year 5** Atlas finalized, operationalized and applied within planning and decision-making processes by at least six institutions; technical guidance packages finalized.

Activity	Key Stakeholders	Targets and Beneficiaries
A.1.2.1 Atlas Scoping, Data Assessment and Design	FRIM, JPSM, DID/JPS, NAHRIM, METMalaysia, MYSA	Target: Atlas framework, datasets, indicators and planning layers validated. Beneficiaries: Agencies contributing climate-risk and planning information.
A.1.2.2 Atlas Development and Vulnerability Analysis	FRIM, JPSM, State Forestry Departments and relevant agencies	Target: Forest-Climate Vulnerability Atlas developed, validated and applied by participating national and sub-national institutions to support climate-risk assessment, restoration prioritization and adaptation planning. Beneficiaries: National and sub-national institutions utilizing vulnerability information for adaptation planning and restoration prioritization.
A.1.2.3 Forest Risk Planning Guidance and Protocols	FRIM, JPSM, State Forestry Departments, NRES and relevant agencies	Target: Forest Risk Planning Guidance Package developed and piloted for integration of climate-risk information into planning, prioritization and adaptation reporting processes. Beneficiaries: Forest-sector planners, managers and technical agencies.

Output 1.3: Institutionalization, Operational Guidance and Scaling Frameworks Developed

This output supports the long-term institutionalization, operational application and scaling of climate-informed adaptation approaches developed through the project. It ensures that ICFIS and the Forest-Climate Vulnerability Atlas are embedded within planning and decision-making processes while translating implementation experience from Component 2 into practical guidance, toolkits and scaling frameworks. Building on project experience, the output will support replication, future investment and long-term sustainability of climate-resilient forest, peatland, watershed and urban NbS approaches. The framework will also support establishment or strengthening of an inter-institutional coordination mechanism to guide application of climate intelligence and adaptation planning across relevant agencies.

Activity 1.3.1: Forest-Sector Institutional Uptake Framework

A framework will be developed to support the long-term institutionalization, application and sustainability of ICFIS and the Forest-Climate Vulnerability Atlas.

The framework will establish institutional arrangements for hosting, managing, maintaining and updating ICFIS and Atlas products beyond the project period. It will define roles and responsibilities for participating institutions, data-sharing arrangements, quality assurance procedures and coordination mechanisms required to support long-term operation. The framework will also provide guidance on how climate-risk information generated through ICFIS and the Atlas can be integrated into forest-sector planning, restoration prioritization, adaptation investment planning and adaptation reporting processes.

Participating institutions may include the Ministry of Natural Resources and Environmental Sustainability (NRES), FRIM, NAHRIM, DID/JPS, Town and Country Planning Department (PLANMalaysia), JPSM, State Forestry Departments, METMalaysia, Malaysian Space Agency (MYSA) and other relevant agencies involved in climate-risk assessment, forest management, watershed management and adaptation planning. An institution will be considered to have adopted climate intelligence, vulnerability assessment and adaptation-planning tools when there is documented evidence that ICFIS products, Atlas products, vulnerability assessments, planning guidance or adaptation decision-support tools have been incorporated into planning, prioritization, implementation, monitoring or reporting processes.

Building on lessons generated through Component 2 interventions, the framework will further identify opportunities for scaling, replication and future investment in climate-resilient forest, peatland and watershed management.

Activity 1.3.2: Standard Operating Procedures, Operational Guidance and NbS Toolkits

Building on implementation experience under Outputs 2.1, 2.2 and 2.3, this activity will translate project evidence into practical SOPs, operational guidance and NbS toolkits to support wider application and replication.

Three technical guidance packages will be developed:

- Peatland Restoration and Fire Management Toolkit
- Watershed Restoration and Sediment Management Toolkit
- Urban Nature-based Solutions Toolkit

The materials will provide practical guidance for government agencies, local authorities and future adaptation programmes on planning, implementation, monitoring, operation and maintenance of climate-resilient NbS interventions. The Urban Nature-based Solutions Toolkit will draw directly on implementation experience, monitoring results and validation activities undertaken in Kubang Pasu and Alor Setar under Output 2.3. The guidance packages will incorporate lessons and recommendations generated through environmental and social assessments, biodiversity assessments, hydrological assessments, community health and safety assessments and monitoring systems established under Component 2. Where relevant, the toolkits will include guidance on safeguards screening, occupational health and safety, biodiversity protection, community engagement, accessibility considerations, inclusive participation and adaptive management approaches to support environmentally and socially sustainable implementation.

Activity 1.3.3: Sustainable Finance, Scaling and Replication Framework

In collaboration with UNDP under the Climate Finance Network (CFN) and Climate Action for Resilient Asia (CARA) initiatives, the project will explore opportunities to strengthen the long-term sustainability, replication and scaling of successful adaptation interventions developed under the project.

At the beginning of the project, a Sustainable Finance Assessment will be undertaken to identify potential financing partnerships, investment opportunities and long-term financing mechanisms that could support the operation, maintenance and scaling of project interventions beyond the project lifetime. The assessment will consider opportunities across the project's major intervention areas, including peatlands, watersheds, wetlands, urban and peri-urban NbS, and community-based restoration activities, and will assess the feasibility of a range of sustainable financing approaches, such as payments for ecosystem services, biodiversity and carbon finance, ecotourism and recreation, sustainable production systems, public-private partnerships and other context-appropriate financing mechanisms. As part of the assessment, feasible financing initiatives will be identified for implementation. Specifically, a targeted economic analysis of community nurseries (Output 3.1) will be undertaken to confirm their financial viability as livelihood and ecosystem restoration support mechanisms. The assessment will include gender-responsive analysis of participation, benefit-sharing and livelihood opportunities associated with community nursery operations. The analysis will quantify start-up and operating costs, revenue potential from seedling sales and complementary products or services, and broader livelihood benefits. Findings will inform the design of sustainable community nursery business models while also providing recommendations for broader financing and institutional arrangements to support the long-term sustainability of project investments.

Towards the end of the project, a Scaling and Replication Framework will be developed based on implementation experience, monitoring results and lessons generated through Components 1, 2 and 3. The framework will identify opportunities, requirements and enabling conditions for wider application of climate-informed adaptation and NbS approaches beyond the initial project intervention sites. Financing options may include public-sector investment pathways, integration into government planning and budgeting processes, co-financing opportunities, avoided-cost

approaches, Payment for Ecosystem Services and other mechanisms identified through stakeholder consultation and analysis.

In relation to output 2.3, the Scaling and Replication Framework will build on municipal uptake pathways tested through the Malaysia Adaptation Sharing Hub (MASH) and participating local authorities under Output 2.3. Where feasible, recommendations may support incorporation of NbS approaches into Local Plans (Rancangan Tempatan), municipal development guidelines and related planning instruments. The Urban Nature-based Solutions Toolkit and associated guidance will be designed for potential application across the large number of existing retention ponds and similar stormwater-management assets nationwide, estimated at more than 10,000 sites.

Drawing on project experience, the framework will consolidate lessons learned, good practices and operational recommendations into a practical roadmap for future expansion and investment. Particular attention will be given to opportunities for integrating climate-risk information, restoration planning and NbS approaches into national and sub-national planning, investment and programme development processes.

Output 1.3 Milestones

- **Year 1** Sustainable Finance Assessment completed and institutional uptake requirements identified.
- **Year 4** Draft SOPs, technical guidance packages and toolkits prepared and tested through project implementation. Draft Institutional Uptake Framework, NbS guidance packages and Scaling Framework structure developed.
- **Year 5** Institutional uptake framework operationalized; Scaling and Replication Framework endorsed and disseminated.

Activity	Key Stakeholders	Targets and Beneficiaries
A.1.3.1. Forest-Sector Institutional Uptake Framework	FRIM, NRES, JPSM, State Forestry Departments, DID/JPS, NAHRIM, METMalaysia, MYSA, PLANMalaysia	Target: Institutional uptake framework operationalized and climate intelligence, vulnerability assessment and adaptation-planning tools applied by at least six participating institutions in planning, prioritization, monitoring or decision-making processes. Beneficiaries: National and sub-national institutions applying climate-risk information in planning and decision-making.
A.1.3.2 Standard Operating Procedures, Technical Guidance and NbS Toolkits	FRIM, JPSM, DID/JPS, MADA, Kubang Pasu Municipal Council (MPKP), Bomba and relevant agencies	Target: Three NbS technical guidance packages and associated SOPs developed and validated. Beneficiaries: Government agencies, local authorities and future adaptation programmes.
A.1.3.3 Sustainable Finance, Scaling and Replication Framework	FRIM, NRES, PLANMalaysia, Ministry of Economy, UNDP Climate Finance Network	Target: 1 Sustainable Finance Assessment and 1 Scaling and Replication Framework developed, identifying financing pathways and opportunities for wider application of project approaches. Beneficiaries: National and sub-national institutions, local authorities and future implementing agencies.

Component 2: Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience

Outcome 2: Ecosystems and climate-resilient infrastructure provide strengthened hydrological, buffering and adaptation functions.

Alignment with the Adaptation Fund Results Framework: Component 2 contributes primarily to AF Outcome 5 and Output 5 by strengthening ecosystem resilience and improving the capacity of natural-resource assets to withstand climate variability and climate change. Through peatland hydrological restoration, climate-adaptive watershed management and enhancement of urban

stormwater detention systems using NbS, the component strengthens ecosystem services, improves water regulation, reduces climate-related risks and enhances resilience of vulnerable communities, livelihoods and economic systems.

Component 2 represents the project's investment and demonstration component. It implements NbS across three priority climate-vulnerable landscape systems in Peninsular Malaysia: peatland ecosystems, forested watersheds and urban stormwater-management systems. These landscapes are increasingly affected by climate variability and change, including prolonged dry periods, peatland degradation and fire risk, increasing rainfall intensity, erosion and sediment mobilisation, localized flooding, water-security challenges and urban heat stress. These pressures reduce ecosystem resilience and threaten water resources, livelihoods, public health and critical infrastructure.

The component therefore focuses on restoring and strengthening ecosystem functions that support climate adaptation. Interventions are designed to improve water retention and regulation, maintain peatland moisture, reduce fire susceptibility, stabilize watersheds, reduce erosion and sediment transport, strengthen flood-management functions and improve adaptive management of ecosystem and water-resource assets through three complementary outputs:

- **Output 2.1: Climate-Resilient Peatland Rewetting, Fire Resilience and Monitoring Systems Operationalized.**
- **Output 2.2: Climate-Adaptive Watershed Management through Nature-based Solutions implemented in the Ulu Muda Watershed.**
- **Output 2.3: Urban and Peri-Urban Nature-based Solutions for Flood and Heat Resilience Implemented**

Activities under Component 2 are implemented in selected landscapes in Selangor and Kedah. Community participation, technical capacity development, gender-responsive implementation, social inclusion, environmental and social safeguards and long-term sustainability of Component 2 interventions are supported through Component 3.

Output 2.1: Climate-Resilient Peatland Rewetting, Fire Resilience and Monitoring Systems Operationalized

Output 2.1 strengthens the climate resilience of the KLSFR landscape through peatland rewetting, hydrological restoration, fire-resilience measures and adaptive monitoring systems. The output responds to increasing climate variability, prolonged dry periods and declining peat moisture conditions that increase the risk of peat fires, ecosystem degradation and associated impacts on livelihoods, public health and surrounding infrastructure.

The output adopts an integrated EbA approach that combines hydrological restoration, peat-fire prevention and preparedness, and adaptive management. Building on existing peatland management plans, scientific assessments and stakeholder consultations, interventions are designed to maintain peat moisture, strengthen water-retention functions, reduce climate-induced fire risk and improve the long-term resilience of peatland ecosystems. Recent assessments indicate that a significant proportion of monitoring stations exceed recommended groundwater thresholds associated with elevated fire risk, highlighting the need for targeted restoration and improved management interventions. The project will therefore focus on restoring peatland hydrological functions while strengthening institutional and community capacities for fire prevention, monitoring and adaptive management.

Interventions will be implemented across priority areas of the KLSFR landscape through a combination of peatland rewetting measures, fire-resilience systems and monitoring technologies. These measures will support adaptive management of peatland ecosystems while strengthening

institutional and community capacities for peatland stewardship, fire prevention and climate adaptation.

The output contributes directly to improved ecosystem resilience, reduced peat-fire occurrence, strengthened hydrological functions and enhanced climate-adaptation benefits for surrounding communities and stakeholders. Community participation, including engagement of women and local communities, will support peatland stewardship, fire-risk awareness, monitoring and adaptive management, contributing to the long-term sustainability of restoration outcomes.

Activity 2.1.1: Peatland Rewetting and Hydrological Restoration through Nature-based Solutions

Peatland rewetting and hydrological restoration measures will be implemented within priority areas of KLSFR to improve water retention, stabilize groundwater levels and reverse peat drying during prolonged dry periods.

Interventions will build on existing peatland rehabilitation approaches and include a portfolio of peatland rewetting and hydrological restoration measures, including clay dykes, canal controls, water-retention structures, swales and other low-impact techniques appropriate to peatland environments. AquaVault water-storage units may be deployed as a supplementary water-retention and fire-preparedness measure where technical assessments demonstrate clear added value and cost-effectiveness.

Hydrological interventions will be informed by groundwater monitoring, peat condition assessments, hydrological modelling and site-specific engineering design. Prior to implementation, the project will undertake a landscape-scale hydrological modelling and design optimisation study to assess the most effective configuration of clay dykes, swales, canal-blocking measures, water-retention structures and associated infrastructure. Where groundwater abstraction is proposed, a groundwater sustainability assessment will determine sustainable abstraction limits, potential drawdown impacts and associated monitoring requirements. The project will prioritize restoration of peatland hydrological functions while minimizing disturbance to peat soils and ecological processes.

Before implementation, detailed baseline assessments and technical studies will be undertaken to identify priority intervention areas and refine intervention design. Building on existing peatland management plans, fire-risk assessments, hydrological studies and stakeholder consultations, the assessments will evaluate peatland condition and degradation, hydrological and groundwater dynamics, climate and fire risks, existing drainage and water-management infrastructure, and suitable NbS and water-retention measures. The studies will also identify priority intervention areas, establish baseline indicators for monitoring and evaluation, and develop detailed engineering and implementation designs for hydrological restoration measures.

Results will inform final intervention design, site prioritization and implementation planning for peatland rewetting, hydrological restoration and fire-risk reduction measures. Consistent with the Environmental and Social Management Framework (ESMF), the project will develop peatland-specific environmental, social, occupational health and safety, construction-management and monitoring measures and procedures to guide implementation, as detailed in a site specific ESMP. These procedures will include contractor management requirements, emergency response arrangements, worker health and safety measures and community safety considerations associated with hydrological restoration works.

Activity 2.1.2: Peatland Fire Resilience, Prevention and Institutional Coordination

Measures will be implemented to strengthen peatland fire prevention, preparedness and institutional response capacity across the KLSFR landscape. The activity will support operational

preparedness measures, fire prevention systems, peatland fire protection infrastructures and institutional coordination mechanisms involving FRIM, the Selangor State Forestry Department (JPNS), JBPM/Bomba and other relevant agencies.

The activity will strengthen operational planning, contingency arrangements and inter-agency coordination procedures required to improve preparedness and response during periods of elevated fire risk. Community awareness and reporting mechanisms related to peat-fire prevention will be implemented in coordination with Component 3, with particular attention to participation of women, youth and vulnerable groups in awareness and preparedness activities.

Emergency water-supply systems, including deep tube wells and supplementary water-storage infrastructure where appropriate, will support rapid response during periods of elevated fire risk.

Activity 2.1.3: Peatland Monitoring, Early Warning and Adaptive Management Systems

An integrated monitoring and early warning system will be established to support adaptive peatland management, hydrological monitoring and fire-risk assessment. The real-time monitoring system will combine groundwater piezometers, water-level sensors, peat-moisture sensors, weather stations, telemetry systems and other monitoring equipment required to assess peatland conditions and intervention performance. Satellite-derived indicators and climate-risk information generated through Component 1 will be integrated into the monitoring framework to strengthen early warning and adaptive management functions.

Monitoring information will support identification of elevated fire-risk conditions, validation of hydrological restoration performance, operational decision-making and long-term adaptive management. Community-based observation and reporting mechanisms established under Component 3 will complement technical monitoring systems and strengthen local participation in peatland stewardship and fire-risk management.

Lessons learned, operational experience, monitoring results and stakeholder feedback generated through peatland restoration, fire-risk reduction and monitoring activities will be documented throughout project implementation. Findings will contribute to the Peatland Restoration and Fire Management Toolkit, operational guidance and associated Standard Operating Procedures developed under Output 1.1.3, while also generating practical evidence on peatland adaptation approaches, hydrological management, community-based fire resilience and monitoring systems to support future replication and scaling.

Output 2.1 Milestones

- **Year 1:** Baseline assessments including water abstractions study, peatland condition mapping, landscape hydrological modelling, groundwater sustainability assessment (where applicable), fire-risk assessment, stakeholder consultations, peatland firefighting capacity building audit, safeguards procedures, site level ESMP, and detailed intervention design completed. Priority restoration areas identified, and implementation plan finalized.
- **Year 2:** Peatland rewetting and hydrological restoration interventions initiated; fire-management equipment and monitoring systems procured and installed.
- **Year 3:** Hydrological restoration measures operational; fire-management coordination mechanisms established; monitoring systems fully functional.
- **Year 4:** Adaptive management measures refined based on monitoring results; operational procedures tested and coordination arrangements strengthened.
- **Year 5:** Intervention performance validated; lessons documented, integrated into operational and scaling framework and disseminated.

Activity	Stakeholders	Targets and Beneficiaries
A.2.1.1 Peatland Rewetting and Hydrological Restoration through Nature-based Solutions	FRIM, JPNS, DID/JPS, relevant technical partners	Target: Baseline assessments, landscape hydrological modelling, groundwater sustainability assessment (where applicable) and detailed intervention design completed. Peat hydrological stabilisation measures implemented across at least 1000 ha of degraded peatland within KLSFR. Dry-season groundwater maintained above the -40 cm fire-risk threshold at monitored points within intervention areas. Approximately 720 ha of adjacent agricultural land benefiting from improved water availability and strengthened hydrological resilience associated with peatland restoration measures. Beneficiaries: 4,760 people (1,129 households) benefiting from reduced peat-fire risk, improved ecosystem resilience and reduced haze exposure. Approximately 513 farmers and associated workers directly benefiting from improved groundwater availability and landscape resilience.
A.2.1.2 Peatland Fire Resilience, Prevention and Institutional Coordination	FRIM, JPNS, JBPM/Bomba, Mineral and Geoscience Department (JMG), DID/JPS, local authorities	Target: Integrated peatland fire-resilience system established, including one landscape-level fire prevention and contingency framework, operational inter-agency coordination mechanisms, and preventive fire-management measures implemented across at least 1000 ha of priority peatland areas. Beneficiaries: Approximately 4,760 people (1,129 households) in peatland-adjacent communities benefiting from reduced fire risk, reduced haze exposure and improved landscape resilience.
A.2.1.3 Peatland Monitoring, Early Warning and Adaptive Management Systems	FRIM, JPNS, DID/JPS, JBPM/Bomba, METMalaysia, relevant technical partners	Target: Integrated peatland monitoring and adaptive management system established at at least two intervention locations, including 12 monitoring points and operational groundwater deep well, peat-moisture and fire-risk monitoring systems. Community observation and reporting mechanisms established in two surrounding communities. Beneficiaries: Approximately 4,760 people (1,129 households) benefiting directly from improved risk monitoring, early warning and adaptive peatland management.

Output 2.2: Climate-Adaptive Watershed Management through Nature-based Solutions implemented in the Ulu Muda Watershed

Output 2.2 supports climate-adaptive watershed management within the Ulu Muda watershed to strengthen water security, reduce climate-induced soil erosion and sediment delivery, and enhance the resilience of critical watershed functions under increasing climate variability and change. The output adopts an EbA approach combining watershed protection, soil-erosion management, sediment management and adaptive monitoring. Building on existing watershed-management plans, scientific assessments and stakeholder consultations, interventions are designed to strengthen hydrological regulation, reduce erosion and sediment risks, improve water quality and support long-term watershed resilience.

The Ulu Muda watershed area comprises several existing and proposed forest reserves, the largest of which is the Ulu Muda Forest Reserve (105,060 ha), while the Ulu Muda State Park covers an area of 26,275 ha with 11,118 ha overlapping with the Ulu Muda Forest Reserve. Prior to implementation, detailed site assessments and safeguard due diligence will be undertaken to identify eligible intervention areas within the broader Ulu Muda watershed that are under the State Park protection status.

Focusing interventions within the Ulu Muda State Park area provides strong safeguards in terms of land tenure and minimisation of risks from potential development activities, given its strong legal protection. Interventions will be implemented within priority watershed management units identified through baseline assessments, stakeholder consultations and safeguard screening. Priority areas will be selected based on hydrological, ecological, climate-risk and watershed-

protection criteria to ensure that project investments contribute directly to climate adaptation, watershed resilience and downstream water security.

The project will strengthen the climate resilience of 800 ha of priority areas within the Ulu Muda watershed through an integrated package of climate-adaptive watershed protection, soil-erosion and sediment management, and adaptive monitoring measures in Activities 2.2.1–2.2.3. The location, type and extent of specific on-the-ground interventions will be determined through Year 1 assessments, field validation and safeguard screening. Forest enrichment, assisted natural regeneration and riparian rehabilitation (Activity 2.2.1) will be concentrated in approximately 50 ha of the highest-priority sites, while additional direct interventions, including nature-based slope and riverbank stabilization measures (Activity 2.2.1), sediment-management structures (Activity 2.2.2), and adaptive watershed monitoring (Activity 2.2.3), will be implemented, as appropriate for the watershed conditions. Together, these complementary measures will strengthen watershed resilience, improve hydrological functions, reduce climate-induced erosion and sediment delivery, and enhance downstream water security across the 800-ha priority watershed area.

The output contributes directly to improved watershed condition, reduced climate-induced erosion and sediment delivery, strengthened hydrological regulation and enhanced climate resilience for downstream water users and associated ecosystems. Inclusive and gender-responsive approaches will be applied throughout assessment, planning and implementation processes, recognizing differentiated water use, resource dependence and climate vulnerabilities among women, men and vulnerable groups. Consistent with the ESMF requirements, check dams and other water-related infrastructure will undergo safeguard screening, assessment and management measures to address community safety risks.

Activity 2.2.1 Climate-Adaptive Watershed Soil-Erosion Management

Year 1 will undertake hydrological, erosion-risk, ecological, climate-risk and socio-economic baseline assessments to identify and validate priority intervention areas and establish monitoring baselines. This will also include safeguard screening, site-selection analysis, delineation of priority watershed management units, and development of climate-smart planting, maintenance and survival-monitoring regimes, including site-selection criteria and native species mixes appropriate for watershed protection and climate adaptation objectives. Baseline assessments and stakeholder consultations will consider gender-differentiated water use, livelihood dependencies and climate risks to inform intervention design and implementation priorities.

Site selection will be guided by climate-risk, hydrological, ecological and watershed-protection criteria, as well as practical considerations (accessibility, distance from entry point etc.), and will ensure that project-supported activities contribute directly to climate adaptation, watershed resilience and downstream freshwater security. The assessment process will establish intervention typologies, site-selection criteria and management requirements, while excluding areas that do not meet project eligibility requirements or where activities would duplicate existing rehabilitation obligations.

Building on these assessments, climate-adaptive watershed protection and soil-erosion management measures will be implemented within validated priority management zones. Priority intervention areas will be identified through erosion-risk analysis, hydrological assessments, field validation, stakeholder consultation and safeguard screening. Potential intervention areas may include degraded slopes, riparian corridors, erosion hotspots and other disturbed catchment areas contributing to surface soil erosion and sediment delivery. The assessment will establish intervention typologies, implementation specifications, climate adaptation rationale and monitoring requirements for different watershed conditions.

The activity applies a strategic mosaic approach targeting priority erosion and runoff hotspots in the catchment area rather than applying interventions uniformly across the watershed landscape. This enables resources to be concentrated on hotspot locations contributing disproportionately to erosion, sediment delivery and watershed instability while improving management across the wider priority watershed area. Interventions should include enrichment planting of native species, assisted natural regeneration, riparian rehabilitation, and nature-based slope and riverbank stabilization measures. It is designed to strengthen watershed resilience by reducing surface erosion and strengthening hydrological functions under increasing climate variability.

Selection of native species for the enrichment planting not only assists forest regeneration but also promotes species that are resilient to climate change. This will prioritize species suitable for watershed protection, erosion control and long-term climate resilience. Species selection and planting regimes will be informed by ecological suitability, weather patterns, biodiversity objectives, availability of planting materials, long-term maintenance requirements and safeguards assessment identified in Year 1.

Activity 2.2.2 Climate-Adaptive Watershed Sediment Management

The activity aims to reduce sediment delivery, improve water quality and strengthen long-term watershed stability supporting downstream water supply and irrigation systems by implementing targeted sediment-management measures within priority intervention areas validated through baseline assessments and safeguard screening. Areas will be selected in the tributaries of the Muda River upstream of the Muda dam. During Year 1, catchment and river processes studies will be conducted to inform the design of check dams; this can include hydro-modelling, Soil and Water Assessment Tool (SWAT) mapping with sedimentation rate assessment to inform the project team on an achievable rate reduction target within the project term. From then, studies will inform on specific strategic sites that can be prioritized and selected for measures implementation.

Sediment reduction will be achieved through construction of check dams and other nature-based sediment-management approaches. Natural engineering and bio-anchorage (using living root systems) will be used to secure unstable terrain and stabilize filtering structures. Filtering and vegetated gabion weirs against rushing water and erosion will help trap running sediments in the river network and provide permanent stability. The project targets to install 30 check dams structures within the 800ha of improved watershed management. These measures are intended to reduce climate-induced erosion and sediment delivery into critical assets such as Muda dam and its intertwined irrigation network. Associated with more intense rainfall, this will ensure watershed functions which are critical for downstream water security, benefiting several water treatment plants and a more resilient irrigation system for downstream MADA rice fields.

Activity 2.2.3 Watershed Monitoring, Evaluation and Adaptive Management

This activity establishes a watershed monitoring framework to assess hydrological interventions performance of watershed management measures, changing conditions and adaptation outcomes. Monitoring will include vegetation recovery, planting survival assessments, erosion rate indicators, sediment yields, turbidity measurements, hydrological observations, biodiversity indicators and remote-sensing analysis. The monitoring framework will complement and strengthen existing monitoring systems operated by MADA and other agencies and support adaptive management of watershed interventions throughout implementation.

The activity will generate evidence on adaptation effectiveness, watershed soil-erosion reduction and sediment-management performance to support adaptive management, future investment decisions and wider replication of successful approaches. Lessons learned, monitoring results and implementation experience will be documented and incorporated into the Watershed Soil Erosion and Sediment Management Toolkit, operational guidance and associated Standard

Operating Procedures developed under Output 1.3. The activity will also generate evidence supporting future replication and scaling of watershed adaptation approaches in Malaysia.

The activity will also assess the economic value of watershed protection for downstream water users and water service providers. In collaboration with the Kedah State Water Company/Syarikat Air Darul Aman (SADA) and relevant agencies, the project will undertake baseline and end-line assessments of selected water treatment plants supplied by the Ulu Muda watershed to evaluate changes in raw water quality, sediment loads, treatment requirements and operational costs. The assessment will generate evidence on the economic benefits of watershed protection and explore opportunities for future financing mechanisms, including Payment for Ecosystem Services (PES) approaches for consideration in future scaling and replication under output 1.3.

Output 2.2 Milestones

- **Year 1:** Hydrological, erosion-risk, ecological, climate-risk and safeguard assessments completed; site-selection criteria established; priority intervention areas validated; monitoring framework established; climate-smart planting and maintenance regimes developed; detailed intervention design finalized; integrated site-level ESMP covering forest restoration and sediment management activities prepared.
- **Year 2:** Watershed protection, soil-erosion management and sediment-management interventions initiated; check dams and stabilization measures established; monitoring systems operational.
- **Year 3:** Nature-based watershed interventions operational; adaptive management processes informed by monitoring data; sediment-management measures functioning across priority intervention areas.
- **Year 4:** Adaptive management measures refined; watershed performance assessed; operational guidance and lessons learned documented.
- **Year 5:** Intervention performance validated; monitoring results and lessons integrated into the Watershed Soil Erosion and Sediment Management Toolkit and disseminated for replication and scaling.

Activity	Stakeholders	Targets and Beneficiaries
A.2.2.1 Climate-Adaptive Watershed Soil-Erosion Management	FRIM, Kedah State Forestry Department, LSANK, MADA	Target: Baseline hydrological, erosion-risk, ecological, climate-risk and safeguard assessments completed; site-selection criteria established; and detailed intervention design finalized for validated priority watershed management units. 800 ha under improved watershed management through climate-adaptive watershed protection, soil-erosion management, sediment-management and adaptive monitoring measures, including 50 ha of forest enrichment, assisted natural regeneration, riparian rehabilitation and related nature-based stabilization measures. Beneficiaries: 57,635 MADA farmers and agricultural water users benefiting from strengthened watershed resilience, improved water regulation and reduced climate-related water-security risks.
A.2.2.2 Climate-Adaptive Watershed Sediment Management	FRIM, Kedah State Forestry Department, LSANK, MADA, JPS/DID	Target: Priority sediment-management interventions implemented through check dams and other nature-based sediment-management measures contributing to reduced sediment delivery and improved watershed condition, subject to baseline validation. 30 check dams established within priority sub-catchments. Beneficiaries: Approximately 4.2 million people in Kedah, Penang and Perlis benefiting indirectly from strengthened watershed functions, enhanced raw-water security and reduced climate-related water-supply risks. SADA benefitting from improved raw-water quality and reduced sediment-management requirements.
A.2.2.3 Watershed Monitoring, Evaluation	FRIM, MADA, LSANK, Kedah State Forestry Department, JPS/DID, SADA	Target: Operational watershed monitoring framework established, including hydrological, sediment, turbidity, vegetation recovery, planting survival and adaptation-performance indicators; lessons and operational guidance generated for incorporation into Output 1.3. Beneficiaries: MADA, LSANK, Kedah State

and Adaptive Management		Forestry Department, SADA and other agencies utilizing watershed-monitoring and adaptation decision-support information.
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Output 2.3: Urban and Peri-Urban Nature-based Solutions for Flood and Heat Resilience Implemented

Output 2.3 supports the integration of NbS into municipal stormwater-management systems to strengthen climate resilience, reduce flood risks and improve adaptive management of urban and peri-urban water assets. The output demonstrates how existing retention ponds, wetlands, drainage corridors and associated green-blue infrastructure can be managed as multifunctional climate-resilience assets that provide flood attenuation, water regulation, biodiversity enhancement, urban cooling and community benefits.

The output combines statewide planning and investment prioritization with on-the-ground demonstration, monitoring and learning. It aims to strengthen the evidence base, institutional capacity and practical experience required to scale urban NbS across Kedah while delivering tangible climate-adaptation benefits in the Kubang Pasu municipal landscape.

Implementation is centred on Kubang Pasu, where approximately 71 ha of stormwater detention facilities and associated green-blue infrastructure will be brought under improved climate-resilient management through assessment, rehabilitation, habitat enhancement, monitoring and adaptive management. Rather than measuring success based on the number of retention ponds treated, the project will assess outcomes based on the total area managed using climate-resilient and biodiversity-sensitive approaches.

The output adopts a three-part approach. First, a Statewide NbS Opportunity Scan (NBSOS) will identify priority adaptation opportunities, support future investment planning and strengthen integration of NbS into municipal and state planning processes across Kedah. Second, urban and peri-urban NbS will be implemented within the Kubang Pasu demonstration landscape to enhance stormwater management, flood resilience, biodiversity and ecosystem services. Third, monitoring systems and adaptive-management processes will generate evidence on intervention performance and support replication, learning and long-term sustainability.

The output contributes directly to reduced urban flood risk, strengthened management of municipal stormwater assets, enhanced ecosystem services, improved adaptive capacity and increased institutional experience in the application of NbS for urban climate resilience. Consistent with ESMF requirements, environmental and social screening and assessment will be conducted to inform a site-level ESMP covering biodiversity, community health and safety, and other safeguards. A review of existing grey infrastructure will also be conducted to identify any additional safety measures required (e.g. fencing and signage).

Activity 2.3.1: Statewide Nature-based Solutions Opportunity Scan, Municipal Learning and Replication Pathways

A Statewide Nature-based Solutions Opportunity Scan (NBSOS) will be undertaken using the World Bank (2024) framework to identify priority opportunities for nature-based adaptation investments across Kedah. The assessment will progressively cover all districts in the state and will include urban and peri-urban flood-prone areas, agricultural landscapes, river catchments, drainage networks, wetlands, retention ponds, coastal ecosystems, mangroves and areas vulnerable to urban heat stress.

The NBSOS will generate climate-risk and NbS opportunity maps, identify priority investment areas and support development of a Statewide Nature-based Solutions Planning and Investment Framework. The assessment will support integration of NbS into state and municipal planning processes and provide a strategic evidence base for future adaptation investments. Findings will support decision-making by the Kedah State Government, state technical agencies, all 12 local

authorities in Kedah and other stakeholders involved in climate adaptation, flood management, biodiversity conservation and urban development.

The assessment will be implemented progressively across the project period. Year 1 will focus on Kubang Pasu to support planning and implementation of the demonstration landscape. Subsequent years will expand the assessment to additional districts across Kedah, culminating in statewide synthesis, analysis and dissemination during the final year of the project.

Building on the NBSOS process and lessons generated through implementation in Kubang Pasu, the activity will support municipal learning, replication planning and scaling pathways for urban NbS across Kedah. Participating local authorities will be engaged through technical exchanges, peer-learning activities, municipal dialogues and knowledge-sharing processes that strengthen understanding of how NbS can be integrated into municipal planning, stormwater management, retention-pond management, urban greening and climate-adaptation programmes.

The project will facilitate state-wide learning and replication through MASH and Kedah local-authority networks. A Kedah Nature-based Solutions Adaptation Forum will be organized towards the latter part of the project, bringing together representatives from all 12 local authorities, relevant state agencies, academia, civil society organizations and technical partners. As the demonstration local authority, MPKP will share implementation experience, lessons learned, challenges encountered and practical solutions developed through the project. Site visits and peer-learning activities will facilitate exchange among participating local authorities and support identification of future opportunities for NbS investment and implementation.

Knowledge products developed through the project, including the Urban Nature-based Solutions Toolkit, technical guidance, monitoring protocols, implementation case studies and lessons learned, will be disseminated through MASH and local-authority networks. The activity will support all 12 local authorities in Kedah to access planning tools, technical guidance and implementation experience generated through the project, while supporting at least three local authorities to initiate consideration, planning or integration of NbS approaches within local planning, retention-pond management, urban greening or climate-adaptation programmes.

The activity will deliver one Statewide Kedah Nature-based Solutions Opportunity Scan, climate-risk and NbS opportunity maps, a Statewide Nature-based Solutions Planning and Investment Framework, a Kedah Nature-based Solutions Adaptation Forum, municipal learning and exchange activities, and an Urban Nature-based Solutions Replication Toolkit to support future scaling and replication across Kedah.

Activity 2.3.2: Kubang Pasu Urban Nature-based Solutions Demonstration Landscape

Kubang Pasu will serve as the demonstration landscape for implementation of urban and peri-urban NbS. Approximately 71 ha of stormwater detention facilities, including retention ponds, wetlands, riparian buffers and associated green-blue infrastructure, will be brought under improved climate-resilient management through a phased programme of assessment, rehabilitation, habitat enhancement and ecosystem-based management.

Prior to implementation, detailed technical, environmental and social assessments will be undertaken to inform intervention design and safeguard implementation. These assessments will include hydrological and climate-risk assessments to evaluate flood-risk reduction potential and avoid unintended upstream, downstream and site-level hydrological impacts; biodiversity, aquatic habitat and ecosystem-services assessments to evaluate ecological condition, ecosystem services and biodiversity values; and community health, safety and climate-risk assessments addressing public safety considerations, accessibility, vector-breeding risks, climate hazards and operational requirements.

A district-wide assessment of retention ponds and associated drainage assets will establish the adaptation baseline and identify priority intervention sites. The assessment will consider hydrological performance, drainage connectivity, flood exposure, maintenance requirements, biodiversity values, ecological condition, urban heat exposure, surrounding land use, community exposure, accessibility considerations, community priorities and municipal planning needs.

Community consultations will inform intervention planning and detailed design, with particular attention given to the needs and priorities of women, youth, older persons, persons with disabilities and other user groups when considering accessibility, safety, public use, maintenance requirements and the overall functionality of retention ponds and associated green-blue infrastructure.

Based on these assessments, retention ponds and associated drainage assets will be classified into management typologies reflecting different functions, risk profiles and intervention requirements. Site-selection criteria and prioritization methodologies will be developed to guide investment decisions and ensure resources are directed towards locations where adaptation benefits can be maximized.

NbS interventions will subsequently be implemented across priority sites. Interventions will include retention pond rehabilitation, wetland enhancement, riparian restoration, native vegetation planting, bioengineered bank stabilization, vegetated buffers, sediment-trapping systems, infiltration enhancement, urban mini-forests, biodiversity habitat creation, shading systems and other ecological-engineering measures appropriate to local conditions.

Planting materials required for implementation will progressively be supplied through the MPKP central nursery and satellite community nurseries established under Activity 3.1.4. Initial planting stock required during the establishment phase will be procured externally where necessary. Thereafter, nursery-produced native trees, shrubs and wetland plants will support restoration, replacement planting and long-term maintenance activities.

Design and implementation of interventions will incorporate accessibility, public-safety and usability considerations to ensure that retention ponds and associated green-blue infrastructure provide equitable benefits to women, children, older persons and persons with disabilities. Community consultations will continue throughout implementation to inform adaptive design and management decisions.

The activity will deliver hydrological, biodiversity and community-risk assessments, a completed retention pond inventory and typology framework for Kubang Pasu, detailed designs and implementation plans for priority sites, and approximately 71 ha of stormwater detention assets under improved climate-resilient and biodiversity-sensitive management.

Activity 2.3.3: Monitoring, Data Generation and Adaptive Management Systems

Establishes an integrated monitoring, data-management and adaptive-management system to assess the performance, effectiveness and long-term sustainability of urban NbS implemented under Activity 2.3.2. The activity will generate evidence on hydrological, biodiversity, climate and ecosystem outcomes while supporting data-driven management of municipal stormwater assets.

A climate-resilience monitoring system will be established combining automated monitoring technologies, environmental sensors, biodiversity monitoring systems and digital decision-support tools. The system will support monitoring of flood attenuation, hydrological performance, water levels, rainfall, temperature, vegetation establishment, habitat condition, biodiversity outcomes and maintenance requirements across intervention sites.

Monitoring infrastructure will include water-level sensors, rainfall gauges, climate-monitoring stations, environmental sensors, monitoring cameras, communications infrastructure, data-storage systems and dashboard platforms. Monitoring systems will be integrated into municipal decision-making processes and linked to MPKP Smart City systems where feasible.

Bioacoustic monitoring systems will be deployed to assess biodiversity responses to NbS interventions and track changes in ecological condition over time. Monitoring programmes will focus on birds, amphibians and other indicator species to provide cost-effective and scientifically robust evidence on ecosystem recovery, habitat quality and biodiversity outcomes.

The activity will also establish monitoring protocols, quality-assurance procedures and data-management systems to support integration of information generated through automated monitoring systems and community-based monitoring activities. Citizen-science observations generated under Activity 3.1.4 will contribute to biodiversity monitoring, environmental reporting and adaptive-management processes while strengthening local stewardship and public engagement.

Monitoring results will be reviewed periodically to assess intervention performance, identify maintenance needs and inform adaptive-management decisions. Data generated through the monitoring system will support refinement of operational procedures, maintenance regimes, restoration approaches and future investment planning.

Selected intervention sites will function as living laboratories supporting applied research, university partnerships, student internships and long-term monitoring of urban NbS. Monitoring results, implementation experience and lessons learned will contribute directly to the Urban NbS Toolkit, monitoring protocols, operational guidance and scaling framework developed under Outputs 1.3 and 2.3.1.

The activity will deliver an operational climate-resilience monitoring and adaptive-management system, monitoring protocols, bioacoustic and biodiversity monitoring programmes, integrated data-management and dashboard systems, periodic performance assessments and evidence-based recommendations supporting long-term management and scaling of urban NbS.

Output 2.3 Milestones

- **Year 1:** Kubang Pasu NBSOS completed; climate-risk and NbS opportunity maps developed; baseline hydrological, biodiversity and community-risk assessments completed; retention pond inventory, typology framework and site-selection criteria developed; monitoring framework established; site-level ESMP developed, establishing standard technical designs and safeguard requirements for both upgrading of existing assets and new infrastructure; approximately 10 ha stormwater detention assets under improved climate-resilient management.
- **Year 2:** NBSOS completed for four additional districts in Kedah; detailed designs completed; ESMP requirements incorporated into contractor Site Plans; priority NbS interventions initiated; monitoring systems installed and operational; municipal learning and exchange activities initiated; approximately 25 ha stormwater detention assets under improved climate-resilient management.
- **Year 3:** NBSOS completed for four additional districts in Kedah; NbS interventions expanded to approximately 45 ha stormwater detention assets under cumulative improved management; with ESMP requirements applied to incremental Site Plans; biodiversity, hydrological and climate monitoring systems operational; adaptive-management procedures integrated into municipal asset-management processes.

- **Year 4:** NBSOS completed for three additional districts in Kedah; NbS interventions expanded to approximately 61 ha stormwater detention assets under cumulative improved management; performance assessments completed; adaptive-management approaches refined; monitoring results incorporated into urban NbS guidance and operational procedures; Kedah Nature-based Solutions Adaptation Forum conducted.
- **Year 5:** Statewide NBSOS completed covering all 12 districts in Kedah; approximately 71 ha stormwater detention assets under improved climate-resilient management; monitoring results, lessons learned and implementation experience incorporated into the Urban Nature-based Solutions Toolkit, Operational Guidance and Scaling Framework; long-term management arrangements adopted by MPKP; at least three local authorities supported to initiate consideration or integration of urban Nature-based Solutions approaches.

Activity	Stakeholders	Targets and Beneficiaries
A.2.3.1 Statewide Nature-based Solutions Opportunity Scan, Municipal Learning and Replication Pathways	FRIM, Kedah State Government, MPKP, MBAS, participating local authorities, DID/JPS, PLANMalaysia and relevant state agencies	Targets: One statewide Kedah NbS Opportunity Scan (NBSOS) completed covering all 12 districts; climate-risk and NbS opportunity maps developed; Statewide NbS Planning and Investment Framework prepared; municipal exchange visits, technical learning activities and peer-learning programmes conducted; Kedah NbS Adaptation Forum conducted; Urban NbS Replication Toolkit developed; lessons learned disseminated through MASH and local-authority networks; all 12 local authorities engaged through municipal learning and replication activities; at least three local authorities supported to initiate planning, adoption or integration of NbS approaches within municipal planning, retention pond management, urban greening or climate-adaptation programmes. Beneficiaries: Kedah State Government, local authorities, technical agencies, planners and municipal practitioners benefiting from improved climate-risk information, NbS planning tools, investment guidance and replication pathways for urban climate adaptation.
A.2.3.2 Kubang Pasu Urban Nature- based Solutions Demonstration Landscape	FRIM, MPKP, DID/JPS, Kedah State Government and relevant technical partners	Targets: Hydrological and climate-risk assessment, biodiversity and ecosystem-services assessment, and community health and safety assessment completed; retention pond inventory and typology framework completed; approximately 200 retention ponds assessed and categorized; site-selection criteria and prioritization methodology developed; priority retention ponds, wetlands, riparian buffers and associated green-blue infrastructure rehabilitated and enhanced through NbS interventions; approximately 71 ha of stormwater detention assets under improved climate-resilient and biodiversity-sensitive management. Beneficiaries: Approximately 85,687 residents benefiting from improved flood resilience, enhanced stormwater management, climate resilience, biodiversity enhancement and ecosystem services in the Kubang Pasu demonstration landscape.
A.2.3.3 Monitoring, Data Generation and Adaptive Management Systems	MPKP, FRIM, DID/JPS, universities and relevant technical partners	Targets: Operational monitoring and adaptive-management system established; monitoring stations, sensors, dashboard systems and associated smart-monitoring infrastructure installed and operational; hydrological, climate, biodiversity and safeguards monitoring protocols developed and operationalized; bioacoustic monitoring systems established; biodiversity monitoring implemented; citizen-science observations integrated into municipal monitoring systems; monitoring outputs incorporated into municipal asset-management and decision-making processes, including MPKP Smart City systems where feasible; adaptive-management procedures operationalized to support long-term maintenance and performance improvement of NbS assets; monitoring results incorporated into the Urban NbS Toolkit, Operational Guidance and Scaling Framework. Beneficiaries: Municipal agencies, technical personnel and approximately 85,687 residents benefiting from improved flood-risk management, adaptive maintenance, evidence-based decision-making and climate-resilient management of municipal assets. Monitoring systems will incorporate gender-responsive and socially inclusive indicators and reporting mechanisms.

Component 3: Institutionalizing Capacity, Stewardship and Sustainable NbS Management

Outcome 3: Communities and institutions strengthen climate resilience through inclusive participation, enhanced capacities and application of adaptation knowledge.

Alignment with Adaptation Fund Results Framework: Component 3 contributes primarily to **AF Outcome 2 and Output 2.1** by strengthening the capacity of government agencies, local stakeholders and community members to support, implement, monitor and sustain climate adaptation measures. Through technical training, community stewardship mechanisms, citizen-science initiatives, knowledge management and dissemination activities, the component strengthens the institutional and human capacities required to maintain, replicate and scale adaptation investments. The component also supports the long-term sustainability of ecosystem restoration and NbS interventions implemented under Component 2 by strengthening local ownership, adaptive management and knowledge-sharing processes.

Component 3 serves as the project's sustainability, capacity-development and knowledge-management component. While Component 1 generates climate intelligence, planning tools and operational guidance, and Component 2 implements landscape-level adaptation investments, Component 3 strengthens the capacities, stewardship mechanisms and learning systems required to support long-term implementation, adaptive management, institutional uptake and replication.

The component is structured around three complementary outputs:

- **Output 3.1: Inclusive Community Participation, Capacity and Livelihoods Strengthened.** This output promotes locally led adaptation, community participation, social inclusion and livelihood opportunities linked to peatland restoration, watershed management and urban Nature-based Solutions.
- **Output 3.2: Technical Capacity for Climate Intelligence, NbS Management and Project Implementation Strengthened.** This output builds technical and institutional capacities required to apply climate intelligence, implement adaptation interventions, operate monitoring systems and support adaptive management.
- **Output 3.3: Knowledge Management, Learning and Dissemination Systems Operationalized.** This output captures, consolidates and disseminates project lessons, tools, methodologies and implementation experience to support institutional learning, replication and scaling.

Gender equality, social inclusion and environmental and social safeguards are integrated throughout Component 3. Particular attention will be given to participation of women, youth and vulnerable groups, while ensuring that stakeholder engagement, grievance management, benefit-sharing mechanisms, the ESMF, Stakeholder Engagement Plan (SEP) and GAP are implemented in a transparent and inclusive manner. Where relevant, implementation will follow UNDP requirements relating to Indigenous Peoples and local communities.

Activities under Component 3 are implemented across the project intervention landscapes in Selangor and Kedah, while national and sub-national training, learning and knowledge-sharing functions support broader institutional uptake of project approaches throughout Malaysia.

Output 3.1: Inclusive Community Participation, Capacity and Livelihoods Strengthened

Output 3.1 strengthens community participation, stewardship and climate resilience while supporting the long-term sustainability of project investments under Components 1 and 2. Recognizing that successful adaptation depends on local ownership and capacity, the output promotes meaningful participation of communities in the implementation, monitoring and management of adaptation measures, guided by principles of Locally Led Adaptation (LLA), gender equality and social inclusion.

The output supports community-based livelihood opportunities linked to nursery development, ecosystem management, monitoring services and climate-resilient value chains, with particular attention to women, youth and vulnerable households. Experiences from community stewardship, local adaptation services and livelihood models will contribute to the sustainable financing and scaling approaches developed under Output 1.3.

Gender-responsive grievance redress and stakeholder feedback mechanisms will be established and integrated into project implementation. Capacity-building will support FRIM, project staff and partners in environmental and social safeguards monitoring, grievance management, Protection from Sexual Exploitation, Abuse and Harassment (PSEAH) and inclusive community engagement. A Gender Equality and Social Inclusion (GESI) Action Plan will be developed during the inception phase and integrated into project implementation. The GESI Action Plan will establish participation targets, inclusion measures, monitoring indicators, gender-responsive benefit-sharing approaches and procedures for addressing barriers faced by women, youth, Indigenous Peoples, persons with disabilities and other vulnerable groups.

Activity 3.1.1 Inclusive Community Participation and Locally Led Adaptation Mechanisms

Establishes the institutional and operational arrangements required to support meaningful, inclusive and sustained community participation across all project intervention landscapes. Building on principles of Locally Led Adaptation (LLA), gender-responsive adaptation and social inclusion, the activity will develop and operationalize a common project framework for community engagement, participation, benefit-sharing, grievance management and adaptive management.

The activity will support stakeholder mapping, community profiling and socio-economic assessments to identify target groups, vulnerable households, women, youth and other priority beneficiaries. Based on these assessments, the project will establish transparent participation criteria, beneficiary-selection procedures and mechanisms for equitable access to training, livelihood opportunities, monitoring activities and project-supported incentives.

Project-wide procedures and guidance will be developed covering community engagement, participation mechanisms, gender and social inclusion targets, stakeholder feedback processes, grievance redress mechanisms (GRM), community monitoring arrangements and safeguards implementation. Capacity-building will be provided to FRIM, project staff and partners on environmental and social safeguards monitoring, grievance management, PSEAH and inclusive community engagement.

Local participation and coordination mechanisms will be established where appropriate to support implementation of peatland, watershed and urban NbS activities. Special attention will be given to ensuring meaningful participation of women, youth and vulnerable groups in project decision-making, implementation and monitoring processes, thereby strengthening local ownership and long-term sustainability of project investments.

Activity 3.1.2 Peatland Community Stewardship and Climate Resilience in KLSFR

Strengthens community participation, resilience and livelihood opportunities associated with peatland restoration, fire-risk reduction and sustainable landscape management in the KLSFR landscape. The activity recognizes that long-term peatland restoration and fire prevention depend on active community participation, local stewardship and sustained engagement of communities and land users adjacent to peatland ecosystems.

Community participation mechanisms will support local involvement in peatland restoration, fire prevention, monitoring, reporting and adaptive management activities, while ensuring that project benefits are delivered through transparent, inclusive and gender-responsive processes.

During Year 1, the project will undertake a more detailed assessment of vulnerable farmers, agricultural operators and forest-edge land users in the intervention area, including the number of farmers, workers and land users potentially affected by peatland fire risk and dry-season water stress. This assessment will be linked to the water abstraction study and baseline assessment under Output 2.1, allowing the project to compare conditions before and after clay dyke installation and other rewetting interventions.

Based on the assessment findings, the project will identify specific measures to strengthen climate-resilient livelihoods and reduce vulnerability among farmers and land users benefiting from improved dry-season water availability, reduced fire risk and enhanced peatland management. Possible measures may include awareness raising, technical guidance on sustainable water use, participation in community-based monitoring, and support for improved coordination between land users and peatland management agencies.

Community-based monitoring and reporting mechanisms established under Output 2.1 will be supported through training, awareness activities and engagement processes that strengthen collaboration between communities, farmers, land users and participating agencies responsible for peatland management, restoration and fire prevention. Lessons learned from community engagement, peatland stewardship, farmer participation and locally led adaptation approaches will contribute to the development of guidance, toolkits and replication strategies under Output 1.3.

Activity 3.1.3. Watershed Stewardship, Climate Resilience and Community Awareness in Ulu Muda and downstream area

Supports community participation in climate-adaptive watershed management while strengthening local awareness, stewardship and socio-economic resilience among communities associated with the Ulu Muda watershed and downstream water users.

The activity will establish a community-managed nursery to support production of native planting materials required for watershed protection and enrichment planting activities under Output 2.2. Community members will participate in seed collection, seedling production, nursery operations, maintenance and monitoring activities, generating local employment opportunities while strengthening stewardship of watershed resources. Participation will prioritize women, youth and vulnerable households identified through socio-economic assessments to ensure equitable access to project benefits and livelihood opportunities. The community nursery will also serve as a platform for capacity development in ecosystem and sustainable resource management and climate adaptation practices. The community nursery will be designed to explore longer-term operational and financing models, including the potential production and sale of native planting materials and the provision of ecosystem-management services beyond project implementation, where viable and appropriate. These measures are intended to support the long-term sustainability of nursery operations and strengthen local ownership of restoration activities. Community nursery participation activities will target a minimum of 50% women participants in nursery related employment, training and capacity building activities and will actively promote women's leadership in nursery management, decision making and monitoring functions with a target of at least 40% women representation in management and coordination roles.

The activity will support climate-resilience awareness and adaptation capacity among downstream farming communities dependent on water resources originating from the Ulu Muda watershed. Activities may include awareness programmes on climate risks, water security, watershed functions, climate-smart agricultural practices, financial literacy, household resilience planning and informed adaptation decision-making. The activity will begin with a socio-economic and climate-vulnerability assessment covering approximately 200 households in downstream farming communities to identify climate-related livelihood risks, adaptation priorities, barriers to resilience and opportunities for community participation. The activity will adopt gender-responsive and

socially inclusive approaches throughout implementation. Participation in awareness, training and capacity-development activities will target a minimum of 50% women participants and at least 20% participation from vulnerable groups. Findings will inform the design of climate-resilience awareness activities, adaptation-support measures and targeted engagement of women, youth and vulnerable groups.

Lessons from previous watershed-management initiatives, community engagement programmes and adaptation experiences within the Ulu Muda landscape will be incorporated into implementation design and awareness materials.

Activity 3.1.4 Urban NbS Stewardship, Climate Resilience and Community Awareness in Kubang Pasu

This activity strengthens community stewardship, environmental awareness and citizen participation in urban NbS interventions implemented under Output 2.3. The activity aims to build long-term community ownership of retention ponds, wetlands and associated green-blue infrastructure while supporting biodiversity monitoring, environmental education and climate-resilience awareness.

A community nursery network will be established to support production of native trees, shrubs, aquatic plants and other vegetation required for retention pond enhancement and urban greening activities. Building on the central nursery established by MPKP, four satellite community nurseries will be established and community members, particularly women, youth and vulnerable groups, will receive training in nursery management, plant propagation and maintenance of climate-resilient native species. Nursery activities will provide planting materials for NbS interventions while strengthening local stewardship and creating opportunities for longer-term community participation and livelihood development.

The activity will establish a Citizen Science Monitoring Programme focusing on biodiversity and ecosystem monitoring within retention ponds, wetlands and associated green-blue corridors. Monitoring may include bird, frog and other biodiversity observations using citizen science platforms and protocols developed with technical support from FRIM and specialist partners. Community members, schools, university students, interns, Nature Clubs (Kelab Pencinta Alam), teachers and local volunteers will participate in monitoring activities and environmental stewardship initiatives. A network of Eco-Wardens will be established as trained community champions supporting long-term monitoring, stewardship and public engagement. Eco-Wardens will receive additional training and mentoring to coordinate monitoring activities, support data quality assurance, organize community awareness activities and act as focal points between communities, MPKP and project partners. Citizen scientist, Eco-Warden selection and community participation approaches will seek balanced representation of women and men while creating opportunities for youth leadership and participation by vulnerable groups.

The activity will further support community awareness, environmental education and outreach programmes focused on flood resilience, urban heat, biodiversity conservation, water stewardship and climate adaptation. Activities may include school programmes, citizen-science workshops, biodiversity events, volunteer planting campaigns, nature walks, awareness materials and public outreach initiatives. Community engagement approaches will promote participation of women, youth, older persons and persons with disabilities while encouraging inclusive use and stewardship of urban green-blue infrastructure.

Training will also cover inclusive design principles, gender-responsive community engagement approaches and accessibility considerations to ensure that urban Nature-based Solutions provide equitable benefits to women, youth, older persons and persons with disabilities. Lessons, materials and experiences generated through community participation and citizen-science

activities will contribute to project knowledge products, awareness materials and dissemination activities under Output 3.3.

Output 3.1. Milestones

- **Year 1:** Community participation framework, GESI Action Plan, grievance redress mechanism (GRM) and stakeholder engagement procedures established; socio-economic and climate vulnerability assessments completed; Sustainable Finance Assessment completed.
- **Year 2:** Community stewardship, nursery, awareness, citizen science and monitoring programmes operational across the three intervention landscapes.
- **Year 3:** Community livelihood, stewardship and monitoring activities expanded and fully integrated into peatland, watershed and urban NbS interventions.
- **Year 4:** Community stewardship, citizen science and livelihood models consolidated; lessons learned and locally led adaptation approaches incorporated into project guidance, knowledge products and replication materials.
- **Year 5:** Community stewardship mechanisms, local capacity and sustainable financing arrangements established to support the long-term sustainability and scaling of adaptation investments.

Activity	Stakeholders	Targets and beneficiaries
A.3.1.1 Inclusive Community Participation and Locally Led Adaptation Mechanisms	FRIM, local authorities, community organizations, women's groups, Community Development Department (KEMAS)	Target: Community participation framework developed and applied across all project landscapes; stakeholder mapping and socio-economic profiling completed; transparent beneficiary-selection, participation and incentive mechanisms established; project grievance redress and stakeholder feedback mechanisms operationalized; safeguards and PSEAH procedures integrated into community engagement processes; local participation mechanisms established in project intervention areas; minimum 50% women participation target adopted across all community activities. Beneficiaries: community representatives and local stakeholders participating in planning, consultation, governance and community engagement activities. The activity adopts gender-responsive and socially inclusive participation targets, including a minimum of 50% women participation across all community engagement activities and at least 20% participation from identified vulnerable groups. In addition, meaningful participation by promoting women's representation in leadership roles within community committees, consultation platforms and local decision-making structures, with a target of at least 40% women representation in such roles where applicable.
A.3.1.2 Peatland Community Stewardship and Climate Resilience in KLSFR	FRIM, JPNS and local partners	Target: Community participation mechanisms established in peatland intervention areas; Year 1 assessment completed on vulnerable farmers, workers, land users, water use and livelihood resilience needs; approximately 30 community members/farmers/land users engaged in peatland restoration, forest-edge stewardship and monitoring activities, 4 community-based monitoring groups established with 100 community members and land users trained in peatland fire prevention, early warning, reporting, basic monitoring and sustainable peatland management practices. Beneficiaries: Approximately 4,833 community members from peatland-adjacent communities benefiting from improved peatland management, reduced fire risk, strengthened climate resilience and enhanced participation in local adaptation processes.
A.3.1.3 Watershed Stewardship, Climate Resilience and Community	FRIM, Kedah State Forestry Department, MADA, Universiti Utara Malaysia	Target: One community nursery established and operational to support watershed restoration activities. Approximately 100 community members engaged in nursery development, forest enrichment, watershed stewardship and monitoring activities (minimum 50% women and 20% vulnerable groups). Socio-economic and climate-vulnerability assessment covering approximately 200 downstream farming households completed. Climate-resilience awareness, adaptation and livelihood-support activities implemented for

Awareness in Ulu Muda and downstream area	and local partners	approximately 350 downstream farmers and community members, including at least 30 youth participants (minimum 50% women and 20% vulnerable groups). Beneficiaries: Approximately 57,635 downstream farmers and water users benefiting from strengthened watershed resilience, water-security functions and adaptation-awareness activities, with targeted engagement of women, youth and vulnerable groups.
A.3.1.4 Urban NbS Stewardship, Climate Resilience and Community Awareness in Kubang Pasu	FRIM, MPKP, local partners	Target: Four satellite community nurseries established and operational (50% women). At least 300 citizen scientists engaged in biodiversity and environmental monitoring by Year 5 (50% women). At least 20 Eco-Wardens trained and operational as local stewardship leaders. At least 10 awareness, citizen-science, school or community outreach activities implemented. Participation targets will promote representation of women, youth and vulnerable groups. Beneficiaries: Approximately 30 nursery participants (minimum 70% women), 300 citizen scientists and 20 Eco-Wardens (50% women participation), and at least 500 community members, students and local stakeholders participating in awareness, stewardship and monitoring activities.

Output 3.2: Technical Capacity for Climate Intelligence, NbS Management and Project Implementation Strengthened

This output strengthens the technical and institutional capacities required to apply climate intelligence, implement adaptation interventions, operate monitoring systems and support adaptive management across the project landscapes. The output supports national, state and municipal institutions responsible for climate-risk assessment, ecosystem management, project implementation and long-term operation of adaptation investments.

Capacity-building activities will focus on three complementary areas: (i) application of climate intelligence, climate-risk and vulnerability information for adaptation planning and decision-making; (ii) implementation, monitoring and adaptive management of landscape-specific NbS interventions; and (iii) monitoring, safeguards, gender-responsive implementation and project management functions required to ensure effective delivery and sustainability of project results.

Training programmes will be tailored to the needs of participating institutions and may include technical training, operational guidance, field demonstrations, peer-to-peer learning, training-of-trainers approaches and knowledge-exchange activities. Particular attention will be given to strengthening institutional uptake of project tools, guidance and monitoring systems beyond the project implementation period.

Activity 3.2.1 Climate Intelligence, Project Implementation and Adaptive Management Capacity Building

Strengthens the capacity of national and sub-national institutions to apply climate intelligence, vulnerability information and project management approaches to support climate-resilient planning, implementation and adaptive management. Training will focus on practical application of ICFIS, the Forest-Climate Vulnerability Atlas, climate-risk and vulnerability assessment approaches, restoration prioritization and evidence-based adaptation planning.

The activity will also strengthen capacities related to project monitoring, adaptive management, environmental and social safeguards implementation, stakeholder engagement, grievance management, gender-responsive adaptation planning, collection and reporting of sex-disaggregated indicators, knowledge management and institutional learning. Training-of-trainers approaches will be applied where appropriate to support long-term institutional uptake and sustainability. Training will include collection, analysis and reporting of sex-, age- and disability-disaggregated data and application of gender-responsive monitoring approaches consistent with Adaptation Fund requirements.

Activity 3.2.2 Peatland Restoration, Fire Resilience and Monitoring Capacity Building

Strengthens the technical and institutional capacities required for long-term management of peatland restoration, hydrological rehabilitation, fire-risk reduction and monitoring systems established under Output 2.1. Training and technical support will target FRIM, Selangor State Forestry Department (JPNS), JBPM/Bomba, DID/JPS, local authorities and other relevant stakeholders responsible for peatland restoration, hydrological management, fire prevention, related environmental and social safeguards, monitoring and adaptive management.

Capacity-building activities will strengthen technical skills related to peatland ecology and hydrology, clay dyke construction, water-retention systems, groundwater and peat-moisture monitoring, fire-risk assessment, early warning systems, operational response procedures, monitoring technologies, telemetry systems, adaptive management and inter-agency coordination. Practical field demonstrations, simulation exercises and training-of-trainers approaches will support long-term institutional uptake and sustainability. Lessons and operational experience generated through implementation will contribute to peatland restoration guidance, fire-management toolkits, monitoring protocols and operational procedures developed under Output 1.1.3.

Activity 3.2.3 Watershed Management, Monitoring and Restoration Capacity Building

Strengthens the technical and institutional capacities required for long-term implementation, monitoring and adaptive management of watershed adaptation measures established under Output 2.2. Training and technical support will target the Kedah State Forestry Department, MADA, Kedah State Water Resources Board (LSANK), SADA and other relevant stakeholders responsible for watershed management, soil-erosion management, sediment management, water-resource management and adaptation planning.

Capacity-building activities will strengthen technical skills related to climate-adaptive watershed management and related environmental and social safeguards for forest enrichment, assisted natural regeneration, nursery management, soil-erosion management, sediment management, check dam implementation, watershed monitoring systems, sediment and turbidity monitoring, hydrological monitoring, interpretation of watershed performance indicators, adaptive management and inter-agency coordination. Field demonstrations, practical exercises, site visits and training-of-trainers approaches will support institutional uptake and sustainability. Lessons, monitoring results and implementation experience generated through watershed adaptation activities will contribute to watershed management guidance, soil-erosion and sediment-management toolkits, monitoring protocols and operational procedures developed under Output 1.1.3.

Activity 3.2.4: Urban Nature-based Solutions Monitoring, Adaptive Management and Municipal Capacity Building

Strengthens the technical and institutional capacities required for long-term planning, implementation, monitoring and management of urban NbS interventions established under Output 2.3. Training and technical support will target MPKP, DID/JPS, FRIM and other relevant agencies responsible for urban drainage, retention pond management, biodiversity monitoring, landscaping, Smart City operations and climate-resilient municipal planning.

Capacity-building activities will support application of the Nature-based Solutions Opportunity Scan, retention pond typologies, monitoring systems and adaptive-management approaches developed under Output 2.3. Training will cover NbS planning and implementation, retention pond assessment and enhancement, climate-resilient stormwater management, native plant nursery management, biodiversity monitoring, bioacoustic monitoring, environmental monitoring systems, monitoring sensors, dashboard systems, climate-adaptation monitoring and reporting, adaptive maintenance, community engagement, Eco-Warden integration, community health and safety,

accessibility considerations and integration of NbS into municipal planning and asset-management processes. Field demonstrations, peer-learning exchanges, study visits, training-of-trainers approaches and practical application at demonstration sites will support institutional uptake and future replication. Lessons and materials developed through the activity will contribute to the Urban NbS Toolkit, standard operating procedures and operational guidance developed under Output 1.1.3. Training programmes will incorporate safeguards requirements, gender-responsive engagement approaches, accessibility principles and community health and safety considerations relevant to urban NbS implementation.

Output 3.2. Milestones:

- **Year 1:** Capacity needs assessment completed and training programme developed.
- **Year 2:** Initial training programmes delivered on climate intelligence, safeguards, adaptation planning and landscape-specific NbS implementation.
- **Year 4:** Technical personnel trained and applying climate intelligence, monitoring systems and adaptive-management approaches across project landscapes.
- **Year 5:** Institutional capacities strengthened for long-term operation, monitoring and replication of adaptation investments and climate-risk management systems.

Activity	Stakeholders	Targets and Beneficiaries
A.3.2.1 Climate Intelligence, Project Implementation and Adaptive Management Capacity Building	FRIM, NRES, JPSM, State Forestry Departments, DID/JPS, NAHRIM, METMalaysia, MYSA, PLANMalaysia	Target: 200 personnel trained in application of ICFIS and Atlas products, climate-risk assessment, adaptation planning, restoration prioritization, monitoring, safeguards implementation, stakeholder engagement and gender-responsive adaptation planning. 30 personnel trained on monitoring and evaluation, environmental and social safeguards implementation, stakeholder engagement, grievance redress mechanisms, Indigenous Peoples engagement, and gender-responsive adaptation planning and monitoring. Beneficiaries: National and sub-national agencies, project management teams and implementing partners responsible for climate adaptation, planning, safeguards and monitoring.
A.3.2.2 Peatland Restoration, Fire Resilience and Monitoring Capacity Building	FRIM, JPNS, JBPM/Bomba, DID/JPS, JMG, local authorities and relevant technical partners	Target: 40 personnel trained in peatland restoration, hydrological rehabilitation, groundwater and peat-moisture monitoring, fire-risk assessment, early warning systems, operational fire-response procedures, contingency planning and adaptive management approaches. Beneficiaries: FRIM, JPNS, JBPM/Bomba, DID/JPS, JMG and participating agencies responsible for peatland management, fire-risk reduction and long-term operation of monitoring and restoration systems.
A.3.2.3 Watershed Management, Monitoring and Restoration Capacity Building	FRIM, Kedah State Forestry Department, MADA, LSANK, SADA	Target: 10 technical personnel trained in climate-adaptive watershed management, forest enrichment, soil-erosion management, sediment management, watershed monitoring systems and adaptive management approaches. Training materials, operational guidance and technical knowledge products developed and applied by participating agencies. Beneficiaries: Forestry, watershed and water-resource agencies responsible for implementation, monitoring and long-term management of watershed adaptation interventions in the Ulu Muda watershed.
A.3.2.4 Urban Nature-based Solutions Monitoring, Adaptive Management and Municipal Capacity Building	MPKP, FRIM, DID/JPS	Target: 50 municipal and technical personnel trained in NbS planning, retention pond management, biodiversity monitoring, nursery management, monitoring systems, dashboard operations, adaptive maintenance, community engagement and climate-resilient asset management. Training materials, monitoring protocols and operational procedures developed and applied by participating agencies. Beneficiaries: Municipal engineers, drainage and public works personnel, planners, landscape officers, nursery staff, dashboard operators, biodiversity monitoring teams and technical officers responsible for urban flood resilience and Nature-based Solutions implementation.

Output 3.3: Knowledge Management, Learning and Dissemination Systems Operationalized

This output ensures that knowledge, tools, methodologies and lessons generated through the project are systematically documented, shared and maintained beyond the project period. It supports dissemination of climate-risk information, NbS approaches and implementation experience generated under Components 1, 2 and 3, while providing long-term access to project knowledge products and lessons learned.

The output will establish a knowledge management system that facilitates learning and exchange among government agencies, local authorities, technical institutions, researchers, practitioners and future adaptation programmes. Emphasis will be placed on documenting practical implementation experience and supporting replication of successful approaches in forest, peatland, watershed and urban landscapes.

Knowledge management activities will capture technical, institutional and community perspectives, including locally led adaptation experiences, community stewardship approaches, gender-responsive adaptation practices and lessons from vulnerable groups participating in project activities. Knowledge products and dissemination activities will support replication, scaling and future adaptation investment while promoting inclusive adaptation approaches.

Activity 3.3.1: National Knowledge Portal

A National Knowledge Portal will be established and maintained as a central repository for project knowledge products, guidance materials and implementation lessons.

The portal will provide access to selected outputs from ICFIS and the Forest-Climate Vulnerability Atlas, operational guidance and NbS toolkits developed under Output 1.3, the Sustainable Finance and Scaling Framework, case studies, policy briefs, technical publications and other project knowledge products.

The portal will serve as a dissemination and learning platform rather than a primary data-hosting system. Long-term hosting and maintenance arrangements will be established and hosted by FRIM and other relevant national adaptation knowledge platform that may be established in the future to ensure continued access to project resources beyond the project implementation period.

Activity 3.3.2: Knowledge Products and Case Studies

Knowledge products will be developed to document project experience, lessons learned and good practices emerging from implementation across the three intervention landscapes.

Products will synthesize technical findings, implementation experience and evidence generated through climate-risk assessment, peatland adaptation, watershed management and urban NbS interventions. Materials may include technical briefs, policy notes, case studies, awareness materials, factsheets and synthesis reports designed to support learning, replication and future investment.

Knowledge products will document both technical and implementation lessons, including experiences from local authorities, community participants, women leaders, community champions and locally led adaptation initiatives where relevant. Particular attention will be given to documenting practical lessons on adaptation planning, stewardship mechanisms, community participation, monitoring systems and NbS implementation.

Knowledge products will be prepared in formats appropriate to their intended audiences and, where relevant, made available in both English and Bahasa Malaysia. User-friendly

communication products will be developed to support wider accessibility and uptake among local authorities, practitioners, communities and future adaptation programmes.

Knowledge products will seek to document diverse adaptation experiences, including perspectives and lessons from women, local communities, youth and community-based adaptation practitioners. Case studies may highlight women leaders, community champions and locally led adaptation initiatives where relevant. Documentation of community experiences will follow appropriate informed-consent procedures.

Activity 3.3.3: Learning, Dissemination and Knowledge Exchange

National and sub-national learning and dissemination activities will be implemented to communicate project results, facilitate knowledge exchange and support replication of successful adaptation approaches.

Three sub-national learning and dissemination events will be conducted in the project intervention landscapes related to output 2.1, 2.2 and 2.3 and corresponding component 3 activities to share implementation experience, technical lessons and good practices emerging from project activities. The events will bring together implementing agencies, local authorities, technical partners, community representatives and other stakeholders to review project results, discuss operational lessons and identify opportunities for future replication and scaling.

Knowledge products developed through the project, including technical guidance, implementation tools, case studies, lessons learned, policy recommendations and adaptation approaches, will be disseminated through the National Knowledge Portal and other relevant knowledge-sharing platforms. Knowledge products will support learning across sectors involved in climate adaptation, forestry, ecosystem management, water resources management and NbS planning.

national dissemination event will be organized towards the end of the project to present key findings, tools, guidance materials and policy recommendations to national and sub-national decision-makers, technical agencies, development partners and other stakeholders involved in climate adaptation, forestry, water resources and NbS planning.

Learning and dissemination activities will seek balanced participation of government agencies, local authorities, technical institutions, community representatives, women, youth and other relevant stakeholders. Activities may include peer-learning exchanges, practitioner dialogues, municipal learning events and knowledge-sharing sessions coordinated through MASH and other relevant knowledge-sharing platforms.

Learning and dissemination activities will promote inclusive participation and representation among speakers, panellists and participants. Where appropriate, activities may facilitate exchanges involving women, Indigenous Peoples, youth, local communities and technical practitioners to support intergenerational learning and sharing of practical adaptation experience.

Output 3.3 Milestones

- **Year 2:** Knowledge management and dissemination strategy developed.
- **Year 3:** National Knowledge Portal established and initial project resources uploaded.
- **Year 4:** Knowledge products, case studies and dissemination materials prepared and shared through the portal and learning events.
- **Year 5:** Knowledge Portal fully operational with project tools, guidance materials and lessons learned consolidated and disseminated nationally.

Activity	Stakeholders	Targets and Beneficiaries
A.3.3.1 National Knowledge Portal	FRIM, NRES, NAHRIM, PLANMalaysia, UNDP and relevant technical partners	Target: 1 National Knowledge Portal established and maintained, providing access to project tools, guidance materials, SOPs, toolkits, case studies and knowledge products generated under Components 1, 2 and 3. Beneficiaries: Government agencies, local authorities, researchers, practitioners and future adaptation programmes.
A.3.3.2 Knowledge Products and Case Studies	FRIM, UNDP, research institutions, local authorities and project partners	Target: At least 7 knowledge products and case studies developed and disseminated, including 1 ICFIS and Forest-Climate Vulnerability Atlas synthesis brief, 2 peatland adaptation and fire-management knowledge products, 2 watershed adaptation and water-security knowledge products, and 2 urban Nature-based Solutions knowledge products. Products will document technical lessons, implementation experience, locally led adaptation approaches and inclusive adaptation practices. Beneficiaries: Technical institutions, practitioners, decision-makers and future adaptation programmes.
A.3.3.3 Learning, Dissemination and Knowledge Exchange	FRIM, NRES, local authorities, universities, NGOs, MASH and project partners	Target: 1 national dissemination event conducted; at least 3 sub-national learning and knowledge-sharing events conducted in Selangor, Ulu Muda and Kubang Pasu. Beneficiaries: Government agencies, local authorities, researchers, practitioners, community representatives, development partners and future adaptation programmes.

B. Economic, Social and Environmental benefits

The project will contribute to **AF Outcome 2** (Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses) and **AF Outcome 5** (Increased ecosystem resilience in response to climate change and variability-induced stress). It will generate adaptation benefits at local, landscape and national scales through investments in climate-risk management, peatland and watershed resilience, urban flood management, institutional capacity development and community participation. Benefits are expected to accrue to communities, water users, public institutions and ecosystems, while contributing to broader climate resilience, water security and sustainable development objectives. The following section summarizes the principal adaptation benefits, beneficiary groups and social and environmental outcomes expected from project implementation.

Adaptation Benefits and Co-benefits

The project is designed to reduce climate-related risks associated with peat fires, hydrological variability, erosion, sedimentation, flooding and water insecurity, while strengthening the resilience of ecosystems, communities and institutions. Adaptation benefits are expected through improved peatland hydrological conditions, strengthened watershed functions, enhanced urban flood-buffering capacity, improved climate-risk information and increased capacity for climate-informed planning and management. In addition to these direct adaptation outcomes, the project is expected to generate wider economic, social and environmental co-benefits.

Primary adaptation benefits include strengthened peatland hydrological resilience and reduced peat-fire risk using canal blocking and clay dikes to re-establish a high groundwater table. This saturates the soil and prevents deep, persistent underground smouldering that is incredibly difficult to extinguish, protecting surrounding communities from extreme air pollution during dry spells; The Kuala Langat peatlands serve as a vital hydrological sponge for the southern section of the Greater Kuala Lumpur area. Restoring their resilience ensures they can absorb massive quantities of water during heavy monsoons—preventing devastating floods in towns like Banting and Sepang. For the Ulu Muda catchment benefits are improved watershed functions, reduced erosion and sedimentation pressures will ensure sufficient water reserves that can be carried over to survive extended periods of climate-induced drought. Keeping the Muda Dam free of excessive sediment maintains also its flood-attenuation capabilities, preventing catastrophic overflows that threaten communities downstream during extreme weather events. Mitigating reservoir sedimentation prevents structural decline in water quality (such as high turbidity) and secures the

baseline volume needed to sustain cross-border municipal water supplies during dry seasons, thus enhancing water security; improved urban flood buffering, stormwater management and urban cooling; strengthened climate-risk information and adaptive planning capacity; and improved stewardship, monitoring and adaptive-management capacity among participating institutions and communities.

Enhancing fire resilience prevents significant releases of carbon dioxide and methane, directly aligning with national emission-reduction targets because degraded peatlands release millennia-old carbon stocks during fires. Rewetting and maintaining soil moisture protects regional biodiversity and prevents land subsidence, as well as maintaining waterlogged peatlands acts as a natural regional coolant, buffering surrounding urban populations from extreme temperature spikes. Restoring these peatlands' function will benefit prevention of recurrent public health crises, avoid airport and school closures, and cut down localized greenhouse gas emissions that threaten Malaysia's climate targets. The project generates broader co-benefits by using native species, improved ecosystem management, strengthened institutional coordination, technical capacity development, community stewardship and inclusive participation in climate adaptation processes.

Quantified estimates presented below are based on available technical assessments, published literature, project design assumptions and concept-stage analyses undertaken by FRIM. Where indicated, values are preliminary estimates that will be refined through baseline studies, monitoring systems, technical assessments and economic analyses undertaken during implementation.

Table: Economic, Social and Environmental Benefits

Category	Output	Quantified Estimate / Indicative Benefit	Methodology and Data Source
ECONOMIC BENEFITS			
Reduced flood-related damages and maintenance pressures	O.2.3	Preliminary estimate: 20–25% reduction in localized flood damages and maintenance requirements in intervention areas	Historical records indicate that between 561 and 1,188 households were displaced during major flood events in 2024. The project aims to reduce flood impacts for a significant proportion of households located within the priority intervention areas by Year 5.
Reduced water-treatment costs and sediment-management pressures	O.2.2	To be quantified through economic valuation study under Output 2.2	Economic valuation of avoided sedimentation, improved raw-water quality and reduced treatment requirements
Strengthened resilience of water-dependent agricultural systems	O.2.2	57,635 registered MADA farmers benefiting from improved watershed functions and water security	MADA service-area data and beneficiary methodology
Stewardship, nursery and monitoring opportunities	O.3.1	Community nursery participants, Eco-Wardens, citizen scientists and stewardship groups engaged in adaptation activities	Project monitoring and participation records
SOCIAL BENEFITS			
Improved water security and climate resilience	O.2.2	Up to 4.2 million people benefiting indirectly from strengthened watershed functions and water security	Watershed service-area estimates and beneficiary methodology
Reduced peat-fire risk and associated community exposure	O.2.1	Preliminary estimate: 70 to nearly 100% reduction in fire ignition risk within well-managed peatland intervention areas	Based on FRIM literature review and research conducted regionally
Improved urban thermal comfort	O.2.3	Preliminary estimate: 2.0–3.0°C localized cooling effect around selected NbS intervention sites (findings confirm that establishing tree belts and pocket forests	Published literature on urban NbS performance and site-level monitoring

		around retention ponds can realistically achieve the target)	
Gender-responsive and inclusive participation	O.3.1, O.3.2, O.3.3	Minimum 50% women participation across training, stewardship, governance and monitoring activities	GESI Action Plan and project monitoring framework
Community participation in adaptation	O.3.1	Eco-Warden programme, citizen-science activities, community nurseries and stewardship mechanisms operationalized across project landscapes	Project monitoring records
ENVIRONMENTAL BENEFITS			
Improved peatland hydrological resilience	O.2.1	1000 ha under improved hydrological management and monitoring	FRIM monitoring systems and project reporting
Reduced erosion and sedimentation pressures	O.2.2	800 ha under climate-adaptive watershed management, enrichment planting and assisted natural regeneration	FRIM monitoring and project reporting
Improved urban flood-buffering functions	O.2.3	71ha of stormwater management asset enhanced through NbS and ecological retrofitting measures	Municipal records and project monitoring
Biodiversity and ecosystem-function benefits	O.2.1, O.2.2, O.2.3	Habitat enhancement and improved ecosystem functionality across intervention landscapes	Ecological monitoring and project reporting
Carbon-stock protection and ecosystem resilience	O.2.1	Protection of peatland carbon stocks and strengthened ecosystem resilience within managed peatland areas	Published literature & FRIM assessments and project monitoring (groundwater-threshold analyses, peat moisture monitoring)

These benefits are expected to be experienced at different scales and by different stakeholder groups. While some outcomes are localized to project intervention sites, others extend across broader service areas through improved watershed functions, water security and climate-risk management systems. The beneficiary estimates presented below summarize the populations expected to directly and indirectly benefit from project implementation.

Project Beneficiaries and Methodology

The project will generate significant direct and indirect adaptation benefits for vulnerable communities, ecosystem-dependent livelihoods, technical personnel and institutions through implementation of climate-risk management systems, EbA, NbS, community stewardship approaches and institutional capacity strengthening across the project landscapes.

The project is expected to directly benefit approximately 148,382 people, including 59,826 women (40.3%) and 88,556 men (59.7%), through interventions implemented under Components 1, 2 and 3. Direct beneficiaries include communities within the KLSFR landscape benefiting from reduced peat-fire risk and improved ecosystem resilience; MADA farmers and agricultural water users benefiting from strengthened watershed functions and improved water security; urban and peri-urban residents benefiting from enhanced retention-pond systems and associated NbS interventions in Kubang Pasu; and national, state and municipal personnel receiving training and institutional capacity support.

The project is also expected to generate broader indirect benefits for approximately 4.2 million people, including an estimated 1,995,000 women and 2,205,000 men, through strengthened watershed regulation, improved hydrological resilience and enhanced raw-water supply security associated with the Ulu Muda watershed system.

While the overall beneficiary profile reflects the demographic composition of the target populations and sectors reached by the project, implementation targets generally aim to achieve at least **50%**

participation of women across training, stewardship, monitoring, governance and capacity-development activities, with a minimum target of 70% women participation in women-prioritized nursery activities. Detailed gender and social inclusion targets, participation approaches and monitoring arrangements are presented in the GESI Assessment and Action Plan.

Direct beneficiaries are defined as individuals who directly participate in, receive support from, or experience measurable resilience benefits resulting from project interventions. Indirect beneficiaries are populations benefiting from broader ecosystem, hydrological, water-security and climate-risk reduction functions supported by the project. Beneficiary estimates were developed using demographic statistics, agricultural databases, watershed service-area assessments, municipal records and project participation targets. Detailed beneficiary calculations, assumptions and methodologies are provided in the Beneficiary Assessment Annex.

Approaches to beneficiary verification, sex-disaggregation, social inclusion and avoidance of double counting will be refined during project inception and incorporated into the project monitoring and evaluation framework. Given the differentiated ways in which climate risks affect women, men and vulnerable groups, the project incorporates gender-responsive and socially inclusive approaches throughout design and implementation.

Table: Summary of Project Direct and Indirect Beneficiaries

Output / Beneficiary Group	Direct Beneficiaries	Women	Men	Gender Target	Indirect Beneficiaries
Kuala Langat Selatan Forest Reserve landscape (Outputs 2.1 and 3.1)	4,760	2,261	2,499	National population ratio (47.5% women)	–
MADA farmers and water users benefiting from strengthened watershed resilience (Output 2.2)	57,635	16,714	40,921	29% women, based on registered farmers	–
Kubang Pasu urban and peri-urban NbS landscape (Output 2.3)	85,687	40,701	44,986	National population ratio (47.5% women)	–
National, state and municipal personnel receiving training and institutional support (Output 3.2)	300	150	150	Minimum 50% women	–
Broader regional population benefiting from strengthened watershed regulation and raw-water security (Output 2.2)	–	–	–	National population ratio (47.5% women)	4,200,000
Total Direct Beneficiaries (unique individuals)	148,382	59,826	88,556	–	–
Total Indirect Beneficiaries (unique individuals)	–	1,995,000	2,205,000	–	4,200,000

Beneficiary estimates exclude subset beneficiary groups used for project monitoring and reporting to avoid double counting. Detailed beneficiary calculations, assumptions and methodologies are provided in the Beneficiary Assessment Annex.

Gender and Social Inclusion

A GESI Assessment and Action Plan has been prepared and is included as an annex. The assessment examined gender-differentiated climate vulnerabilities, barriers to participation, access to resources and decision-making, and opportunities to strengthen inclusive adaptation outcomes across the project landscapes. Findings from the assessment have informed project design, beneficiary targeting, implementation arrangements, monitoring systems and safeguards measures.

The assessment was informed by extensive stakeholder consultations undertaken during project preparation at national, sub-national and community levels across all project landscapes and components. Consultation methods included stakeholder interviews, focus group discussions with women, men and mixed groups, community scorecards, perception surveys, field visits, institutional consultations and literature review. The process engaged government agencies, local authorities, community representatives, civil society organizations, technical experts and vulnerable groups, and provided important insights into local climate risks, adaptation priorities, participation barriers and opportunities for more equitable adaptation outcomes.

The assessment found that climate change and ecosystem degradation affect women, men and vulnerable groups differently across the project landscapes. Women often experience disproportionate impacts associated with unpaid care responsibilities, household water management, livelihood disruption and health-related burdens arising from floods, droughts, heat stress and peat-fire haze events. Low-income households, older persons, persons with disabilities and other vulnerable groups may face additional constraints in accessing information, participating in decision-making processes and benefiting from adaptation investments.

In Kuala Langat Selatan, peat-fire haze creates significant health burdens and caregiving responsibilities, particularly for women and female-headed households, who are often responsible for caring for children, older family members and individuals with respiratory conditions during haze events.

In Ulu Muda, increasing rainfall variability, drought risk and water insecurity can disrupt agricultural livelihoods and place additional pressure on household water management, disproportionately affecting women's responsibilities related to household wellbeing, food security and care work.

In Kubang Pasu, recurring flooding and stormwater management challenges can increase household recovery burdens, disrupt access to services and livelihoods, and create additional caregiving and safety concerns, particularly for women, older persons and vulnerable households. Increasing temperatures and heat exposure may further contribute to time poverty, mobility constraints and rising household costs associated with cooling, water use and transportation.

At the same time, the assessment identified strong opportunities for more inclusive adaptation approaches. Consultations demonstrated high willingness among both women and men to participate in ecosystem restoration, watershed management, monitoring and NbS activities, with women frequently expressing equal or greater interest in participation than men. Community nurseries and native seedling production emerged as particularly promising opportunities for women-led livelihood development and local stewardship, while existing informal leadership roles held by women within community groups provide a foundation for stronger participation in adaptation governance and decision-making processes.

The assessment also identified several structural barriers that may limit equitable participation and benefit sharing if not explicitly addressed. These include time poverty associated with unpaid care responsibilities, male-dominated leadership structures, limited access to technical and leadership roles for women, insufficient integration of gender-responsive budgeting and benefit-sharing approaches, and weak inclusion of vulnerable groups in planning and monitoring processes. Despite strong willingness to participate, women remain underrepresented in many governance and decision-making structures relevant to natural-resource management and adaptation planning.

In response, the project integrates gender-responsive and socially inclusive approaches across all components, with particular emphasis on equitable participation in stewardship activities, community monitoring, ecosystem restoration, technical training, institutional capacity

development, climate-risk planning and knowledge-sharing processes. Activities will be designed to address participation barriers and promote equitable access to project benefits, leadership opportunities and decision-making processes.

The project includes explicit gender-responsive participation targets across its community and institutional capacity-development activities. As a minimum standard, the project aims to achieve 50% participation of women across community stewardship, citizen-science programmes, Eco-Warden networks, awareness activities, restoration and monitoring initiatives, technical training, institutional capacity-development activities and governance-related processes. In addition, women-prioritized nursery and livelihood activities will target a minimum of 70% women participants to strengthen women's leadership, economic participation and engagement in NbS implementation. The project also seeks to strengthen the participation of vulnerable and underrepresented groups, including low-income households, female-headed households, youth, older persons and persons with disabilities where relevant and feasible. Indicative social inclusion targets of approximately 20% participation by vulnerable and underrepresented groups have been incorporated into relevant community-based activities and will be refined during project inception based on site-specific assessments and stakeholder engagement processes.

The project will allocate dedicated resources for implementation of the GESI Action Plan, including gender-responsive capacity development, targeted outreach, inclusive participation measures, monitoring and reporting, and support for women-led and community-based adaptation initiatives. The allocation for GESI-related activities is estimated at 12.3% of the total project budget as detailed in the GESI budget in the Gender Action Plan (GAP) annex.

Progress against these targets will be monitored through sex-disaggregated participation records, beneficiary monitoring systems and GESI indicators integrated within the project Results Framework. Detailed participation targets, social inclusion measures, implementation actions and monitoring arrangements are provided in the GESI Assessment and Action Plan annex.

Avoiding and Mitigating Negative Impacts

In addition to maximizing adaptation benefits and promoting inclusive participation, the project has been designed to avoid, minimize and manage potential environmental and social risks associated with implementation. The project has been screened in accordance with the Adaptation Fund Environmental and Social Policy (ESP), Adaptation Fund Gender Policy and UNDP Social and Environmental Standards (SES), and incorporates measures to avoid, minimize and manage potential environmental and social risks throughout implementation. The project is classified as **Moderate Risk (Category B)**.

The project applies a native-species and ecosystem-compatibility approach for peatland, watershed and urban NbS activities. Biodiversity screening, site-level safeguards review and good-practice environmental management measures will be integrated into implementation. Physical interventions will avoid land acquisition, involuntary resettlement, physical displacement and restrictions on customary access. Activities will be limited to existing disturbed, managed or degraded areas where feasible and appropriate.

Social safeguards measures include inclusive stakeholder engagement, strengthened participation of women, youth and vulnerable groups, grievance redress mechanisms and public safety considerations for urban and water-related infrastructure. The project will also apply a zero-tolerance approach toward Sexual Exploitation and Abuse/Sexual Harassment and Gender-Based Violence (GBV), with related awareness and reporting measures integrated into project implementation and training activities.

Detailed safeguards measures and management approaches are further elaborated through the SES screening process, ESMF, GRM and related safeguards instruments included in the Safeguards Annexes. Together, these measures are intended to ensure that adaptation benefits are delivered in an inclusive, environmentally sustainable and socially responsible manner while supporting long-term resilience outcomes across the project landscapes.

C. Cost-effectiveness

The project is designed to support cost-effective climate adaptation by combining improved climate-risk information, ecosystem-based approaches, operational monitoring systems and local stewardship across peatland, watershed and urban landscapes. Rather than relying primarily on large-scale grey infrastructure expansion, the project seeks to address underlying drivers of climate vulnerability while improving the performance, management and sustainability of existing natural and built systems.

Component 1 supports development of climate-risk assessment and decision-support tools, including the ICFIS and the Forest-Climate Vulnerability Atlas. These tools help inform prioritization, planning and monitoring of adaptation investments across the project landscapes and support more coordinated management of climate-related risks.

The project further improves cost-effectiveness by integrating peatland, watershed and urban adaptation objectives within existing government systems and assets; enhancing the performance of existing infrastructure and landscapes rather than relying solely on new construction; strengthening monitoring, maintenance-support and stewardship arrangements; improving the targeting of adaptation investments; and building on existing institutional mandates, municipal systems and forestry operations.

Comparative analysis: NbS vs. Grey Infrastructure

The project prioritizes NbS and ecosystem-based approaches where these provide flexible, scalable and ecosystem-compatible alternatives or complements to conventional infrastructure investments. The proposed interventions are intended to enhance, rather than replace, existing engineered systems and government investments.

Table: Technical and Economic Comparison of Adaptation Alternatives

Intervention Area	Proposed NbS / Hybrid Approach	Conventional Alternative	Cost-Effectiveness and Co-Benefits
Peatland water management and fire-risk reduction (Output 2.1)	Hydrological management and rewetting, peat moisture monitoring and community stewardship	Expanded centralized water-supply and fire-suppression infrastructure	Supports preventive peatland management, reduces fire vulnerability and strengthens ecosystem functions while using modular and scalable systems adapted to peat landscapes.
Watershed stabilization and erosion reduction (Output 2.2)	Climate-adaptive watershed management, enrichment planting, assisted natural regeneration, erosion-control measures and sediment-management interventions	Repeated dredging, hard erosion-control structures and downstream sediment management	Addresses upstream drivers of erosion, sedimentation and hydrological instability while strengthening watershed functions, water security and long-term ecosystem resilience.
Urban flood and heat mitigation (Output 2.3)	Retention-pond enhancement, native planting, biodiversity-support measures, urban cooling features and associated NbS interventions	Expansion of concrete drainage systems and conventional flood-control infrastructure	Enhances flood buffering, stormwater management and urban cooling while strengthening biodiversity, public amenity value and lower-intervention maintenance approaches.
Monitoring and maintenance systems (Outputs 1.3 and 3.1)	Adaptive management systems, stewardship mechanisms, citizen science	Reactive maintenance and periodic outsourced	Improves early identification of maintenance needs, strengthens local ownership and supports more

	and condition-based maintenance support	inspection systems	responsive maintenance coordination.
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Economic and Avoided-cost Rationale

The project's cost-effectiveness is based primarily on reducing future climate-related losses and strengthening the capacity of ecosystems, institutions and communities to manage increasing climate risks. The proposed interventions address key drivers of vulnerability, including peatland drying and fire risk, watershed erosion and sedimentation, flood exposure, hydrological instability and limited capacity for climate-informed planning and management. By reducing these risks, the project is expected to help lower future costs associated with peat-fire suppression, haze impacts, sediment management, flood damage, ecosystem degradation, infrastructure maintenance and inefficient adaptation investments.

Expected benefits include reduced peat-fire risks and associated environmental, health and suppression costs; reduced erosion and sedimentation pressures affecting reservoirs, irrigation systems and downstream water users; improved flood-buffering and stormwater-management performance; strengthened resilience of water-dependent agricultural systems; improved water security; and more effective prioritization of adaptation investments through improved climate-risk information and monitoring systems.

Compared with stand-alone grey infrastructure approaches, the project emphasizes modular and ecosystem-based interventions that can generate multiple benefits simultaneously, including improved watershed condition, enhanced water regulation, biodiversity benefits, reduced maintenance requirements and increased resilience to climate variability. These characteristics make such approaches particularly relevant in landscapes where climate risks, ecosystem degradation and competing land and water demands are closely interconnected.

Preliminary concept-stage analysis undertaken by FRIM indicates that the proposed portfolio of interventions has the potential to generate substantial avoided-cost and resilience benefits over time. Watershed-management and sediment-control measures are expected to contribute to improved raw-water quality and reduced pressures on downstream water-treatment systems, while strengthened peatland hydrological management and urban flood-management functions may help reduce future climate-related losses. Detailed economic valuation methodologies and benefit estimates will be further refined through monitoring, performance assessment and targeted economic studies during implementation.

Long-term sustainability will be supported through strengthened institutional capacity, monitoring systems, stewardship mechanisms, community nurseries, citizen-science and Eco-Warden programmes, and improved coordination among forestry, water management, municipal and other relevant agencies. These arrangements intend to support continued monitoring, maintenance, learning and replication of project approaches beyond the project lifetime.

D. National policy framework

The project is fully aligned with Malaysia's national development priorities, climate adaptation agenda, biodiversity commitments and water-security objectives. Project interventions support government priorities related to climate adaptation, flood-risk management, watershed resilience, peatland management, water security, ecosystem conservation and institutional capacity development. The project also contributes to Malaysia's increasing emphasis on ecosystem-based approaches, risk-informed planning and integrated management of climate-sensitive landscapes.

Consistency with National Strategies and Climate Frameworks

National Adaptation Plan (MyNAP 2027–2050)

Malaysia is developing its first National Adaptation Plan (MyNAP 2027–2050), which is expected to provide the overarching framework for climate adaptation across sectors and levels of government. The project aligns strongly with emerging MyNAP priorities related to water security, agricultural resilience, ecosystem conservation, resilient infrastructure and strengthened climate-risk information systems. Through improved climate-risk assessment, watershed and peatland management, urban adaptation measures and institutional capacity development, the project contributes practical approaches that support operationalization of Malaysia's adaptation agenda.

National Climate Change Policy 2.0 (NCCP 2.0, 2024)

The project contributes directly to:

- **Strategic Thrust 3 (Adaptation and Resilience)** through climate-risk planning, ecosystem resilience, watershed stabilization, peatland restoration and NbS implementation; and
- **Strategic Thrust 1 (Climate Governance and Capacity)** through strengthening climate-risk information systems, institutional capacity, operational adaptation planning and technical decision-support systems.

Malaysia's Nationally Determined Contributions (NDC 3.0, 2025)

The project supports adaptation priorities reflected in Malaysia's Nationally Determined Contribution (NDC 3.0), particularly those related to water security, ecosystem resilience, flood management, climate-resilient agriculture, forest conservation and resilient urban systems. Project interventions contribute to strengthening watershed functions, reducing peat-fire risks, improving urban flood management and enhancing climate-risk assessment and adaptation planning capacity across multiple sectors.

Thirteenth Malaysia Plan (13MP, 2026–2030)

The project directly supports 13MP priorities related to flood mitigation, climate adaptation, water security, biodiversity protection and resilient urban development. The project's institutional uptake and scaling approach also supports integration of adaptation measures into state and national planning systems.

Water Sector Transformation 2040 (WST 2040)

The project contributes to Water Sector Transformation 2040 by strengthening resilience of watersheds and water-related ecosystems against floods, droughts and hydrological instability. Interventions in the Ulu Muda watershed support long-term water security, watershed stabilization and climate-resilient water-resource management.

National Policy on Biological Diversity 2022–2030 (NPBD 2030)

The project contributes to implementation of the National Policy on Biological Diversity 2022–2030 through protection and enhancement of ecosystem functions, use of native species, strengthened ecological monitoring and improved integration of biodiversity considerations into climate adaptation planning. Interventions in peatland, watershed and urban landscapes support ecosystem resilience while generating adaptation benefits linked to water regulation, flood management and climate-risk reduction.

National Food Security Policy 2030 (NFSP 2030)

The project contributes to National Food Security Policy 2030 by strengthening ecological resilience and reducing climate risks affecting agricultural systems and water security within the MADA landscape. In particular, the project contributes to:

- **Goal 6:** strengthening resilience outcomes for climate-vulnerable and resource-constrained communities; and

- **Goal 12:** strengthening ecological resilience of agrofood systems through watershed stabilization, flood mitigation and climate-resilient water management.

National Gender Policy and Inclusive Development Alignment

The project aligns with Malaysia's National Women's Policy (DWN 2025–2030), the inclusivity objectives of the Thirteenth Malaysia Plan and broader national commitments on gender equality and social inclusion. Gender-responsive measures are integrated across project implementation through targeted participation in stewardship activities, technical training, community monitoring, livelihood opportunities, leadership structures and project decision-making processes. The project also incorporates sex-disaggregated monitoring, gender-responsive budgeting and safeguards measures to promote equitable adaptation outcomes.

Alignment with Sub-National and Institutional Frameworks

The project supports long-term ownership and sustainability by aligning interventions with the mandates, planning priorities and operational responsibilities of key state, municipal and sectoral institutions in Selangor and Kedah.

Selangor State Alignment

Project interventions in the Kuala Langat peat landscape under Output 2.1 support the Selangor State Structure Plan 2035 (RSN Selangor 2035), the First Selangor Plan 2021–2025 (FSP 2025) and the Selangor Smart Action Plan 2025. The project contributes to state priorities related to peatland management, fire-risk reduction, biodiversity conservation, climate adaptation and promotion of NbS. It also supports improved climate-risk assessment, community participation and long-term management of peatland ecosystems.

Kedah State and Municipal Alignment

The project supports priorities in the Greater Kedah 2050 Blueprint and Kedah Development Plan 2035 on water security, agricultural sustainability, climate resilience, disaster-risk reduction and natural-resource management. Interventions in Ulu Muda and Kubang Pasu contribute to improved watershed condition, flood management, climate adaptation and protection of water resources that are critical for downstream communities and agricultural production.

The project strengthens upstream watershed resilience in the Ulu Muda catchment under Output 2.2 while supporting urban and peri-urban NbS implementation in Kubang Pasu under Output 2.3. Component 1 supports climate-risk intelligence, forest-climate vulnerability analysis and operational planning tools relevant to forestry, watershed management and municipal adaptation planning. Components 2 and 3 support implementation, stewardship and adaptive-management approaches linked to flood mitigation, water regulation and protection of the national rice bowl.

The project also supports institutional strengthening within MPKP through urban NbS planning, community stewardship approaches and adaptive maintenance systems linked to retention ponds, drainage corridors and climate-resilient green infrastructure.

Sectoral Alignment with Muda Agricultural Development Authority (MADA)

Project interventions in the Ulu Muda watershed complement MADA's mandate on irrigation management, agricultural productivity and national food security. While MADA's primary focus is downstream irrigation infrastructure and agricultural water management, the project strengthens upstream ecological functions that support long-term water regulation, sediment control and climate resilience within the Muda River Basin. By integrating watershed management, enrichment planting and erosion-control measures, climate-risk monitoring and adaptive-management approaches, the project supports more climate-resilient water supply conditions for downstream agricultural systems. Community-based adaptation activities under Output 3.1 further

strengthen resilience and preparedness among downstream farming communities affected by rainfall variability, flooding and water-related climate risks.

E. Alignment with National technical standards

The project is designed to comply with all relevant Malaysian legal requirements, technical codes, and environmental standards. In accordance with AF ESP Principle 1 (Compliance with the Law), the project will be implemented in partnership with the Government of Malaysia, utilizing existing country safeguard systems and institutional arrangements.

Key legislation includes regulations pertaining to Environmental Impact Assessment (EIA), land tenure (National Land Code), forestry, and occupational health and safety (OHS). The following table demonstrates the project's logical alignment with these standards. Detailed technical designs, site-specific screening requirements, permits and approvals will be confirmed during project inception and prior to implementation of relevant activities. Compliance requirements identified through environmental and social screening will be incorporated into project planning, procurement, contractor management and implementation arrangements.

Table: National Technical Standards and Alignment with AF ESP Principle 1

Technical Standard / Regulation	Scope / Relevance	Related Outcome/ Output	Compliance Status and Steps to Comply	Authority
Environmental Quality Act 1974 (EIA Order 2015)	Mandates environmental assessment requirements for activities affecting environmentally sensitive areas.	Outcome 2 (Outputs 2.1 and 2.2: peatland hydrological management and watershed management interventions).	Procedural Step: Official screening submission to Department of Environment (DOE) during project inception. If triggered, a Schedule 1 or 2 EIA will be undertaken by registered expert in the first 6 months of the project and approved by DOE prior to implementation. For Output 2,3, no statutory EIA screening requirement is anticipated, as it involves small-scale enhancements to existing retention ponds. Site-level design will still undergo SES screening, with good-practice construction and environmental management measures applied.	Department of Environment (DOE)
National Land Code 1965	Regulates land ownership, land use and registration in Peninsular Malaysia and Labuan.	Outcome 2 and Outcome 3 (Outputs 2.1, 2.2 and 2.3).	Procedural Step: Site screening and detailed design review to avoid land acquisition, involuntary resettlement, restrictions on access and other land-related impacts. Temporary access routes, lay-down areas and construction activities under Outputs 2.1, 2.2 and 2.3 will be managed to minimize short-term disturbance through strict site zoning, traffic management and environmental controls.	Department of the Director General of Land & Mines (JKPTG)
State Forestry Laws of Kedah and Selangor	Govern gazettement and classification of forest reserves, forest management planning, licensing and permitted activities.	Outcome 2 (Outputs 2.1 and 2.2: peatland hydrological management, enrichment planting, assisted natural regeneration and watershed management).	Screening and compliance with applicable approvals, permits and forest-management requirements for project interventions within forest reserve areas.	State Forestry Departments
National Water Quality Standards (NWQS)	Defines parameters for raw-water quality and aquatic ecosystem protection.	Outcome 2 (Output 2.2: watershed and sediment-management interventions)	Baseline water-quality assessments and monitoring integrated into project design and implementation. Monitoring will support alignment with applicable NWQS standards.	NRES

Urban Stormwater Management Manual (MSMA) 2nd/3rd Edition	Technical standards for urban stormwater management and nature-based drainage design.	Outcome 2 (Output 2.3: retention-pond enhancement and associated NbS measures).	Required: Urban interventions will be designed in accordance with relevant MSMA standards and applicable flood-management requirements. Retention-pond enhancement and associated NbS measures will be designed to a 1-in-50-year ARI in line with MSMA 2nd Edition design acceptance criteria for major urban drainage and detention systems, unless a higher standard is specified by the relevant authority. The MSMA 3rd Edition remains in draft pending formal gazettment JPS; upon adoption, Output 2.3 designs will be reviewed and updated to comply with any revised standards.	Department of Irrigation and Drainage (DID/JPS)
PLANMalaysia Green Infrastructure Guidelines	National guidance for green infrastructure and NbS integration within urban planning.	Outcome 1 and Outcome 2 (Outputs 1.3 and 2.3).	Alignment with national planning guidance for urban NbS implementation, retention-pond enhancement and climate-resilient urban design.	PLANMalaysia
Occupational Safety and Health Act (OSHA) 1994	Ensures safety, health and welfare of workers.	Outcome 3 and all field-based activities.	Required: Contractors and partners will comply with applicable OSHA requirements, including site-specific safety procedures and risk-management measures. Community health and safety risks associated with field-based activities, including construction works, planting operations and community monitoring activities, will be managed in accordance with OSHA 1994 requirements.	Department of Occupational Safety and Health (DOSH)
National and State forestry guidelines/ rules/schedules on enrichment planting and forest rehabilitation	Technical guidance on enrichment planting, assisted natural regeneration and rehabilitation practices.	Outcome 2 (Output 2.2: enrichment planting, assisted natural regeneration and watershed management interventions).	Required: Species selection, planting approaches and site management will comply with relevant technical guidance and approvals from forestry authorities.	JPSM, State Forestry Departments, FRIM
Plant Quarantine Act 1976 and Malaysian Quarantine and Inspection Services Act 2011	Regulates movement and biosecurity of planting materials, seedlings and nursery stock.	Outcome 2 and Output 3.1 (community nurseries and planting activities).	Required: Nursery operations and planting activities will prioritize native species and comply with applicable phytosanitary and biosecurity requirements.	State Forestry and Agriculture Departments, Malaysian Quarantine and Inspection Services
Fire Services Act 1988	Fire prevention, emergency preparedness and public safety.	Output 2.1: peatland hydrological management and fire-risk reduction measures.	Required: Fire-risk mitigation measures will be integrated into peatland interventions and relevant emergency-response coordination mechanisms.	Fire and Rescue Department Malaysia
Child Act 2001	Provides protection and welfare provisions for children.	Outcomes 2 and 3 (Outputs 2.3, 3.1 and awareness-related activities).	Required: Child-safety will be incorporated into public-facing infrastructure, awareness activities and community engagement processes where relevant. Where Eco-Warden, citizen-science or school-based awareness activities involve participants under 18, additional safeguarding measures will apply, including parental or guardian consent, adult supervision requirements, child-appropriate	Department of Social Welfare (JKM)

			activity design and prohibition of hazardous field tasks, in compliance with the Child Act 2001.	
Persons with Disabilities Act 2008	Safeguards rights and welfare of persons with disabilities.	All Outcomes (All Outputs).	Required: Project activities, consultations, training and public-facing interventions will promote accessibility and inclusive participation for persons with disabilities where feasible and appropriate.	Department of Social Welfare (JKM)

F. Other relevant projects/programmes

The project has been designed to complement, rather than duplicate, ongoing investments in climate adaptation, watershed management, peatland restoration, flood management and climate-resilience planning in Malaysia. It builds on existing government programmes, applied research initiatives and development-partner investments while addressing key gaps related to climate-risk intelligence, operational adaptation planning, NbS implementation, long-term stewardship systems and adaptive management. Emphasis is placed on translating research, pilot initiatives and policy frameworks into operational models that can be integrated into routine planning, management and maintenance systems.

Table: Other relevant projects in Malaysia

Project Title, Timeline, Location, Budget	Main Interventions & Target Population	Implementing Entity	Lessons Learned	Overlaps and Synergies with the Project
FRIM R&D and Pilot Projects Ongoing; National; Government core funding	Applied research and technical pilots related to forest-climate intelligence, peatland hydrology, NbS and climate-resilient water management, including AquaVault systems. Target users include forestry agencies and technical institutions.	FRIM	Pilot-scale technologies require operational validation, institutional uptake and integration into wider planning and adaptive-management systems to support long-term scaling.	Operationalizes and scales FRIM's research and pilot systems through integration with climate-risk intelligence, watershed management, peatland restoration and adaptive-management systems under Components 1–3. AquaVault implementation under Output 2.1 builds directly on FRIM technical innovation and field-testing experience.
Global Environment Centre (GEC) Peatland Restoration Ongoing; Selangor/Pahang; Donor-funded	Community-based peatland restoration, canal blocking, fire prevention and Eco-Warden stewardship systems targeting peatland buffer-zone communities.	GEC	Passive rewetting and community fire-prevention systems provide important restoration benefits, but prolonged drought conditions require strengthened hydrological management and monitoring.	The project builds on existing peatland stewardship and Eco-Warden systems by integrating active hydrological management and adaptive-management approaches under Output 2.1.
MADA Irrigation and Climate Works Ongoing; Kedah; State/local funding	Irrigation infrastructure, flood-control systems and agricultural water management supporting approximately paddy farmers within the Muda irrigation scheme.	MADA	Long-term agricultural resilience increasingly depends on upstream watershed stability, sediment control and climate-resilient water regulation.	Complements MADA's downstream irrigation mandate through upstream watershed restoration, erosion reduction and adaptive-management systems in Ulu Muda under Output 2.2. Community-based adaptation activities under Output 3.1 further strengthen downstream resilience and preparedness.

DID Urban Stormwater Management Ongoing; National; National funding	Urban drainage systems, retention ponds, stormwater infrastructure and flood-risk management for urban populations.	Department of Irrigation and Drainage (DID)	Conventional drainage systems perform more effectively when integrated with NbS approaches that improve ecological buffering and runoff retention.	Complements existing urban drainage infrastructure by integrating NbS approaches, adaptive-maintenance systems and climate-resilient retention pond upgrading under Output 2.3.
AF Penang Island Urban NbS Project / MASH Framework 2022–2027; Penang; USD 10M (AF)	Urban greening, sustainable drainage systems, river restoration and application of the MASH framework for integrated urban NbS management. Target population includes residents of George Town and municipal agencies.	UN-Habitat / Think City	Urban NbS systems require strong municipal ownership, long-term maintenance planning and community stewardship to remain functional after implementation.	Builds on the AF Penang urban NbS programme and adopts the MASH framework in Output 2.3, including adaptive-management systems, municipal coordination, monitoring approaches, community stewardship models and maintenance protocols.
UNDP Climate Promise and CFIL/Climate Finance Network 2025–2026+; National; USD 1.25M	Climate policy support, climate finance mechanisms and resilience financing models targeting government agencies and financial institutions.	UNDP	Climate finance operationalization requires validated field models and measurable resilience outcomes.	Provides field-tested NbS, watershed and climate-risk management models that can support broader climate-finance operationalization and investment planning.
UNDP/Ministry of Agriculture Hill Paddy Resilience 2025–2028; Sabah; USD 750k	Climate-resilient agricultural practices and livelihood resilience support for hill paddy farmers in Sabah.	UNDP / Ministry of Agriculture	Agricultural adaptation approaches must reflect local ecological and socio-economic conditions, including traditional knowledge systems.	Complements ongoing agricultural adaptation initiatives through watershed resilience, climate-risk management and community-based adaptation approaches in a different geographic and agricultural context.
Japan International Cooperation Agency (JICA) Flood Management Multi-year; National	Large-scale flood-control and grey infrastructure investments in major river basins.	Japan International Cooperation Agency (JICA)	Grey infrastructure performs more effectively when supported by upstream ecosystem buffering and sediment reduction.	Complements downstream flood infrastructure through upstream watershed restoration, erosion reduction and NbS buffering under Outputs 2.2 and 2.3.
World Bank Analytical Work Ongoing; National	Climate resilience analytics, policy support and infrastructure financing.	World Bank	Pilot NbS models require operational validation before integration into large-scale financing mechanisms.	Provides field-tested NbS and watershed resilience models that may inform future scale-up and investment planning.
World Bank: Sustainable Forest Management 2023–2028; National; ~USD 100M loan	Institutional strengthening for forestry management, reducing deforestation and improving forest-carbon management.	World Bank / JPSM	Forest conservation outcomes are strengthened when linked to community stewardship and livelihood resilience mechanisms.	Complements broader forestry institutional reforms through community stewardship, adaptive-management systems and livelihood-support approaches under Component 3.
UNDP-Sida Gender-Responsive Climate Action 2021–2024; National	Development of gender-responsive climate-policy frameworks and GESI integration approaches.	UNDP / NRES	Gender-responsive climate frameworks require operational community-level implementation models to translate policy into practice.	Operationalizes gender-responsive adaptation through stewardship, livelihood and governance systems under Component 3, including women-led NbS participation and gender-responsive monitoring approaches.

Green Climate Fund (GCF) FP181: NbS for Climate-Resilient Landscapes and Communities 2023–2030; Kelantan; USD 30.2M	Integrated watershed management and climate resilience interventions targeting rural smallholders.	Ministry of Natural Resources / GCF	Integrated landscape approaches require strong coordination between forestry, agriculture and local governance systems.	Complements broader national NbS and watershed resilience initiatives through climate-risk intelligence, adaptive-management systems and operational lessons relevant to wider scaling.
ASEAN NbS Scaling Initiative 2023–2028; Regional	Regional NbS policy, financing and technical standards development across ASEAN member states.	ADB / ASEAN	Scaling NbS requires standardized evidence, monitoring systems and implementation models.	Contributes practical field evidence, climate-risk analytics and implementation lessons relevant to regional NbS scaling and knowledge-sharing efforts.
Jeniang Water Transfer Scheme Phase 1 completed in 2022; Phase 2: 2026–2030; Kedah; MYR 492 million	Water-transfer and irrigation infrastructure supporting approximately 36,467 ha of agricultural land and 18,000 farmers in the southern MADA region.	Ministry of Agriculture and Food Security	Long-term effectiveness of water-transfer infrastructure depends on reliable upstream water availability and watershed stability.	The proposed project complements downstream water-transfer infrastructure through upstream watershed restoration, erosion reduction and hydrological resilience measures in Ulu Muda.
Global Environment Facility (GEF): Sustainable Management of Peatland Ecosystems in Malaysia (SMPEM) 2020-2026; USD10.3 million.	Peatland ecosystem rehabilitation, fire prevention, hydrological management and community engagement in peatland landscapes in North Selangor, South Selangor (including KLSFR), Southeast Pahang, Maludam Peninsula (Sarawak), Klias Peninsula (Sabah).	International Fund for Agricultural Development / NRES & GEC	Integrated peatland restoration requires sustained hydrological management, institutional coordination and long-term monitoring systems.	Complements ongoing peatland rehabilitation activities and implementation of the Integrated Management Plan for KLSFR through integration of climate intelligence, active hydrological management, AquaVault systems and adaptive-management approaches.
World Wide Fund for Nature (WWF): Strengthening the resilience of Malaysia's Ulu Muda Forest Complex (part of SIG-WWF's; Forests Forward Program) 2024-2028; Ulu Muda Forest Complex; Funding amount not disclosed.	Enhancement of forest governance and improvement of forest management, covering 170,000ha through advocacy for improved forest protection status, pilot restoration of 25 hectares, recommendations to ensure the connectivity and intactness of the forest and engagement with local people to help reduce poaching activities and incidences of human-wildlife conflict.	WWF Malaysia	Investment in Ulu Muda Forest Complex can help improve climate resilience and the management of forests, enhance water and food security, and strengthen community empowerment initiatives,	Potential synergies may exist related to watershed management, biodiversity conservation and community engagement in Ulu Muda.

Together, these initiatives provide a strong foundation. The project adds value by linking climate-risk information, watershed and peatland management, urban NbS interventions and community stewardship approaches within a single adaptation framework. It therefore fills an important gap between research, policy development and practical implementation, while strengthening institutional capacity to sustain and replicate successful approaches beyond the project landscapes.

G. Learning and knowledge management

The project incorporates a structured learning and knowledge-management approach to capture, apply and disseminate experience generated through implementation. Learning activities are designed to support continuous improvement of project interventions, strengthen institutional capacity and facilitate replication of successful approaches in other climate-vulnerable landscapes.

Particular emphasis will be placed on generating practical lessons from implementation of EbA and NbS in tropical peatland, watershed and urban environments. The project will document technical, institutional and operational experience related to peatland hydrological management, watershed resilience, erosion and sediment management, retention-pond enhancement, community stewardship approaches and climate-informed planning. Lessons generated through implementation will be used to strengthen decision-making, support future investments and inform adaptation planning at national, state and local levels.

Knowledge Generation and Technical Learning

Knowledge generation will be supported through implementation of Components 1 and 2. Climate-risk assessments, vulnerability analyses, monitoring systems and field-based interventions will provide information on climate hazards, ecosystem conditions, hydrological processes and adaptation performance across the project landscapes. Experience from peatland hydrological management, enrichment planting, assisted natural regeneration, erosion-control measures, sediment-management interventions and retention-pond enhancement will be systematically documented throughout implementation.

The project will develop technical reports, case studies, operational guidance notes and learning products that capture implementation experience and lessons related to planning, design, monitoring, maintenance and long-term management of adaptation interventions. Particular attention will be given to identifying enabling conditions for successful implementation, operational challenges, maintenance requirements, institutional coordination needs and factors influencing long-term sustainability. Output 1.3 will support translation of technical experience into practical guidance, decision-support resources and implementation frameworks that can inform future adaptation planning, investment prioritization and replication in other locations.

Community-Based Learning and Applied Knowledge

Component 3 supports generation of practical knowledge through community participation, stewardship activities and local monitoring initiatives. Eco-Warden and citizen-science programmes will contribute field observations and operational experience that complement technical monitoring and help strengthen long-term management of project interventions. Community nurseries and stewardship activities will provide lessons on participation models, maintenance arrangements, volunteer engagement and locally appropriate approaches for sustaining adaptation investments.

Training activities implemented under Outputs 3.1 and 3.2 will generate experience related to capacity development, adaptation awareness, stewardship approaches and institutional uptake of climate adaptation measures. Lessons from these activities will be incorporated into training materials, guidance documents and outreach resources to support replication and scaling.

Dissemination, Learning and Knowledge Sharing

Knowledge dissemination and awareness activities will be implemented primarily through Output 3.3. A project knowledge portal will provide access to selected climate-risk information, technical guidance, case studies, monitoring results and lessons generated through implementation. The

portal will serve as a platform for sharing practical experience related to peatland management, watershed resilience, urban NbS implementation and community-based adaptation approaches.

The project will also organize technical exchanges, learning workshops, dissemination events and stakeholder dialogues involving government agencies, municipalities, researchers, practitioners, civil-society organizations and community representatives. These activities will facilitate exchange of experience among project sites and support wider application of successful approaches.

Where appropriate, project lessons and technical outputs will be disseminated through national adaptation platforms, professional networks, conferences, research publications and UNDP and AF knowledge-sharing mechanisms. Selected project sites may also serve as demonstration locations supporting peer learning and applied training.

Knowledge Sustainability and Institutional Uptake

The project emphasizes practical application and institutional uptake of lessons rather than establishment of a stand-alone knowledge-management system. Knowledge products, operational guidance, training materials and technical resources developed through the project are intended to support continued use of project approaches by relevant agencies, municipalities and local stakeholders following project completion.

Responsibility for knowledge-management coordination will rest with the Project Management Unit (PMU), working closely with FRIM, UNDP and relevant technical partners. Outputs 1.3 and 3.3 provide the primary mechanisms for documenting implementation experience, translating lessons into practical guidance and supporting dissemination, learning and replication.

H. Stakeholders consultations and engagement

A gender-responsive and inclusive stakeholder consultation process has been undertaken during preparation of the full proposal, led by the FRIM in collaboration with UNDP and supported by gender, safeguards and stakeholder-engagement specialists. Consultations have involved national and sub-national government agencies, technical institutions, municipalities, civil-society organizations, local communities, women and representatives of vulnerable groups, consistent with the Adaptation Fund Environmental and Social Policy and Gender Policy.

The consultation process combined technical consultations, institutional coordination meetings, site visits, field verification missions, focus-group discussions and community engagement sessions in Selangor and Kedah. These consultations helped validate climate risks, adaptation priorities, implementation approaches, beneficiary groups, institutional arrangements and opportunities for strengthening local participation and long-term sustainability.

Consultations informed refinement of project interventions under Components 1–3, including peatland hydrological management, watershed resilience measures, retention-pond enhancement, stewardship approaches, capacity-development activities and proposed monitoring arrangements. Discussions also explored climate vulnerabilities, ecosystem pressures, livelihood implications, implementation feasibility, governance arrangements, institutional coordination needs and opportunities for strengthening adaptation benefits for vulnerable groups.

Stakeholder inputs were incorporated in project design, GESI Assessment and Action Plan, SEP, and environmental and social safeguards instruments, including the Social and Environmental Screening Procedure (SESP) and ESMF. Consultation findings contributed to the design of community stewardship mechanisms, capacity-development activities, monitoring approaches, grievance mechanisms and safeguards measures.

Recognizing that some site-specific interventions and implementation arrangements will be refined during project inception, stakeholder engagement will be an ongoing process throughout implementation. Field officers and safeguards and gender expertise will be engaged across project components to ensure adequate resources are available to engage appropriately with communities. Additional consultations will be undertaken, where required, to validate detailed intervention designs, strengthen local ownership, support adaptive implementation and ensure continued compliance with environmental, social and gender-related commitments.

Table: Summary of stakeholder consultations

Project Area / Output	Main Stakeholders Consulted	Consultation Status	Key Issues Discussed	Key Design Adjustments as a result of stakeholder consultations
Component 1 – Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning	FRIM, NRES, JPSM, State Forestry Departments, DID/JPS, NAHRIM, METMalaysia, MYSA, PLANMalaysia and relevant agencies	Initial national technical consultations completed	Data-sharing, institutional coordination, climate-risk intelligence systems, operational roles and integration with planning systems	Agencies expressed openness to collaboration but requested clearer definition of roles, commitments and data requirements to ensure the interventions add value to existing systems. Component 1 outputs and institutional coordination arrangements are being refined accordingly.
Output 2.1 – Climate-Resilient Peatland Rewetting, Fire Resilience and Monitoring Systems Operationalized	Selangor State Forestry Department, GEC, JAKOA, Kampung Sungai Kelambu representatives, FRIM and technical partners	Technical consultations and preliminary local engagement undertaken; free, prior and informed consent (FPIC)-sensitive and broader community consultations remain ongoing	Peat fire risks, hydrological degradation, Orang Asli engagement procedures, peatland restoration approaches, site selection and governance arrangements	Consultations with GEC, Selangor State Forestry Department and Department of Orang Asli Development (JAKOA) resulted in a change from the earlier Raja Musa project site toward KLSFR, as Kuala Langat North Forest Reserve was already undergoing more established rewetting and restoration efforts while KLSFR showed more immediate degradation, hydrological instability and recurrent fire risks. Following the site change, the project focus also shifted away from domestic water-supply objectives no longer relevant at the new site, toward peatland hydrological management, rewetting support and fire-risk reduction. Extensive assessments and stakeholder consultations have confirmed that there are no Orang Asli customary claims, livelihood dependencies, or cultural associations within the new intervention areas.
Output 2.2 – Climate-Adaptive Watershed Management through Nature-based Solutions implemented in the Ulu Muda Watershed	FRIM, Kedah State Forestry Department, MADA, WWF	Primarily technical and institutional consultations completed; community-level consultations remain limited	Watershed stabilization, erosion control, restoration feasibility, hydrological resilience, restoration logistics and workforce arrangements	Consultations with MADA, Kedah State Forestry Department and WWF helped confirm the relevance of strengthening upstream watershed restoration and erosion-control functions linked to downstream water security and resilience. Discussions also highlighted operational and logistical challenges related to restoration implementation in remote forest conditions, including access, workforce arrangements and long-term maintenance considerations. Inputs from WWF and forestry stakeholders suggested that a hybrid contractor- and community-supported implementation approach may be more realistic than large-scale community workforce deployment. Assessments and stakeholder consultations have confirmed no

				customary land claims, livelihood dependencies or distinct cultural associations between Orang Asli communities and the intervention areas (note no Orang Asli villages exist within Ulu Muda).
Output 2.3 – Urban and Peri-Urban Nature-based Solutions for Flood and Heat Resilience Implemented	MPKP, local communities, KEMAS, Kedah State Economic Planning Unit, community representatives.	Community and municipal consultations substantially completed for the current Kedah intervention sites	Retention pond upgrading, maintenance responsibilities, urban flooding, nursery activities, community safety, stewardship and women-focused livelihoods	Consultations strengthened focus on adaptive maintenance approaches, low-maintenance native planting systems, women-prioritized nursery activities and community stewardship models linked to retention pond upgrading. Municipal support for the project was confirmed. Operation and maintenance protocols will be agreed in year 1 including responsibilities for key stakeholders.
Output 2.3 Concept note Kuala Lumpur and Petaling Jaya urban pilot NbS sites	Kuala Lumpur City Hall (DBKL), C40 Cities, Selangor Climate Adaptation Centre, Selangor State Economic Planning Unit	Preliminary consultations completed during earlier design stages	Urban resilience concepts, flood-risk reduction, NbS opportunities and GESI integration approaches	The proposed Kuala Lumpur and Petaling Jaya interventions have been removed following technical, feasibility and stakeholder discussions. In Petaling Jaya, consultations indicated that a separate hard-engineering intervention had already been initiated at the proposed site, reducing the relevance and additionality of the proposed NbS intervention. In Kuala Lumpur, community consultations indicated stronger local preference for conventional hard-engineering flood solutions rather than NbS-focused approaches. The project therefore shifted toward testing a more scalable replication approach in Kedah through alternative urban/peri-urban sites better aligned with project objectives and local implementation conditions.

I. Justification and Adaptation reasoning

The project is a full-cost adaptation investment designed to address increasing climate-related risks affecting Malaysia's peatland, watershed and urban systems, water resources and climate-vulnerable communities. The project responds to growing climate pressures including prolonged dry periods, peatland fire risk and carbon release, erosion and sedimentation, water-security challenges, flooding, urban heat stress and increasing pressure on water-management systems.

The justification for AF support is based on the need to move beyond fragmented, reactive and sector-specific approaches towards more integrated, climate-informed adaptation systems. While Malaysia has established important systems for water management, forestry, disaster-risk management and environmental protection, existing financing mechanisms primarily support routine operations, infrastructure maintenance, conventional firefighting, drainage management and sector-specific interventions. They provide limited support for integrated climate-risk assessment, EbA, long-term stewardship mechanisms and the incremental costs associated with implementing adaptation measures across interconnected landscapes.

Baseline scenario: limitations of current systems

Under the baseline scenario, climate adaptation efforts remain fragmented across agencies, sectors and landscapes.

In peatland areas, management remains heavily focused on reactive fire monitoring and suppression once high-risk conditions emerge. Existing systems have limited capacity for integrated hydrological management, preventive water-retention measures, climate-informed peatland management and community-linked monitoring approaches that address the underlying

drivers of peat-fire vulnerability. Moreover, there is limited adapted peatland firefighting capacity and peatland defence against fire. Specifically, findings highlight inadequacies in fire management, gaps in prevention and suppression strategies, and notable firefighter safety concerns. Furthermore, perspectives from management and frontline responders reveal operational challenges and key areas for improvement in terms of capacities.

The Ulu Muda watershed supplies 80% of Kedah's, 70% of Perlis's, and up to 80% of Penang's raw water; erosion, sedimentation and hydrological pressures continue to affect its functions, reservoir performance, irrigation systems and downstream water users. Existing investments primarily focus on water infrastructure, routine maintenance and downstream system management, while more limited financing is available for climate-adaptive watershed management, erosion control, assisted natural regeneration, enrichment planting and other upstream measures that strengthen long-term watershed resilience. Reservoir operational models traditionally rely on a fixed, historic baseline estimate for "dead storage"—the designated area at the bottom of the dam reserved to collect sediment over its projected 50-to-100-year lifespan. Current engineering baselines do not account for the climate-driven acceleration of extreme rainfall events. High-energy downpours are washing silt into the reservoir at a rate that outpaces original designs, drastically reducing the active pool volume and shortening the operational life of the Muda Dam decades ahead of schedule.

In urban and peri-urban areas, local authorities continue to rely primarily on conventional drainage and retention systems that are increasingly stressed by changing rainfall intensity, runoff patterns and rising temperatures. current water management and drainage frameworks are highly reactive, locked into rigid concrete-engineering models, and functionally unable to keep pace with intensifying climate fluctuations. Legacy drainage systems were engineered decades ago based on historical, predictable monsoon rainfall intensity. Current systems cannot cope with the sheer volume of stormwater generated by modern, climate-driven downpours. Because the rigid concrete channels offer no natural infiltration or temporary storage, they immediately bottleneck during high-intensity storms, turning urban corridors and village roads into active floodways. Local authorities (such as the Kubang Pasu Municipal Council and DID) rely on continuous, expensive desilting and physical reconstruction of fractured concrete retaining walls and drainage channels. Existing municipal budgets generally support routine maintenance but provide limited financing for retention-pond enhancement, ecological retrofitting, biodiversity-support measures, monitoring systems and integrated NbS approaches that strengthen flood buffering and urban resilience. This "hard engineering" approach is financially unsustainable under climate acceleration. Increased runoff speeds up structural erosion, cracking concrete banks and causing frequent structural failures. Because local budgets are constrained, maintenance is frequently delayed, leaving the infrastructure compromised before the next major storm event arrives.

At the institutional level, climate-risk information, hydrological monitoring, ecosystem data and adaptation planning systems remain dispersed across agencies and are not consistently translated into practical decision-support tools for planning, implementation and maintenance. Community participation in climate adaptation also remains relatively limited under existing financing models. Existing programmes often support consultation and short-term engagement activities but provide more limited support for long-term stewardship systems, Eco-Warden and citizen-science programmes, community nurseries, technical training and sustained monitoring and maintenance arrangements.

Adaptation Fund Additionality

The AF investment provides additionality by financing adaptation measures that fall outside the scope of existing sectoral financing mechanisms and operational mandates.

Component 1: Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning

Existing government systems provide important climate, hydrological and ecosystem-monitoring functions. However, current systems are not fully configured to support integrated climate-risk analysis, climate-informed planning or practical decision-support for adaptation planning and implementation.

The AF investment supports development of the ICFIS, the Forest-Climate Vulnerability Atlas, institutional uptake mechanisms, operational planning protocols and associated guidance and monitoring systems. These investments strengthen the ability of agencies and local authorities to assess climate risks, prioritize interventions and support climate-informed planning and management across peatland, watershed and urban landscapes.

Component 2: Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience

Current financing mechanisms primarily support conventional infrastructure maintenance, drainage management, firefighting and sector-specific ecosystem management activities. They provide limited support for integrated adaptation approaches that combine climate-risk information, hydrological management, watershed resilience measures, retention-pond enhancement and monitoring systems.

The AF investment supports the incremental costs of adaptation measures that are not routinely financed through existing sectoral budgets. These include peatland hydrological management and water-retention measures; climate-adaptive watershed management, erosion-control and sediment-management interventions; community nurseries supporting native planting material production; urban retention-pond enhancement and associated NbS interventions; monitoring systems; and integration of climate-risk information into planning, implementation and maintenance. The project complements existing infrastructure and management systems by addressing underlying drivers of climate vulnerability and strengthening the resilience of natural systems that support water security and flood management.

Component 3: Institutionalizing Capacity, Stewardship and Sustainable NbS Management

Existing programmes provide limited financing for long-term stewardship systems, operational adaptation training, community-based monitoring systems and institutional uptake of EbA and NbS approaches. The AF investment supports stewardship mechanisms, Eco-Warden and citizen-science programmes, community nurseries, technical training, institutional capacity development and knowledge-sharing systems that strengthen long-term sustainability, monitoring and maintenance of project investments.

These investments help strengthen institutional uptake, stewardship capacity, operational management functions and the long-term sustainability of the project's adaptation interventions.

Component / Output	Baseline Situation (BAU)	With-Project Scenario (AF Additionality)	Financing Gap and Adaptation Logic
Component 1: Climate-risk intelligence and decision-support systems (Outputs 1.1–1.3)	Climate, hydrological and ecosystem data systems remain fragmented across agencies and are not consistently linked to adaptation planning, prioritization and adaptive management.	Climate-risk intelligence, vulnerability assessments, operational guidance and decision-support tools support climate-informed planning, prioritization and implementation across selected landscapes.	Existing financing supports routine monitoring systems but provides limited support for integrated climate-risk intelligence, adaptive-management and adaptation decision-support systems.
Component 2: Peatland hydrological	Peatland management focuses primarily on reactive fire monitoring and suppression, with	Improved peatland hydrological resilience through modular water-retention systems, monitoring,	Existing financing does not adequately support integrated peatland adaptation systems

resilience (Output 2.1)	limited preventive hydrological management systems and community-linked monitoring approaches.	adaptive water management, capacity building and stewardship approaches that reduce peat-fire and strengthen ecosystem resilience.	combining hydrological management, monitoring and stewardship.
Component 2: Climate-adaptive watershed management (Output 2.2)	Erosion, sedimentation and hydrological pressures continue to affect watershed functions, reservoir performance, irrigation systems and downstream water users. Existing investments focus primarily on water infrastructure and routine maintenance, with limited financing for upstream adaptation measures.	Climate-adaptive watershed management, erosion-control and sediment-management measures, assisted natural regeneration, enrichment planting and community nurseries strengthen watershed functions to ensure it can continue to capture, filter, and slowly release rainfall, maintaining a baseline water supply for millions of municipal and industrial users during climate-induced droughts.	Existing financing primarily supports conventional water infrastructure and maintenance rather than integrated watershed adaptation measures that address underlying drivers of climate vulnerability.
Component 2: Urban NbS and retention-pond enhancement (Output 2.3)	Urban drainage and retention systems are increasingly stressed by changing rainfall intensity, runoff patterns and rising temperatures. Municipal budgets primarily support routine maintenance and conventional drainage approaches.	Retention-pond enhancement, biodiversity-support measures, native planting, urban-cooling features and associated NbS interventions improve flood buffering, stormwater management and urban resilience.	Existing financing provides limited support for ecological retrofitting, adaptive monitoring systems and integrated NbS approaches that strengthen urban climate resilience.
Component 3: Stewardship and capacity development (Outputs 3.1 and 3.2)	Community participation and technical adaptation capacity remain limited and are often project-specific or short-term. Existing programmes provide limited support for long-term stewardship, monitoring and maintenance systems.	Stewardship mechanisms, Eco-Warden and citizen-science programmes, community nurseries, technical training and adaptive-management systems established across selected landscapes.	Existing programmes provide limited financing for long-term stewardship systems, operational adaptation training and community-linked monitoring approaches needed to sustain adaptation investments.
Component 3: Knowledge management and institutional learning (Output 3.3)	Lessons from adaptation initiatives are not consistently translated into operational guidance, institutional learning processes or future adaptation investments.	Knowledge products, learning platforms, dissemination mechanisms and institutional learning systems support replication, scaling and continuous improvement of adaptation approaches.	Limited financing exists for operational knowledge-sharing, replication support and institutional learning related to EbA and NbS implementation.

The requested AF financing is therefore necessary to bridge the gap between conventional sectoral management approaches and more integrated, climate-informed adaptation systems that combine climate-risk information, EbA and NbS interventions, institutional capacity strengthening and long-term stewardship mechanisms. The project supports long-term climate resilience by strengthening ecosystem functions, water security, institutional capacity and community participation across peatland, watershed and urban landscapes, while generating lessons that can support wider replication and scaling across Malaysia.

J. Sustainability

The long-term sustainability of the project's adaptation benefits has been integrated into the design across institutional, operational, financial, social and environmental dimensions. Rather than creating parallel structures, the project is designed to strengthen existing systems, capacities and management arrangements so that climate-resilience benefits can be maintained beyond the project implementation period.

The project supports the long-term capacity of national, state and local institutions to incorporate climate-risk information, ecosystem-based approaches and monitoring systems into existing

planning, management and maintenance functions. Sustainability is supported through strengthened institutional capacity, operational guidance, monitoring systems, stewardship arrangements, technical training, knowledge-sharing and integration with existing government mandates and programmes.

Institutional sustainability

Institutional sustainability is supported primarily through Components 1 and 3. Component 1 strengthens the availability and use of climate-risk information through development of the ICFIS, the Forest-Climate Vulnerability Atlas and associated guidance and monitoring systems. These tools are intended to support continued climate-risk assessment, prioritization and planning by FRIM and relevant government agencies beyond the project lifetime.

The project also strengthens institutional sustainability by developing operational guidance, monitoring protocols and implementation frameworks that can be applied by forestry, watershed, municipal and planning agencies. Capacity-development activities, institutional coordination mechanisms and knowledge-sharing processes will help strengthen the ability of participating institutions to apply project approaches within their routine functions and responsibilities.

Knowledge products, guidance materials and dissemination activities developed under Outputs 1.3 and 3.3 will support continued access to technical information, implementation lessons and experience relevant to peatland management, watershed resilience and NbS implementation. The project's knowledge management and dissemination activities intend to support continued access to technical guidance, implementation lessons and operational experience relevant to peatland management, watershed restoration and urban NbS implementation.

Financial and operational sustainability

The project prioritizes approaches that can be incorporated into existing institutional systems, operational and maintenance practices, rather than stand-alone financing mechanisms.

For peatland and watershed interventions under Outputs 2.1 and 2.2, sustainability will be supported through strengthened coordination among forestry, watershed-management and local institutions, combined with stewardship and monitoring arrangements established through Component 3. For urban interventions in Output 2.3, through integration of NbS maintenance requirements within existing municipal maintenance systems and operational workflows, combined with stewardship and monitoring arrangements established through Component 3. Retention-pond enhancement measures are designed to complement existing drainage and stormwater-management systems, while monitoring and maintenance approaches will help improve prioritization of maintenance needs over time. Under Outputs 2.2 and 2.3, the project also supports community nurseries and local participation mechanisms that can contribute to continued maintenance, monitoring and management of project-supported interventions.

Community and technical sustainability

Component 3 strengthens sustainability through technical training, stewardship mechanisms and locally relevant capacity development linked to peatland management, watershed resilience and urban NbS maintenance. Community stewardship, Eco-Warden and citizen-science initiatives are intended to complement, rather than replace, the responsibilities of government agencies and technical institutions by supporting local monitoring, awareness and participation.

Training activities implemented under Outputs 3.1 and 3.2 will strengthen technical capacity related to monitoring, field observations, nursery management, stewardship approaches, operation and maintenance of NbS interventions, and use of climate-risk information. Guidance materials, operational manuals, training resources and knowledge products developed through the project will help retain and transfer knowledge beyond the project implementation period.

Environmental sustainability

The project supports long-term environmental sustainability through protection and enhancement of ecosystem functions across peatland, watershed and urban landscapes.

Peatland hydrological management interventions under Output 2.1 are intended to strengthen peat moisture retention, reduce fire vulnerability and improve ecosystem resilience under changing climate conditions. Climate-adaptive watershed management measures under Output 2.2, including enrichment planting, assisted natural regeneration, erosion-control and sediment-management interventions, are designed to strengthen watershed functions, improve hydrological regulation and reduce pressures on downstream water systems. Urban NbS interventions under Output 2.3 support improved stormwater management, urban cooling, biodiversity enhancement and climate-resilient green infrastructure using native and climate-resilient species where appropriate.

Exit Strategy and Post-Project Continuation

Throughout implementation, the project will work with FRIM and NRES, state agencies, municipalities and other stakeholders to strengthen operational ownership and integration of project-supported systems and approaches within existing institutional arrangements. Post-project sustainability will rely primarily on continued use of climate-risk information systems, institutional capacity, monitoring arrangements, stewardship mechanisms and operational practices established through Components 1–3.

By embedding project approaches within existing government mandates, management systems and stakeholder networks, the project aims to ensure that adaptation benefits continue beyond the period of AF support and provide a foundation for wider replication and scaling.

K. Environmental and social impacts and risks

UNDP, as accredited Implementing Entity (IE) of the AF, commits to implementing the proposed project in compliance with the AF's ESP. UNDP will do so through its own Environmental and Social Management System and application of UNDP's SES, explicitly recognized as meeting the requirements of the AF ESP. A preliminary SESP screening conducted during concept note development has now been updated at project design stage in June 2026 and will be further updated during implementation when appropriate or required.

While the project is expected to have mainly positive social and environmental impacts and to integrate social and environmental standards in its design, several risks have been identified. As per UNDP's SES policy and the AF's ESP, the principles and standards outlined in the table below are triggered. Potential adverse social and environmental risks and impacts are few, largely site-specific, limited in scale, and can be identified with a reasonable degree of certainty and addressed through application of recognized good international practice, mitigation measures, and stakeholder engagement during project implementation.

Based on the updated design-stage SESP, the overall project risk category remains Moderate as per UNDP's SES policy. The planned relevant social and environmental assessments and management measures are described in the sections below. The table below presents the relevant UNDP SES principles and project/project-level standards triggered by the proposed project, as identified during the updated SESP screening. For reference, the table also shows the equivalent AF ESP principles that are considered relevant.

Table: Environmental and Social Principles and Standards Triggered

UNDP SES Principles (P)/Standards (S)	AF ESP Principles
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P1: Human Rights/Leave No One Behind	P2: Access & Equity; P3: Marginalised & Vulnerable Groups; P4: Human Rights
P2: Gender Equality & Women's Empowerment	P5: Gender Equality & Women's Empowerment
P3: Sustainability & Resilience	P11: Climate Change
P4: Accountability	P2: Access & Equity; P4: Human Rights
S1: Biodiversity Conservation & Sustainable Natural Resource Management	P9: Protection of Natural Habitats; P10: Conservation of Biological Diversity
S2: Climate Change & Disaster Risks	P11: Climate Change
S3: Community Health & Safety	P13: Public Health
S4: Cultural Heritage	Relevant where chance finds / culturally significant landscapes may occur
S5: Displacement & Resettlement	P8: Involuntary Resettlement
S7: Labour & Working Conditions	P6: Core Labour Rights
S8: Pollution Prevention & Resource Efficiency	Cross-cutting relevance to AF ESP implementation

Environmental & Social Assessment and Risk Management

As a moderate risk project, an ESMF has been developed during the Program Formulation Grant (PFG) process. The ESMF sets out the approaches, steps and measures for the avoidance, management and mitigation of environmental and social risks identified through the updated design-stage screening and specifies additional targeted assessments to be undertaken during implementation where necessary.

The updated SESP confirms that neither a full Environmental and Social Impact Assessment (ESIA) nor a Strategic Environmental and Social Assessment (SESA) is required for a program of this nature. Targeted management plans have been prepared during the PFG process, including a GAP. A SEP, incorporating a GRM, has been developed and will be implemented throughout the project lifecycle.

Assessments and stakeholder consultations conducted during project formulation confirmed no customary land claims, livelihood dependencies or distinct cultural associations between Indigenous Peoples and the intervention areas. Therefore, although initially identified as a potential issue at Concept Note stage, UNDP SES Standard 6 (Indigenous Peoples) is not triggered and no Indigenous Peoples Planning Framework is required. This is also due to the change in location for output 2.1 and the resulting updated project beneficiaries.

In line with AF ESP Principle 1, the ESMF references and complies with the Malaysian legal and institutional framework providing relevant protections for the environment and communities. The project is implemented in partnership with the Government of Malaysia and utilises existing country safeguard systems and institutional arrangements wherever possible.

Additional Safeguards Measures

Additional measures ensure stronger integration of UNDP programming principles and compliance with best international practices. The project adopts a participatory approach involving local communities, women, youth, government agencies, academia and civil society in project consultation and design, and seeks to ensure that benefits and services are accessible to marginalised and vulnerable groups.

A comprehensive Gender Analysis has been conducted during programme design, together with preparation of a GAP to promote gender equality and women's empowerment. The GAP includes participation targets, gender-related indicators, and measures to prevent and manage GBV and Sexual Exploitation and Abuse (SEA) risks. Stakeholder mapping and analysis have been undertaken during project formulation, and the SEP provides strategic approaches for meaningful

participation and inclusion of all stakeholders, particularly marginalised individuals and groups, in project implementation and monitoring. The SEP also includes mechanisms for local communities and affected populations to raise concerns and grievances, and project stakeholders have access to UNDP's Accountability Mechanism.

Checklist of environmental and social principles

Principles	Potential impacts and risks — further assessment and management required for compliance
Compliance with the Law	Magnitude: Medium. There is a risk that small-scale physical works and site-based interventions may overlook specific technical standards, permitting requirements, or water-related regulatory provisions. Mitigation: the ESMF/Environmental and Social Management Plan (ESMP) will confirm legal and regulatory requirements and implementing partners will secure all necessary approvals before works commence. The ESMF additionally requires further screening, assessments and site-level ESMPs to manage environmental and social risks beyond Malaysian regulatory requirements.
Access and Equity	Magnitude: Medium. There is a risk of excluding non-beneficiaries or unintentionally creating inequitable access to project benefits, especially where hydrological or landscape interventions affect surrounding users. Mitigation: stakeholder mapping, social assessment, clear benefit-sharing criteria, participatory planning, and an accessible GRM.
Marginalized and Vulnerable Groups	Magnitude: Medium. There is a risk that vulnerable groups may be overlooked during planning, benefit distribution, or engagement processes. Mitigation: targeted stakeholder analysis, inclusive SEP measures, and design provisions that specifically address the needs of marginalised and vulnerable groups.
Human Rights	Magnitude: Low/Medium. There is a risk associated with limited capacities of duty bearers to meet human rights obligations and with potential adverse effects on affected communities if participation and safeguards are weak. Mitigation: capacity building on SES and socially inclusive approaches, participatory planning, FPIC where relevant, and implementation of the SEP and GRM.
Gender Equality and Women's Empowerment	Magnitude: Low/Medium. There is a risk of discrimination against women, inadequate participation in decision-making and livelihood opportunities, and project-related GBV/Protection of Sexual Exploitation and Abuse (PSEA) risks. Mitigation: implement the GAP, establish participation targets and gender indicators, and apply GBV/PSEA prevention and response measures throughout the project lifecycle.
Core Labour Rights	Magnitude: Medium. There are occupational health and safety risks for workers engaged in infrastructure installation, restoration, nursery activities, and related field operations. Mitigation: apply OHS procedures, contractor safety requirements, PPE, training, supervision, and compliance with Malaysian labour and occupational safety requirements.
Indigenous Peoples	Magnitude: Negligible. No customary land claims, livelihood dependencies or distinct cultural associations between Indigenous Peoples and the intervention areas. Mitigation: None. (No further assessment required)
Involuntary Resettlement	Magnitude: Low. No physical displacement is anticipated, but there is a risk of perceived or temporary restrictions on access to land, water, or resources. Mitigation: exclude activities involving land acquisition or physical resettlement, use participatory planning, and monitor any access-related effects closely.
Protection of Natural Habitats	Magnitude: Medium. Site-based interventions in peatlands, forests, and urban ecosystems may disturb habitats or ecosystem services if poorly designed. Mitigation: undertake ecological and hydrological assessments as needed, minimize construction footprints, avoid unnecessary vegetation clearance, and use site-appropriate safeguards.
Conservation of Biological Diversity	Magnitude: Medium. There are risks related to impacts on critical habitats, inappropriate species selection, forestry-related biodiversity impacts, and potential introduction of invasive alien species. Mitigation: use ecological screening, native and non-invasive species only, restoration guidance, and monitoring of ecological performance.
Climate Change	Magnitude: Low. There is a risk of maladaptation if interventions are not aligned with local hydrological and climate conditions. Mitigation: ensure climate-informed design, adaptive management, and integration of climate risk information into planning tools and site selection.
Pollution Prevention	Magnitude: Low/Medium. There is a risk of localized pollution, fuel or lubricant leakage, inadequate waste management, and inefficient resource use during infrastructure installation and nursery

and Resource Efficiency	operations. Mitigation: apply waste management procedures, spill prevention and response measures, proper storage and handling protocols, and site supervision.
Public Health	Magnitude: Medium. There is a risk of injury or drowning around retention ponds and a low risk of water- or vector-borne disease where water bodies are created or rehabilitated. Mitigation: fencing, warning signage, awareness measures, maintenance responsibilities, and routine monitoring.
Physical and Cultural Heritage	Magnitude: Low. There is a risk of inadvertent impacts on sites or landscapes with cultural significance during ground disturbance or site works. Mitigation: site screening, exclusion of sensitive areas where identified, and application of a Chance Finds Procedure.
Lands and Soil Conservation	Magnitude: Negligible/Low. Project activities are intended to enhance soil stability, peatland integrity, and watershed resilience. No significant adverse soil conservation risks are anticipated beyond those already covered under habitat, pollution, and construction-related safeguards. No further assessment required

PART III: IMPLEMENTATION ARRANGEMENTS

A. Project management arrangements

The project will be implemented under the National Implementation Modality with UNDP Country Office Support, with the implementation structure clearly defining the roles of the IE and the Executing Entity (EE). This supports a Whole-of-Government approach while ensuring compliance with UNDP and AF fiduciary, environmental, social, and gender requirements.

Overview:

UNDP, as the IE Entity, provides independent project assurance and agreed implementation support services under the Country Office Support to National Implementation Modality framework. FRIM, as the Executing Entity, retains overall responsibility and accountability for day-to-day project execution, management of the PMU, supervision of Responsible Parties, delivery of project outputs, financial management, and chairs the Project Board. NRES provides strategic policy oversight, and ensures alignment with national adaptation priorities, while UNDP co-chairs the Project Board in its capacity as the IE to provide implementation oversight and ensure compliance with Adaptation Fund and UNDP requirements. Together, these arrangements maintain a clear separation between implementation oversight and project execution while strengthening national implementation capacity.

Implementing Entity (IE): United Nations Development Programme (UNDP)

UNDP serves as the Multilateral IE for this project. In performing this role, UNDP undertakes distinct governance, assurance and implementation support functions that are operationally separated through clearly defined roles, responsibilities and decision-making arrangements to maintain independence and avoid conflicts of interest:

- **Programme Assurance (IE Function):** UNDP is responsible for oversight of monitoring and evaluation (M&E), safeguards compliance, and reporting to the AF Board. A designated UNDP representative will perform the Project Assurance function, attend Project Board meetings as and when necessary, and provide independent oversight of project performance, risk management, safeguards compliance, fiduciary management and reporting in

accordance with AF and UNDP requirements.

- **Programme Support Services (Country Office Services):** Based upon a formal written request by the Government of Malaysia and the EE (FRIM) included as annex, UNDP Malaysia Country Office may provide specific, cost-reimbursable support services to augment FRIM's implementation capacity. Under the National Implementation Modality Support Services framework, this may include support related to procurement, recruitment of technical experts, selected financial and administrative transactions, capacity sharing and other relevant activities. These services are provided on an exceptional basis to ensure efficiency and costs recovery are covered under the Project Execution Cost, not the IE fee.

Separately, the UNDP Resident Representative or Deputy Resident Representative, acting on behalf of UNDP in its capacity as the IE, will serve as Co-Chair and voting member of the Project Board in accordance with the approved governance arrangements.

Executing Entity (EE): The Forest Research Institute Malaysia (FRIM)

FRIM is the principal EE and technical lead for the project. FRIM holds overall responsibility for project execution, delivery of results, technical coordination, and effective use of AF resources. The Director-General of FRIM will serve as Project Director.

Strategic Guidance and Alignment with National Adaptation Policy: Ministry of Natural Resources and Environmental Sustainability (NRES)

As the parent ministry of FRIM, NRES will provide strategic leadership and policy guidance to support effective project implementation and ensure alignment with national development and climate adaptation priorities. NRES will support coordination with government stakeholders, provide strategic direction in implementation, and participate in the Technical Working Group, as appropriate, to support technical coordination and policy coherence.

Project Board

The Project Board is the highest project-level oversight and decision-making body, providing strategic guidance, reviewing implementation progress, approving annual workplans and budgets, supporting inter-agency coordination, and ensuring alignment with national climate adaptation priorities. The Project Board will also review implementation progress, key risks, safeguards and gender performance, project evaluation findings, and major project adjustments, and will provide strategic guidance to support achievement of project objectives and long-term sustainability.

The Project Board will meet biannually and will ensure coordination and alignment with national climate adaptation and sectoral coordination mechanisms, including the MyNAP process.

Project Board representation:

- **Project Executive / Chair:** Director General FRIM
- **Beneficiary Representatives:** One or more representatives of project beneficiary groups, including community-based organizations, women-led organizations, and other stakeholder groups directly benefiting from project interventions.
- **Development Partner Representative:** UNDP Malaysia Country Office, Resident Representative/Deputy Resident Representative, with voting rights as Co-Chair.

The Project Board is responsible for project oversight and strategic decision-making. Technical

coordination and advisory functions are delegated to the Technical Working Group (TWG), while project execution responsibilities remain with FRIM, the PMU, and designated Responsible Parties. Responsible Parties and entities with direct implementation responsibilities will not serve on the Project Board to maintain clear separation between project oversight and execution.

Technical Working Group (TWG)

To support effective operational coordination and technical decision-making, implementation coordination will be supported through a multi-disciplinary TWG chaired by FRIM, with regular coordination between FRIM, NRES, key stakeholders, UNDP, Responsible Parties, and relevant technical agencies. The TWG serves as a technical advisory and coordination mechanism and does not perform project oversight or approval functions. The TWG supports inter-agency coordination and technical alignment, validation of methodologies, designs and technical standards, data-sharing coordination and interoperability, integration across project components and outputs, and alignment with national climate and forestry priorities.

The TWG is expected to operate through four indicative technical workstreams covering: (i) Climate Intelligence and Data Governance (Component 1); (ii) Selangor Peatland Restoration (Output 2.1); (iii) Kedah - Ulu Muda Watershed and Kubang Pasu Urban NbS (Outputs 2.2 and 2.3); and (iv) Monitoring, Evaluation, Safeguards, GESI, Sustainability and Scaling (cross-cutting requirements). These workstreams are intended to facilitate coordination among technical agencies and responsible partners, support integration across project components, and provide technical inputs to project implementation. The detailed structure, membership, meeting arrangements and operating procedures of the TWG will be finalized during project inception.

Project Management Unit

A dedicated PMU will be established to support day-to-day project management, coordination, reporting and implementation oversight. The PMU will be hosted by FRIM as EE and will be responsible for project management, coordination of Responsible Parties, reporting, risk management, safeguards implementation, stakeholder engagement, and technical support to Project Board and TWG processes. The PMU will initially be fully funded by the project. UNDP will work closely with the PMU throughout implementation to support strategic oversight, technical quality, and effective project delivery. Over time, these functions are expected to transition progressively to the Government to strengthen national ownership and ensure long-term sustainability. The PMU will be supported by expertise in engineering, safeguards, gender and other technical areas as detailed in the project budget.

The PMU will include the following positions:

- **Project Manager:** Responsible for overall project coordination including overseeing project implementation, reporting and technical integration. The Project Manager will also oversee the financial management of the project, progress updates and activities as endorsed by the Project Board and TWG, and as outlined in the project document.
- **Finance, Procurement and Administrative Officer:** Responsible for financial management, procurement coordination, budgeting, accounting and administrative compliance in accordance with AF, UNDP and national procedures.
- **Monitoring, Evaluation and Knowledge Management Specialist:** Responsible for monitoring implementation progress against the Strategic Results Framework, AF Results

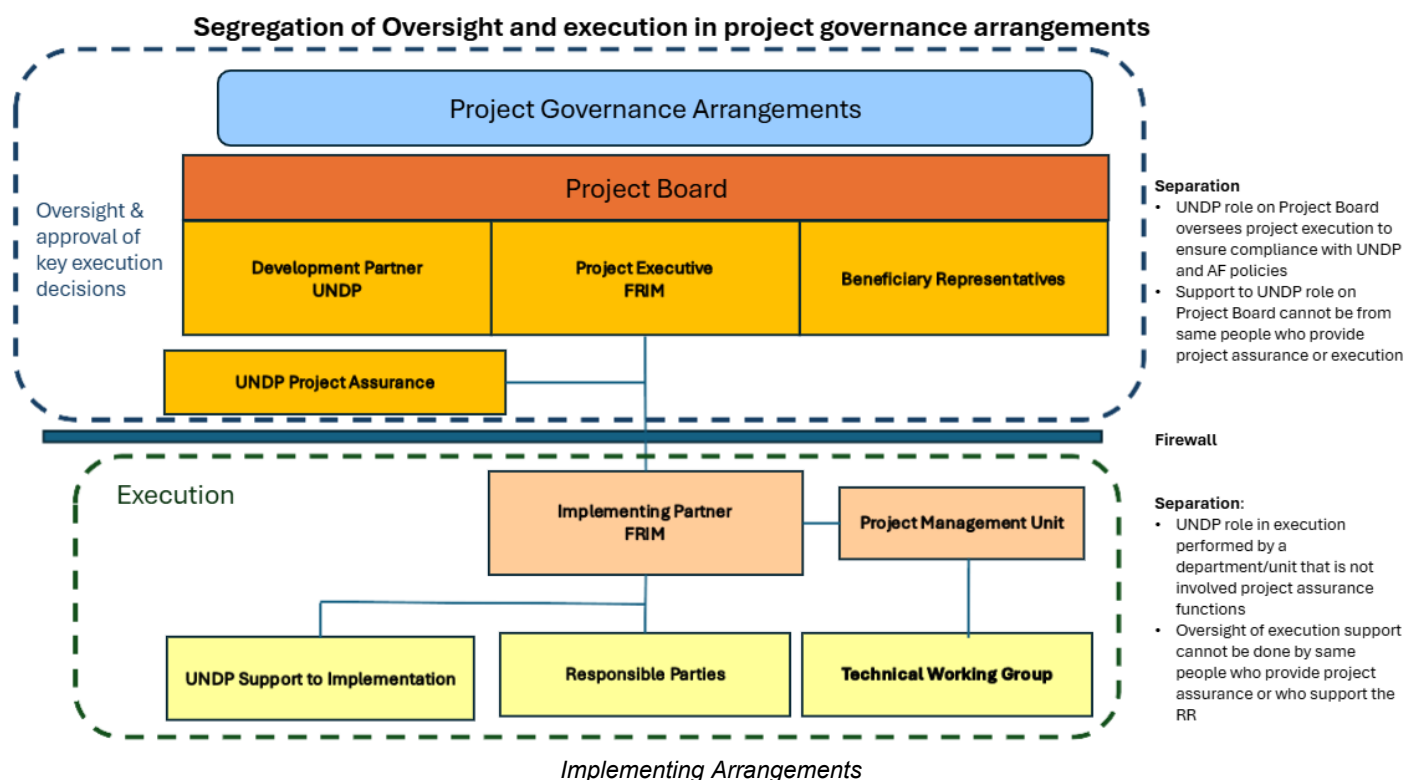
Framework, GAP, safeguards instruments, as well as for knowledge management, and dissemination of lessons learned.

Implementation: Technical Delivery and Accountability Framework

Under the coordination of FRIM as EE, selected project outputs and activities may be implemented through formal arrangements with designated RPs. Responsible Parties may include government agencies, technical institutions, local authorities, community organizations and specialized implementation partners with mandates aligned to specific project outputs and activities. Responsible Parties will be directly accountable to FRIM through formal implementation agreements and will not perform project oversight functions.

Financial and technical accountability arrangements will be governed through Memorandums of Agreement, Service Level Agreements, or other appropriate instruments, to be finalized during project inception and early implementation phases. Initial expressions of interest and stakeholder engagement records are reflected in the consultation documentation and annexes. A more detailed mapping of potential implementation responsibilities, technical collaboration arrangements and institutional roles may be further developed during project inception.

Project beneficiaries, including local communities, Indigenous Peoples, women, local authorities and other stakeholder groups, will participate in project planning, implementation and adaptive management through consultation processes, Technical Working Group engagement, community-level mechanisms and representation within project governance structures, as appropriate. Detailed arrangements are described in the Stakeholder Engagement Plan.



B. Measures for financial and project risk management

The project risk management plan will be overseen by the PMU, which is responsible for day-to-day monitoring and implementing mitigation measures for operational, technical, and SESP-related risks. To ensure high-level accountability, the Project Manager and Safeguards Specialist will provide regular risk status reports to the Project Director, UNDP, and the Programme Board, ensuring all activities remain compliant with UNDP and the AF's fiduciary and environmental standards.

#	Event	Cause	Impact(s)	Risk Category	Impact, Likelihood & Risk Level	Risk Valid From/To	Risk Owner	Risk Treatment and Treatment Owner
1	There is a risk of technical silos and data-sharing bottlenecks between national agencies (FRIM, JPS, MetMalaysia and other data custodians).	Fragmented datasets, differing data standards and limited institutional arrangements for sharing climate, hydrological and ecosystem information.	Could delay development, operationalization and institutional uptake of ICFIS and Forest-Climate Vulnerability Atlas.	Operational (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 3 (Intermediate) Risk Level: Moderate	01/02/2027 to 31/01/2032	Project Manager (PMU)	Risk Treatment 1.1: Establish formal data-sharing arrangements, technical working groups and agreed protocols for data management and exchange during project inception. Owner: PMU, FRIM and NRES.
2	There is a risk of limited institutional uptake of climate-risk information, planning tools and NbS approaches by participating agencies and municipalities.	Established planning practices, competing institutional priorities and continued preference for conventional sectoral approaches.	Which could reduce application of project-supported tools, guidance and adaptation approaches within planning, management and investment decisions.	Operational / Political (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 3 (Intermediate) Risk Level: Moderate	01/02/2027 to 31/01/2032	FRIM / PMU	Risk Treatment 2.1: Strengthen institutional engagement, capacity development and integration of project outputs into agency planning and operational systems. Owner: PMU and FRIM.
3	There is a risk of limited technical capacity or staff turnover among participating agencies and local authorities.	Competing workloads, personnel changes and varying levels of technical experience across institutions.	Which could affect implementation quality, monitoring effectiveness and long-term sustainability of project interventions.	Operational (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 4 (Extensive) Risk Level: Substantial	01/02/2027 to 31/01/2032	Project Manager	Risk Treatment 3.1: Deliver targeted training programmes, operational guidance and knowledge-transfer activities to institutionalize technical capacity within participating agencies. Owner: PMU.

4	There is a risk of delays in obtaining approvals, permits and technical clearances for field interventions.	Multiple approval requirements involving forestry authorities, local governments, water-management agencies and other relevant institutions.	Which could delay implementation of peatland, watershed and urban NbS interventions under Outputs 2.1-2.3 and affect project implementation schedules.	Operational (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 3 (Intermediate) Risk Level: Moderate	01/02/2027 to 31/01/2032	PMU	Risk Treatment 4.1: Establish approval pathways, institutional focal points and permitting schedules during project inception and maintain regular coordination with relevant authorities. Owner: PMU and Executing Entity.
5	There is a risk of limited long-term operation, maintenance and institutional ownership of project-supported systems and interventions.	Competing priorities, budget constraints, institutional changes, or unclear long-term maintenance responsibilities among participating agencies and local authorities.	Reduced sustainability of climate-risk information systems, stewardship arrangements, retention pond NbS interventions and other ecosystem restoration investments beyond the project lifetime.	Sustainability (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 3 (Intermediate) Risk Level: Moderate	01/02/2027 to 31/01/2032	FRIM / PMU	Risk Treatment 5.1: Integrate project-supported systems and approaches into existing mandates, operational procedures, monitoring systems and maintenance arrangements from the outset. Owner: PMU and Participating Agencies.
6	There is a risk of changes in political priorities, institutional leadership or government policies affecting project implementation and uptake.	National, state or local elections, changes in government, institutional restructuring or shifts in policy priorities.	Which could delay decision-making, approvals, resource allocation, institutional engagement and adoption of project-supported climate adaptation approaches and investments.	Political (UNDP Risk Appetite: Cautious)	Likelihood: 3 (Moderately Likely) Impact: 2 (Minor) Risk Level: Moderate	01/02/2027 to 31/01/2032	PMU / FRIM	Risk Treatment 6.1: Maintain engagement across technical and political levels, strengthen institutional ownership across multiple agencies, align project interventions with existing policies and development priorities, and document commitments through formal agreements and endorsed workplans. Owner: PMU and FRIM.

C. Environmental and Social Risk Management

The project has been classified as Moderate Risk under UNDP's SES. In response, an ESMF has been prepared during the full project formulation phase to provide the overarching framework for identifying, avoiding, minimising, mitigating and monitoring environmental and social risks throughout implementation. The ESMF is aligned with the Adaptation Fund Environmental and Social Policy and Gender Policy and is implemented through UNDP's Environmental and Social Management System in partnership with the Government of Malaysia, drawing wherever possible on national legal and institutional safeguard systems.

The ESMF applies across all project components, particularly to site-based interventions under Output 2.1 on peatland hydrological resilience, Output 2.2 on climate-adaptive watershed management, and Output 2.3 on urban and peri-urban NbS. The updated SESP confirms that the programme is not expected to require a full ESIA, and that a SESA is also not applicable for a programme of this nature. Instead, the ESMF establishes a risk management hierarchy and provides for targeted assessments, management procedures and site-specific ESMPs, where required, to ensure that identified risks are addressed proportionately and in accordance with recognised good international practice.

The framework is anchored in compliance with Malaysian law and technical standards, including relevant requirements under the Environmental Quality Act 1974 and EIA Order 2015, the National Land Code 1965, forestry and biodiversity regulations, and occupational safety and health requirements. For Output 2.1 and Output 2.2 interventions, official screening will be undertaken with the Department of Environment during project inception, and if statutory thresholds are triggered, the necessary Schedule 1 or Schedule 2 EIA processes will be completed before implementation. For Output 2.3, no statutory EIA is currently anticipated because the proposed activities involve small-scale enhancement of existing retention ponds; however, all such interventions will still be subject to SES screening, design review and good-practice construction and environmental management requirements. Across Outputs 2.1–2.3, the ESMF also requires screening and design measures to avoid land acquisition, involuntary resettlement and restrictions on access, while managing any temporary access, laydown area and construction-related disturbance through site zoning, traffic management and environmental controls.

The ESMF is complemented by other safeguards instruments prepared during formulation and to be implemented throughout the project lifecycle, notably the Gender Action Plan (GAP), the SEP and the GRM. Assessments undertaken during formulation indicate that no customary land claims, livelihood dependencies or distinct cultural associations between Indigenous Peoples and the full proposal intervention sites have been identified, and therefore UNDP SES Standard 6 on Indigenous Peoples is not triggered and no Indigenous Peoples planning instrument is required. At the same time, the framework retains provisions for Free, Prior and Informed Consent where activities may subsequently affect Indigenous Peoples or local communities in ways requiring explicit consent, and it places strong emphasis on inclusive participation, gender-responsive implementation, protection of marginalised and vulnerable groups, and accessible grievance handling.

The principal risks identified through the SESP and addressed in the ESMF include: possible non-compliance with permitting or technical standards for small-scale physical works; inequitable access to project benefits; exclusion of marginalised or vulnerable groups; weak participation or limited capacity of duty bearers to uphold rights-based approaches; occupational and community health and safety risks; risks to natural habitats and biodiversity from site works or poor restoration design; temporary restrictions on access to land or resources; and pollution prevention and resource-efficiency issues associated with construction and field operations. The ESMF addresses these through clear screening procedures, legal compliance checks, participatory

planning, benefit-sharing criteria, targeted stakeholder analysis, biodiversity-sensitive design, use of native species, OHS requirements for workers and contractors, pollution prevention measures, contractor supervision, and regular safeguards monitoring and reporting.

A major feature of the ESMF is its reliance on targeted technical assessments and management procedures to translate framework safeguards requirements into site- and activity-specific implementation controls during the first year of project implementation. In Year 1, under Activity A.2.1.1 on Peatland Rewetting and Hydrological Restoration, a specialist hydrologist/engineer team will carry out a Landscape Hydrological Modelling and Design Optimisation Study to optimise the configuration of clay dykes, swales, AquaVault tanks and canal blocks and to confirm that rewetting measures deliver peat moisture and fire-risk reduction benefits without creating unacceptable off-site hydrological impacts. In parallel, an independent hydrogeologist will conduct a Groundwater Abstraction Sustainability Assessment to establish safe abstraction limits, assess potential drawdown impacts and define monitoring requirements where AquaVault systems are supplied by tube wells. In addition, during year 1 an independent peatland/safeguards consultant will prepare a Peatland Construction Environmental and Social Management Plan (a site specific ESMP as specified in section II) to manage construction-related impacts on peat stability, hydrology, biodiversity, and worker and community safety, and to translate UNDP SES requirements into peat-specific siting rules, earthworks protocols, occupational health and safety standards, and contractor supervision arrangements.

Under Activity 2.2.1 on Climate-Adaptive Watershed Management, the ESMF will be operationalised in Year 1 through an independent forest/ecological consultant's design of climate-smart Native Tree Planting and Maintenance Regimes. This work will establish site selection criteria and native species mixes tailored to stabilise slopes, protect water resources and improve ecosystem resilience, while avoiding inappropriate planting choices or maintenance practices that could undermine watershed function or biodiversity outcomes.

For Activity 2.3.1 on Retention Pond Assessment, Typology Development and NbS Implementation, the ESMF requires that a package of targeted assessments be completed in Year 1 before site-level implementation proceeds. This will include a Hydrological and Climate Risk Assessment and Technical Design Study by an independent hydrologist or drainage engineer to verify that pond enhancements reduce flood and climate risks without creating adverse upstream, downstream or site-level hydrological impacts. Year 1 activities will also comprise a Biodiversity, Aquatic Habitat and Ecosystem Services Assessment by an independent multidisciplinary ecology team to assess the effects of pond enhancement, hydrological modification and native planting on aquatic and riparian biodiversity, habitat condition, ecosystem services and human-wildlife interactions. In parallel, an independent public safety and environmental health team will undertake a Community Health, Safety and Climate-Related Risk Targeted Assessment to examine risks to nearby residents, school communities, visitors, workers and volunteers – including drowning hazards, vector breeding, wildlife encounters, sensor-related hazards, extreme rainfall and heat exposure – and to specify appropriate site-level mitigation and management measures. Findings from these assessments will feed into an integrated site-level ESMP, consolidating hydrological, biodiversity and community health/safety risk management measures for Activity 2.3.1.

Implementation of the ESMF is led by the PMU with UNDP providing independent programme assurance, quality control and safeguards oversight. The PMU oversees day-to-day safeguards implementation, coordination of responsible parties, stakeholder engagement, and risk monitoring and reporting, supported by a Monitoring, Evaluation and Knowledge Management Specialist, Safeguards Specialist, and a Technical Working Group providing multidisciplinary technical advice. Monitoring covers implementation of the ESMF, ESMPs, GAP, SEP and GRM, and includes annual Project Performance Reports (PPRs), supervision missions, adaptive

management reviews, and independent Mid-Term Review and Final Evaluation (FE) assessing environmental and social performance and compliance with AF and UNDP safeguards requirements.

D. Monitoring and evaluation arrangements including budgeted M&E plan

The project will implement a comprehensive Monitoring and Evaluation (M&E) system consistent with the Adaptation Fund Evaluation Policy, Adaptation Fund Results Framework, Adaptation Fund Gender Policy, Environmental and Social Policy, and relevant UNDP policies and procedures. Monitoring will be coordinated by the FRIM-led PMU with support from implementing partners, local stakeholders and UNDP as the IE.

The PMU will monitor implementation progress against the project results framework, including AF core indicators and project-specific indicators. Baseline data will be established in year 1 of project implementation where required, and indicators will be tracked annually throughout implementation. Baseline data includes peatland condition mapping, landscape hydrological modelling, groundwater sustainability assessment, biodiversity and community-risk assessments and other assessments as detailed in section IIA. The Baseline Data Report will consolidate and validate baseline information developed during project preparation, verify baseline values for the project results framework, confirm the beneficiary counting methodology, establish monitoring protocols, and document any additional information required. Results monitoring will cover project outputs and outcomes across the climate intelligence, ecosystem restoration, watershed management, urban NbS and community resilience components.

M&E will combine project-level performance monitoring with output-specific technical monitoring implemented under Components 1–3. Technical monitoring systems for peatland hydrology, watershed condition, urban NbS, biodiversity, citizen science and community stewardship are integrated within the respective project outputs and provide data for adaptive management and reporting, while the project M&E system focuses on results monitoring, Adaptation Fund indicators, safeguards compliance, beneficiary verification, learning and evaluation.

In accordance with the Adaptation Fund Environmental and Social Policy, monitoring will include implementation of the ESMF, ESMPs, GAP, SEP and GRM. Annual project reporting will include updates on environmental and social risk management measures, implementation of safeguards commitments, gender-responsive actions, stakeholder engagement activities and any corrective actions undertaken.

An Inception Workshop will be conducted within six months of the first AF disbursement to review implementation arrangements, monitoring responsibilities, annual work plans, safeguards requirements, financial procedures and reporting obligations. Annual PPRs will be prepared and submitted in accordance with AF requirements.

UNDP, as IE, will be responsible for oversight and quality assurance of project M&E processes. An independent Mid-Term Review will be undertaken at the project midpoint and an independent FE will be undertaken at project completion. These evaluations will assess project relevance, effectiveness, efficiency, sustainability, environmental and social performance, lessons learned and progress toward adaptation outcomes. The costs associated with management and oversight of the Mid-Term Review and FE will be covered through the IE Fee budget following AF guidance.

This M&E budget provides a breakdown of costs for M&E activities to be led by the Project Management Unit (PMU) and other responsible parties during project implementation. Other

project M&E activities have been included where they contribute directly to monitoring, evaluation, learning and adaptive management. Oversight and participation of the UNDP Country Office, Regional Technical Advisors and HQ units in these M&E activities, including the Independent Mid-Term Review (MTR), Final Evaluation (FE), evaluation oversight and management response process, will be financed through the IE Fee budget.

Table: M&E budget

M&E Activity	Indicative Costs (USD)
Baseline Data Report (including beneficiary methodology and baseline verification)	15,000
Inception Workshop and Report	10,000
M&E required to report on progress made in reaching AF Core Indicators and project results included in the Project Results Framework (including beneficiary tracking and results monitoring)	40,000
Preparation of the Annual AF Project Performance Reports (PPRs)	10,000
Monitoring of ESMF, ESMP, Gender Action Plan (GAP), Stakeholder Engagement Plan (SEP) and Grievance Redress Mechanism (GRM) implementation	40,000
Supervision and Monitoring Missions	30,000
Learning Missions, Knowledge Capture, Lessons Learned Documentation and Adaptive Management Reviews	30,000
Annual Results Review and Adaptive Management Workshops	10,000
Project Completion Report Support	10,000
Independent Mid-Term Review (MTR): The independent or semi-independent MTR will be commissioned by UNDP, not the Implementing Partner or PMU. Costs associated with the supervision and development of the MTR will be charged to the IE Fee budget for regular, LLA and Innovation projects.	20,000 (charged to IE Fee budget)
Independent Final Evaluation (FE): The independent FE will be commissioned by UNDP, not the Implementing Partner or PMU. Costs associated with the supervision and development of the FE will be charged to the IE Fee budget for regular, LLA and Innovation projects.	20,000 (charged to IE Fee budget)
TOTAL indicative COST (Project Budget)	195,000
TOTAL indicative Evaluation COST (IE Fee Budget)	40,000
TOTAL M&E Budget	235,000

The M&E Budget at \$235,000 is 2.5% of the project cost, within the 1-5% range requested in the AF Evaluation Policy.

Note: Project Management Costs (EE Budget) additionally finance the Project Board and Technical Working Group meetings (USD 25,000, and the inception workshop (USD 10,000), in accordance with the Adaptation Fund Harmonization of Costs and Fees guidance.

E. Strategic Results framework, including milestones, targets and indicators

Contribution to the Sustainable Development Goal(s): 6 (Clean Water and Sanitation), 13 (Climate Action), 15 (Life on Land), 17 (Partnerships for the Goals)							
Intended Outcome as stated in the UNSDCF/Country Programme Results and Resource Framework: By 2030, Malaysia has enhanced its environmental sustainability and climate resilience through improved governance, sustainable ecosystem management and strengthened disaster risk reduction (Malaysia UNSDCF 2021–2025, Pillar 4: Environment, Climate Change and Disaster Risk Resilience; Malaysia CPD 2021–2025 Outcome 4).							
Applicable Outputs from the UNDP Strategic Plan: SP 2022–2025 Output 2.1.2: Replicable models and enabling conditions for structural transformations toward sustainable development (forest landscape restoration and NbS); Output 2.5.1: Solutions developed, tested and scaled for sustainable management of nature, ecosystem services, biodiversity and genetic resources. Output 3.3.1: Capacities, systems and incentives for adoption of transformative technologies and approaches for sustainable development enhanced.							
Project Title and Quantum Project Number: Climate-Resilient Forest Ecosystems and Urban Nature-Based Solutions for Climate Adaptation in Malaysia							
Objective and Outcome Indicators		Data Source	Baseline	Mid-term Target	End of Project Target	Data Collection Methods	Risks/ Assumptions
Project Objective: To strengthen the climate resilience and adaptive capacity of vulnerable communities and national/sub-national institutions in Malaysia through the integration of evidence-based policy frameworks, the implementation of Ecosystem-based Adaptation (EbA) and integrated Nature-Based Solutions (NbS) for enhanced water security, and targeted capacity building and gender-responsive livelihood empowerment.	Mandatory Indicator 1: Number of direct and indirect project beneficiaries (individual people, sex-disaggregated)	DOSM census; project surveys; beneficiary registries; municipal, community and agency records	0 direct beneficiaries 0 indirect beneficiaries	At least 70,000 direct beneficiaries	At least 148,000 direct and 4.2 million indirect beneficiaries (approx. 50% women, sex-disaggregated)	Baseline and endline surveys; beneficiary registries; participation records; GIS service-area analysis; AF beneficiary methodology. Data disaggregated by sex.	Risk: Double counting across intervention areas. Assumption: Harmonized beneficiary methodology applied and validated through beneficiary mapping and registry systems.
	AF Core Indicator 2: Area of vulnerable ecosystems under improved ecosystem-based adaptation and NbS management (<i>AF Outcome 5, Indicator 5.1</i>)	FRIM GIS database; MPKP records; project reports; remote sensing	0 ha	925 ha (500 ha peatland; 400 ha watershed; 25 ha urban NbS)	At least 1,870 ha (1,000 ha peatland; 800 ha watershed; 71 ha urban NbS systems)	GIS mapping; remote sensing; field verification	Risk: Extreme drought, wildfire or flooding reduce effectiveness. Assumption: Restoration and NbS measures remain operational and maintained.
	Indicator 3: Number of national and sub-national institutions applying climate intelligence, vulnerability assessment and adaptation-planning tools in planning, prioritization, implementation, monitoring or decision-making processes (<i>AF Outcome 3, Indicator 3.2.2</i>)	Institutional reports; planning documents; user records; policy instruments	0	At least 2 institutions	At least 6 institutions	Planning document review; institutional surveys; user records	Risk: Limited institutional uptake. Assumption: Climate intelligence products address operational planning needs and are embedded within agency mandates.

Component 1	Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning						
Project Outcome 1 Outcome 1: Institutions apply climate intelligence, vulnerability information and adaptation evidence in planning, investment and decision-making processes.	Indicator 4: Number of climate intelligence and vulnerability assessment systems operationalized and institutionally adopted	FRIM records; system logs; institutional agreements	0	ICFIS prototype operational and tested; preliminary Atlas products developed and piloted	ICFIS and Forest-Climate Vulnerability Atlas fully developed and endorsed	Technical validation reports; system records; institutional agreements	Risk: Data-sharing barriers and interoperability challenges. Assumption: Long-term hosting, maintenance and updating arrangements established.
Outputs to achieve Outcome 1	Output 1.1: Integrated Climate-Forest Intelligence System (ICFIS) Developed and Operationalized Output 1.2: Forest-Climate Vulnerability Atlas Developed and Applied Output 1.3: Institutionalization, Operational Guidance and Scaling Frameworks Developed						
Component 2	Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience						
Project Outcome 2 Outcome 2: Ecosystems and climate-resilient infrastructure provide strengthened hydrological, buffering and adaptation functions.	Indicator 5: Area of peatland under improved hydrological management, fire resilience and monitoring systems	FRIM GIS database; monitoring systems; project reports	0 ha	500 ha peatland	1,000 ha peatland	GIS analysis; groundwater monitoring; field verification	Risk: Severe drought and wildfire events. Assumption: Hydrological restoration measures remain effective and maintained.
	Indicator 6: Area of watershed under improved climate-adaptive management and ecosystem restoration measures	FRIM GIS database; watershed monitoring reports	0 ha	400 ha watershed	800 ha watershed	GIS analysis; field validation; watershed monitoring	Risk: Extreme rainfall and site-access limitations. Assumption: Restoration measures successfully established and maintained.
	Indicator 7: Area of urban and peri-urban stormwater detention asset systems under improved climate-resilient NbS management	MPKP records; FRIM reports; GIS mapping	0 ha	25 ha urban and peri-urban stormwater detention asset systems	71 ha urban and peri-urban stormwater detention asset systems	GIS mapping; engineering assessments; site verification	Risk: Municipal maintenance and budget constraints. Assumption: NbS approaches integrated into municipal management systems.
Outputs to achieve Outcome 2	Output 2.1: Climate-resilient peatland rehabilitation, fire resilience and monitoring systems operationalized in the KLSFR landscape. Output 2.2: Climate-adaptive watershed management and EbA implemented in the Ulu Muda watershed to strengthen watershed stability, water security and ecosystem resilience.						

	Output 2.3: Urban and peri-urban NbS implemented through climate-resilient stormwater management, adaptive monitoring and municipal scaling approaches in Kedah.						
Component 3	Institutionalizing Capacity, Stewardship and Sustainable NbS Management						
Outcome 3 Outcome 3: Communities and institutions strengthen climate resilience through inclusive participation, enhanced capacities and application of adaptation knowledge.	Indicator 8: Number of community members actively engaged in ecosystem restoration, stewardship, monitoring, citizen-science, nursery management and climate-adaptation activities	Participation records; training records; community monitoring reports	0	500 community members	1,400 community members (minimum 50% women and 20% vulnerable groups)	Participation records; attendance sheets; training records; community monitoring records. Data disaggregated by sex and vulnerable-group category.	Risk: Low participation rates and volunteer retention. Assumption: Communities perceive tangible benefits and enabling measures support women and vulnerable groups.
	Indicator 9: Number of personnel trained in climate intelligence, adaptation planning, NbS implementation, monitoring and ecosystem management	Training records; attendance sheets	0	150 personnel	300 personnel (minimum 40% women)	Training evaluations; attendance records; post-training assessments. Data disaggregated by sex.	Risk: Staff turnover. Assumption: Skills retained and applied within participating institutions.
	Indicator 10: Number of institutions and local authorities utilizing project knowledge products, guidance materials and learning mechanisms to support adaptation planning, implementation, replication or decision-making	Portal analytics; dissemination records; publication records	No integrated platform	Knowledge Portal operational; at least 3 institutions utilizing project knowledge resources	At least 6 institutions and local authorities utilizing project knowledge products, guidance materials and learning mechanisms	Portal analytics; publication review; dissemination records; event reports; institutional uptake assessment.	Risk: Low engagement with knowledge products. Assumption: Knowledge Portal is maintained and actively disseminated beyond project duration.
Outputs to achieve Outcome 3	Output 3.1: Inclusive Community Participation, Capacity and Livelihoods Strengthened. Output 3.2: Technical Capacity for Climate Intelligence, NbS Management and Project Implementation Strengthened. Output 3.3: Knowledge Management, Learning and Dissemination Systems Operationalized.						

F. Project alignment with the Results Framework of the Adaptation Fund

Project Objective(s)	Project Objective Indicator(s)	Adaptation Fund Outcome	Adaptation Fund Outcome Indicator	Amount (USD)
To strengthen the resilience of vulnerable communities, ecosystems and institutions in Malaysia to increasing climate variability and change through improved climate-risk information, ecosystem restoration, water-security interventions, community participation and institutional capacity	1b. At least 1,870 ha of vulnerable ecosystems and urban NbS systems under improved climate-resilient management (Indicator 2)	Outcome 5: Increased ecosystem resilience in response to climate change and variability-induced stress	5. Ecosystem services and natural resource assets maintained or improved under climate change and variability-induced stress	5,200,000
	1c. At least 6 national and sub-national institutions applying climate intelligence, vulnerability assessment and adaptation-planning tools in planning and decision-making processes (Indicator 3)	Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	2.1. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	3,141,014
Total Objective-Level Grant Amount				8,341,014
Project Outcome(s)	Project Outcome Indicator(s)	Adaptation Fund Output	Adaptation Fund Output Indicator	Amount
Outcome 1: Institutions apply climate intelligence, vulnerability information and adaptation evidence in planning, investment and decision-making processes.	1c. At least 6 national and sub-national institutions applying climate intelligence, vulnerability assessment and adaptation-planning tools in planning and decision-making processes (Indicator 3)	2.1. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	2.1.2 No. of targeted institutions with increased capacity to minimize exposure to climate variability risks (by type, sector and scale)	2,114,014
Outcome 2: Ecosystems and climate-resilient infrastructure provide strengthened hydrological, buffering and adaptation functions.	2.1. 1,000 ha of peatland under improved hydrological management, fire resilience and monitoring systems (Indicator 5)	Output 5: Vulnerable ecosystem services and natural resource assets strengthened in response to climate change impacts, including variability	5.1. No. of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type and scale)	1,507,000
	2.2. 800 ha of watershed under improved climate-adaptive management and ecosystem restoration measures (Indicator 6)	Output 5: Vulnerable ecosystem services and natural resource assets strengthened in response to climate change impacts, including variability	5.1. No. of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type and scale)	1,764,000
	2.3. 71 ha of urban and peri-urban stormwater detention asset systems under improved climate-resilient NbS management (Indicator 7)	Output 5: Vulnerable ecosystem services and natural resource assets strengthened in response to climate change impacts, including variability	5.1. No. of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type and scale)	1,755,000

Outcome 3: Communities and institutions strengthen climate resilience through inclusive participation, enhanced capacities and application of adaptation knowledge.	3.1. 300 personnel trained in climate intelligence, adaptation planning, NbS implementation, monitoring and ecosystem management, and 1,400 community members actively engaged in ecosystem restoration, stewardship, monitoring, citizen-science, nursery and climate-adaptation activities (Indicators 8 and 9)	Output 2.1: Strengthened capacity of national and sub-national centres and networks to respond rapidly to extreme weather events	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events (by gender)	1,201,000
Total Outcome-Level Grant Amount				8,341,014

G. Budget

Total Budget and Work Plan			
Quantum Business Unit	UNDP-XXX		
Quantum Project ID:	00XXXXXX	Quantum Project Title:	<i>As in Quantum</i>
Quantum Award ID:	XXXXXXX	Quantum Award Title:	<i>As in Quantum</i>
PIMS No.	XXXX		
Implementing partner	Forest Research Institute Malaysia (FRIM)		

Quantum Outcome (AF Component)	Quantum Output (AF Outcome)	Quantum Activity (AF Output)	Quantum Responsible Party	Budget Account Code	Quantum Budget Account Description	Amount Year 2027	Amount Year 2028	Amount Year 2029	Amount Year 2030	Amount Year 2031	Total (USD)	No
Component 1: Climate Intelligence, Decision-Support and Institutional Uptake for Adaptation Planning	Outcome 1: Institutions apply climate intelligence, vulnerability information and adaptation evidence in planning, investment and decision-making processes.	Output 1.1 (Integrated Climate-Forest Intelligence System – ICFIS)	UNDP	71400	Contractual Services - Individual	90,000	-	-	-	-	90,000	1
			UNDP	72100	Contractual Services - Companies	-	90,000	140,000	-	-	230,000	2
			UNDP	72800	IT Equipment	-	60,000	-	-	-	60,000	3
			Total UNDP			90,000	150,000	140,000	-	-	380,000	
					Output 1.1 Total	90,000	150,000	140,000	-	-	380,000	
		Output 1.2 (Forest-Climatic Vulnerability Atlas)	UNDP	71400	Contractual Services - Individual	-	56,000	56,000	56,000	-	168,000	4
			UNDP	72800	IT Equipment	20,964	-	-	-	-	20,964	5
			Total UNDP			20,964	56,000	56,000	56,000	-	188,964	
			FRIM	71600	Travel	-	10,000	10,000	10,000	-	30,000	6
			FRIM	75700	Training, Workshops & Conferences	-	15,000	10,000	15,000	5,000	45,000	7
			FRIM	72100	Contractual Services - Companies	-	40,000	90,000	40,000	-	170,000	8
			Total FRIM			-	75,000	120,000	75,000	15,000	285,000	
					Output 1.2 Total	20,964	121,000	166,000	121,000	5,000	433,964	
		Output 1.3 (Institutionalization, Operational Guidance and	UNDP	72100	Contractual Services - Companies	-	-	30,000	30,000	30,000	90,000	9
			UNDP	71400	Contractual Services - Individuals	256,363	227,181	238,540	250,467	207,498	1,180,050	10
			Total UNDP			256,363	227,181	268,540	280,467	237,498	1,270,050	
			FRIM	75700	Training, Workshops & Conferences	-	-	10,001	10,000	10,000	30,001	11

		Scaling Frameworks)	Total FRIM			-	-	10,000	10,000	10,000	30,000		
					Output 1.3 Total	256,363	227,181	278,540	290,467	247,498	1,300,050		
Component 1 Total						367,327	498,181	584,541	411,467	252,498	2,114,014		
Component 2: Ecosystem-Based Adaptation and Nature-Based Solutions for Climate Resilience	Outcome 2: Ecosystems and climate-resilient infrastructure provide strengthened hydrological, buffering and adaptation functions.	Output 2.1 (Climate-Resilient Peatland Rewetting, Fire Resilience and Monitoring Systems Operationalized)	UNDP	71400	Contractual Services - Individual	192,000	48,000	48,000	28,000	28,000	344,000	12	
			UNDP	71200	International Consultants	-	30,000	15,000	-	-	45,000	13	
			UNDP	72100	Contractual Services - Companies	-	260,000	260,000	260,000	-	780,000	14	
			UNDP	72200	Equipment and Furniture	-	45,000	115,000	35,000	-	195,000	15	
			UNDP	71300	Local Consultant		7,000	7,000	7,000	7,000	28,000	16	
			Total UNDP			192,000	400,000	445,000	330,000	35,000	1,392,000		
			FRIM	71600	Travel	10,000	20,000	15,000	10,000	10,000	65,000	17	
			FRIM	75700	Training, Workshops & Conferences	10,000	10,000	10,000	10,000	10,000	50,000	18	
			Total FRIM			20,000	30,000	25,000	20,000	20,000	115,000		
					Output 2.1 Total	212,000	430,000	470,000	350,000	55,000	1,507,000		
		Output 2.2 (Climate-Adaptive Watershed Management – Ulu Muda, Kedah)	UNDP	71400	Contractual Services - Individual	177,000	82,000	117,000	132,000	117,000	625,000	19	
			UNDP	72100	Contractual Services - Companies	-	265,500	201,500	26,500	26,500	520,000	20	
			Total UNDP			177,000	347,500	318,500	158,500	143,500	1,145,000		
			FRIM	72100	Contractual Services - Companies	21,500	32,000	17,500	19,000	2,500	75,000	21	
			FRIM	72800	IT Equipment	61,500	25,000	-	-	-	86,500	22	
			FRIM	71600	Travel	32,500	55,000	55,000	55,000	32,500	230,000	23	
			FRIM	72300	Materials & Goods	-	10,000	15,000	10,000	-	35,000	24	
			FRIM	72200	Equipment and Furniture	-	60,000	5,000	5,000	5,000	75,000	25	
			FRIM	75700	Training, Workshops & Conferences	20,000	15,000	25,000	15,000	25,000	100,000	26	
			Total FRIM			135,500	197,000	117,500	104,000	65,000	619,000		
					Output 2.2 Total	312,500	544,500	436,000	262,500	208,500	1,764,000		
			Output 2.3 (Urban and Peri-Urban NbS for Flood and Heat Resilience – Kubang Pasu, Kedah)	UNDP	75700	Training, Workshops & Conferences	39,000	34,000	34,000	27,000	10,000	144,000	27
				UNDP	72800	IT Equipment	18,000	-	-	-	-	18,000	28
				UNDP	72100	Contractual Services - Companies	162,000	172,000	162,000	152,000	112,000	760,000	29
				UNDP	71300	Local Consultants	150,000	-	-	-	-	150,000	30
				UNDP	71400	Contractual Services - Individuals	30,000	30,000	30,000	30,000	30,000	150,000	31
				UNDP	72200	Equipment and Furniture	160,000	62,000	-	-	-	222,000	32
				Total UNDP			559,000	298,000	226,000	209,000	152,000	1,444,000	
				FRIM	71800	Contractual Services - Implementing Partner	-	12,000	12,000	12,000	20,000	56,000	33
				FRIM	71600	Travel	10,000	-	-	-	-	10,000	34
	FRIM			75700	Training, Workshops & Conferences	5,000	7,000	7,000	5,000	10,000	34,000	35	
	FRIM			72200	Equipment and Furniture	100,000	25,000	25,000	15,000	15,000	180,000	36	
	FRIM			72800	IT Equipment	15,000	5,000	-	-	-	20,000	37	
	FRIM			72300	Materials & Goods	5,000	2,000	2,000	2,000	-	11,000	38	
	Total FRIM					135,000	51,000	46,000	34,000	45,000	311,000		
					Output 2.3 Total	694,000	349,000	272,000	243,000	197,000	1,755,000		

Component 2 Total						1,218,500	1,313,500	1,178,000	855,500	460,500	5,026,000	
Component 3: Institutionalizing Capacity and Sustainable Livelihoods	Outcome 3: Communities and institutions strengthen climate resilience through inclusive participation, enhanced capacities and application of adaptation knowledge.	Output 3.1 (Inclusive Community Participation, Capacity and Livelihoods Strengthened)	UNDP	71400	Contractual Services - Individual	35,000	30,000	30,000	30,000	15,000	140,000	39
			Total UNDP			35,000	30,000	30,000	30,000	15,000	140,000	
			FRIM	75700	Training, Workshops & Conferences	31,000	108,000	104,000	70,000	55,000	398,000	40
			FRIM	71600	Travel	10,000	5,000	10,000	5,000	5,000	35,000	41
			FRIM	72100	Contractual Services - Companies	35,000	50,000	47,000	22,000	16,000	170,000	42
			FRIM	74200	Audio Visual&Print Prod Costs	5,000	15,000	15,000	5,000	5,000	45,000	43
			Total FRIM			81,000	178,000	176,000	102,000	81,000	618,000	
					Output 3.1 Total	116,000	208,000	206,000	132,000	96,000	758,000	
		Output 3.2 (Technical Capacity for Climate Intelligence, NbS Management and Project Implementation Strengthened)	FRIM	75700	Training, Workshops & Conferences	25,000	44,000	74,500	62,500	49,000	255,000	44
			FRIM	71300	Local Consultants	-	-	1,500	-	1,500	3,000	45
			Total FRIM			25,000	44,000	76,000	62,500	50,500	258,000	
						Output 3.2 Total	25,000	44,000	76,000	62,500	50,500	258,000
		Output 3.3 (Knowledge Management, Learning and Dissemination Systems Operationalized)	UNDP	71400	Contractual Services - Individual	20,000	20,000	20,000	20,000	20,000	100,000	46
			UNDP	72400	Communic & Audio Visual Equip	15,000	-	-	-	-	15,000	47
			Total UNDP			35,000	20,000	20,000	-	20,000	115,000	
			FRIM	75700	Training, Workshops & Conferences	-	-	-	20,000	50,000	70,000	48
			Total FRIM			-	-	-	20,000	50,000	70,000	
					Output 3.3 Total	35,000	20,000	20,000	40,000	70,000	185,000	
Component 3 Total						176,000	272,000	302,000	234,500	216,500	1,201,000	
Project Activities Cost (Components 1–3)						1,761,827	2,083,681	2,064,540	1,501,467	929,498	8,341,014	
Project Execution Cost												
			UNDP	64397	Support Services	6,224	6,224	6,224	6,224	6,224	31,120	49
			UNDP	74596	Direct Project Costs	12,000	12,000	12,000	12,000	12,000	60,000	50
			Total UNDP			18,224	18,224	18,224	18,224	18,224	91,120	
			FRIM	74200	Audio Visual&Print Prod Costs	7,000	7,000	7,000	7,000	7,000	35,000	51
			FRIM	71800	Contractual Services - Implementing partner	20,000	35,000	35,000	35,000	20,000	145,000	52
			FRIM	72800	IT Equipment	13,956	1,500	4,500	1,500	1,000	22,456	53
			FRIM	72200	Equipment and Furniture	15,000	-	-	-	-	15,000	54
			FRIM	72500	Supplies	2,000	2,000	2,000	2,000	1,000	9,000	55
			FRIM	75700	Training, Workshops & Conferences	63,000	28,000	58,000	38,000	58,000	245,000	56
			FRIM	71600	Travel	40,000	70,000	75,000	75,000	53,000	313,000	57
			Total FRIM			160,956	143,500	181,500	158,500	140,000	784,456	
						179,180	161,724	199,724	176,724	158,224	875,576	
						1,941,007	2,245,405	2,264,265	1,678,191	1,087,722	9,216,590	
Implementing Entity Fee						412,354	114,516	115,478	85,588	55,474	783,410	
Total project grant						2,353,361	2,359,921	2,379,743	1,763,779	1,143,196	10,000,000	

No	Description
1	Specialist for existing methodologies/model mapping and assessment, 15,000 Y1. Deliverable: Existing system mapping, users' needs and ICFIS/Atlas design roadmap Budget: 15,000 (Y1 15,000) National expert for existing methodologies/model mapping and assessment, 15,000 Y1. Deliverable: Existing system mapping, users' needs and ICFIS/Atlas design roadmap Budget: 15,000 (Y1 15,000) National expert supporting CRVA assessment. Deliverable: CVRA assessment and alignment with MyNAP. Budget: 30,000 (Y1 30,000) National expert supporting hydrological assessments, 30,000 Y1. Deliverable: Hydrological project site assessments. Budget: 30,000 (Y1 30,000)
2	Firm contracted to design, develop and operationalize the Integrated Climate-Forest Intelligence System (ICFIS) Budget: 230,000 (Y2 90,000, Y3 140,000)
3	Procurement of servers, cloud storage, data management systems, computing equipment and related IT infrastructure for ICFIS budget: 60,000 (Y2 60,000)
4	National expert supporting climate-risk analysis, GIS mapping, vulnerability assessments, data harmonisation. Deliverable: Atlas development. Budget: 96,000 (Y2 32,000, Y3 32,000, Y4 32,000) GIS/Data Specialist supporting spatial data processing, GIS analysis, data harmonisation and Atlas preparation Budget: 72,000 (Y2 24,000, Y3 24,000, Y4 24,000)
5	IT equipment for FRIM project technical support across Components 1-3 (laptops, licences) Budget: 20,964 (Y1 20,964)
6	Travel supporting technical consultations, field validation and stakeholder engagement for Atlas development and planning protocol preparation Budget: 30,000 (Y2 10,000, Y3 10,000, Y4 10,000)
7	Stakeholder consultations and validation workshops supporting Atlas development, testing and coordination Budget: 45,000 (Y2 15,000, Y3 10,000, Y4 15,000, Y5 5,000)
8	Professional services supporting GIS processing, map preparation, graphic design, publication and dissemination of Atlas products and planning guidance materials Budget: 170,000 (Y2 40,000, Y3 90,000, Y4 40,000)
9	Professional services supporting preparation, design and publication of toolkits, operational guidance, SOPs and scaling products from component 2 Budget: 90,000 (Y3 30,000, Y4 30,000, Y5 30,000)
10	Specialist for Sustainable Finance assessment to assess financing sources, sustainability pathways and scaling investment opportunities Budget: 40,000 (Y1 40,000) Specialist for consolidation of NbS operational guidance and development of scaling and replication framework Budget: 50,000 (Y5 50,000) Technical Advisor to support technical project implementation Budget: 432,336 (Y1 78,242, Y2 82,154, Y3 86,262, Y4 90,575, Y5 95,104) Project Manager (4,278/month) Budget: 283,642 (Y1 51,332, Y2 53,899, Y3 56,594, Y4 59,423, Y5 62,394) Finance & Administrative Specialist (3,128/month) Budget: 161,785 (Y1 37,536, Y2 39,413, Y3 41,383, Y4 43,453) Monitoring, Evaluation and Knowledge Management Specialist (4,104/month Y1) Budget: 212,287 (Y1 49,253, Y2 51,715, Y3 54,301, Y4 57,016). 5% annual increase
11	Stakeholder consultations and validation workshops supporting development, testing, institutional coordination and uptake of ICFIS and Atlas Budget: 30,001 (Y3 10,001, Y4 10,000, Y5 10,000)
12	Peatland hydrologist support; deliverable: water-balance analysis and groundwater-retention design study Budget: 75,000 (Y1 75,000) Groundwater abstraction sustainability assessment; deliverable: safe abstraction limits, drawdown impacts and monitoring requirements Budget: 50,000 (Y1 50,000) Peatland ecological baseline and ESMP procedure; deliverable: biodiversity, hydrology and construction safeguards package Budget: 50,000 (Y1 50,000) Agricultural livelihood impact assessment; deliverable: livelihood risk and benefit-sharing recommendations Budget: 17,000 (Y1 17,000) Hydrological optimisation studies; deliverable: peatland water-retention thresholds and design recommendations Budget: 40,000 (Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000) Tropical peatland rehabilitation specialist; deliverable: restoration design and technical implementation guidance Budget: 40,000 (Y2 20,000, Y3 20,000) Technical field coordinator and monitoring officer for output 2.1, 18,000/year, year Y2-Y5 Budget: 72,000 (Y2 18,000, Y3 18,000, Y4 18,000, Y5 18,000)
13	Fire management specialist; deliverable: fire-readiness review, capacity audit with recommendation on equipment requirements and ToT package (Y2-Y3). Budget: 45,000 (Y2 30,000, Y3 15,000)
14	Engineering design and construction supervision firm; deliverable: clay dyke/canal-blocking design, QA and handover documents Budget: 50,000 (Y2 20,000, Y3 20,000, Y4 10,000) Civil and earthworks contractors; deliverable: clay dyke and peatland water-retention works (Y2-Y4). Budget: 730,000 (Y2 240,000, Y3 240,000, Y4 250,000)
15	IoT monitoring stations and piezometers; deliverable: operational peatland monitoring network (Y3-Y4). Budget: 105,000 (Y3 70,000, Y4 35,000) Peatland firefighting equipment; deliverable: three agency/community firefighting equipment sets (Y2-Y3). Budget: 90,000 (Y2 45,000, Y3 45,000)
16	Drone monitoring specialist; deliverable: aerial monitoring support and field verification outputs (Y2-Y5). Budget: 28,000 (Y2 7,000, Y3 7,000, Y4 7,000, Y5 7,000)

17	Technical missions and monitoring visits; deliverable: field verification, supervision and implementation support Budget: 65,000 (Y1 10,000, Y2 20,000, Y3 15,000, Y4 10,000, Y5 10,000)
18	Technical validation workshops; deliverable: engineering reviews and inter-agency technical decisions Budget: 50,000 (Y1 10,000, Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000)
19	Specialist for development of Native Tree Planting and Maintenance Regimes, Including Criteria for Site Selection. Deliverable: climate-smart planting, maintenance, and survival-monitoring regimes, including site selection criteria and native species mixes (safeguards) Budget: 60,000 (Y1 60,000) Economic valuation of watershed protection with SADA; deliverables: water-utility valuation report (Y4). Budget: 50,000 (Y4 50,000) National safeguards specialist for ESMP preparation and monitoring; deliverables: ESMP preparation, safeguards monitoring and compliance reports (Y1, Y3, Y5). Budget: 105,000 (Y1 35,000, Y3 35,000, Y5 35,000) Engineering Advisor for Component 2 technical implementation oversight, quality assurance and hydrological guidance across component 2 interventions (Y1-Y5). Budget: 260,000 (Y1 52,000, Y2 52,000, Y3 52,000, Y4 52,000, Y5 52,000) 2 Technical field officers for watershed implementation support, community engagement and monitoring (Y1-Y5). Budget: 150,000 (Y1 30,000, Y2 30,000, Y3 30,000, Y4 30,000, Y5 30,000)
20	Tree planting contractor for enrichment and ANR work, including site preparation, planting materials and construction of check dams (Y2-Y3) Budget: 390,000 (Y2 215,000, Y3 175,000) Community nursery establishment Budget: 30,000 (Y2 30,000) Community payment/labour for seedlings supply (13,000/year, Y2-5), sediment-management works for check-dam and protection work (7,500/year, Y2-5) and vegetation survival monitoring/maintenance (6,000/year, Y3-5) Budget: 100,000 (Y2 20,500, Y3 26,500, Y4 26,500, Y5 26,500)
21	Soil Survey and analysis by FRIM (16,500 Y1, 16,500 Y4) Budget: 33,000 (Y1 16,500, Y4 16,500) Cut-slope reinforcement and Com-pillow riverbank protection; deliverables: slope reinforcement and riverbank protection measures Budget: 42,000 (Y2 27,000, Y3 15,000) Satellite image acquisition Budget: 17,500 (Y1 5,000, Y2 5,000, Y3 2,500, Y4 2,500, Y5 2,500)
22	Equipment for spatial analysis, surveys and workstation (LiDAR, PLC4, GIS software and workstations) (Y1-Y2). Budget: 86,500 (Y1 61,500, Y2 25,000)
23	Enrichment planting field travel and transport; deliverables: field transport for planting, site verification and supervision (Y2-Y5). Budget: 100,000 (Y1 12,500, Y2 25,000, Y3 25,000, Y4 25,000, Y5 12,500) Transport, boat rental and field logistics for field assessments and forestry permit Budget: 130,000 (Y1 20,000, Y2 30,000, Y3 30,000, Y4 30,000, Y5 20,000)
24	FRIM nursery seedling supply Budget: 35,000 (Y2 10,000, Y3 15,000, Y4 10,000)
25	Hydrological sensors, raingauges, samplers and engineering equipment (Y1-Y5). Budget: 75,000 (Y2 60,000, Y3 5,000, Y4 5,000, Y5 5,000)
26	Stakeholder consultations, meetings, field work, community specialist Budget: 70,000 (Y1 10,000, Y2 15,000, Y3 15,000, Y4 15,000, Y5 15,000) Consultations and travel for Component 2 ESMP preparation (10,000/year, Y1, Y3, Y5). Budget: 30,000 (Y1 10,000, Y3 10,000, Y5 10,000)
27	NbS Opportunity Scan consultations, travel and technical training for NBSOS methodology transfer, review of district scans, interpretation of findings, Opportunities and investment framework review to produce 12 district NBSOS assessments maps and reports across Kedah Budget: 144,000 (Y1 39,000, Y2 34,000, Y3 34,000, Y4 27,000, Y5 10,000)
28	NbS spatial analysis and data infrastructure (GIS workstations, plotter, storage, GPS units and tablets) Budget: 18,000 (Y1 18,000)
29	Drone survey and field data collection support (site verification, field data collection and mapping support) Budget: 10,000 (Y1 2,000, Y2 2,000, Y3 2,000, Y4 2,000, Y5 2,000) Retention Pond inventory, typology and detailed engineering design (pond inventory, typology framework, prioritisation and detailed designs) Budget: 70,000 (Y1 50,000, Y2 20,000) NbS rehabilitation and habitat enhancement (wetlands, riparian buffers, mini-forests and habitat enhancement), including site preparation, machinery operation, maintenance Budget: 600,000 (Y1 50,000, Y2 150,000, Y3 150,000, Y4 150,000, Y5 100,000) Technical advisory support for monitoring system design, integration with MPKP systems, technical reviews and related capacity development Budget: 80,000 (Y1 60,000, Y3 10,000, Y5 10,000)
30	Hydrological and climate-risk assessment and technical design study; deliverables: hydrological baseline, flood-risk analysis and design recommendations Budget: 50,000 (Y1 50,000) Biodiversity, aquatic habitat and ecosystem-services assessment; deliverables: biodiversity, habitat and ecosystem-services baseline assessment Budget: 50,000 (Y1 50,000) Community health, safety and climate-risk targeted assessment; deliverables: public safety, accessibility and climate-risk assessment (Y1). Budget: 50,000 (Y1 50,000)
31	Citizen science and Ecowarden field community engagement coordinator Budget: 75,000 (Y1 15,000, Y2 15,000, Y3 15,000, Y4 15,000, Y5 15,000) Nursery field officer for community nurseries Budget: 75,000 (Y1 15,000, Y2 15,000, Y3 15,000, Y4 15,000, Y5 15,000)

32	Hydrological monitoring network equipment (water-level sensors, staff gauges, rainfall gauges and runoff sensors, weather/temperature sensors, communications infrastructure equipment, monitoring cameras), 160,000 Y3, and Bioacoustic monitoring. 62,000 Y2). Budget: 222,000 (Y1 160,000, Y2 62,000)
33	Municipal mentoring and technical support on NbS planning and replication pathways (Y2-Y5) and development of municipal NbS replication toolkit and municipal guidance materials (2,000/year, Y2-4, 10,000Y5). Budget: 16,000 (Y2 2,000, Y3 2,000, Y4 2,000, Y5 10,000) 2 Bioacoustic technical advisors for bioacoustic monitoring design, data interpretation and technical reporting Budget: 40,000 (Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000)
34	Technical support for BRAHMS database capacity by the University of Oxford BRAHMS experts to provide hands-on training, customize the database for MPKP's native nursery, and transfer technical knowledge to FRIM and MPKP staff. Budget: (Y1 10,000)
35	MASH knowledge sharing for Kubang Pasu urban NbS (Y2-5) and Kedah State NbS Symposium / Municipal Forum with all Kedah local authorities (Y5). Budget: 13,000 (Y2 2,000, Y3 2,000, Y4 2,000, Y5 7,000) Community consultation, stakeholder engagement, and implementation support activities (Y1-Y5). Budget: 21,000 (Y1 5,000, Y2 5,000, Y3 5,000, Y4 3,000, Y5 3,000)
36	Nursery Equipment and Irrigation equipment, plant materials and propagation stock, herbarium cabinets, operation and production support for 4 satellite community nurseries Budget: 180,000 (Y1 100,000, Y2 25,000, Y3 25,000, Y4 15,000, Y5 15,000)
37	Commercial botanical collection management system for restoration through BRAHMS Database Development (workstation, software licensing, system installation, technical configuration and specialised training) to develop FRIM and MPKP capacity for managing seed provenance, nursery inventory, planting records, restoration monitoring and replication. Budget: 20,000 (Y1 15,000, Y2 5,000)
38	Citizen scientist and Ecowardens monitoring kits and technical monitoring materials (Y1-Y5). Budget: 11,000 (Y1 5,000, Y2 2,000, Y3 2,000, Y4 2,000)
39	National Gender Equality and Social Inclusion (GESI) expert supporting GESI Action Plan, baseline mapping, beneficiary-selection criteria, GRM/PSEAH protocols, accessibility, gender reporting and sensitization Budget: 120,000 (Y1 15,000, Y2 30,000, Y3 30,000, Y4 30,000, Y5 15,000) National consultant for stakeholder/socio-economic mapping, community profiling and development of Community Participation and Monitoring Framework, including beneficiary-selection criteria, engagement methodologies and GRM awareness Budget: 20,000 (Y1 20,000)
40	Peat-fire prevention, early warning and sustainable peatland management training for KLSFR Budget: 38,000 (Y1 6,000, Y2 10,000, Y3 8,000, Y4 7,000, Y5 7,000) Community early warning and NbS buffer stewardship focal points training Budget: 22,000 (Y2 10,000, Y3 6,000, Y4 6,000) Community monitoring and stewardship support (participatory data collection) Budget: 50,000 (Y1 5,000, Y2 16,000, Y3 13,000, Y4 10,000, Y5 6,000) Community nursery stakeholder consultations, survey, study tours Budget: 25,000 (Y2 15,000, Y3 10,000) Community training programme related to community nurseries, enrichment planning, monitoring/stewardship and sustainability strategy development Budget: 55,000 (Y2 20,000, Y3 20,000, Y4 10,000, Y5 5,000) Community Nursery Training and Capacity Building Programme Budget: 45,000 (Y1 15,000, Y2 10,000, Y3 10,000, Y4 5,000, Y5 5,000) Consultations to develop Community nursery SOP Development and Training Materials Budget: 10,000 (Y3 5,000, Y4 5,000) Training of trainers for Ecowardens and bioacoustic field monitoring and reporting training for citizen scientists Budget: 53,000 (Y2 12,000, Y3 17,000, Y4 12,000, Y5 12,000) School and awareness engagement Programme and activities, annual events, citizen science forums, and final lessons learned workshop Budget: 70,000 (Y1 5,000, Y2 15,000, Y3 15,000, Y4 15,000, Y5 20,000)
41	Travel for stakeholder consultation, social profiling, field engagement, community outreach, monitoring Budget: 35,000 (Y1 10,000, Y2 5,000, Y3 10,000, Y4 5,000, Y5 5,000)
42	Community stewardship, awareness campaigns, and peat-fire resilience activities (KLSFR) Budget: 45,000 (Y1 15,000, Y2 15,000, Y3 15,000) Socio-Economic and Land Management Practices (UUM Sub-contract) Budget: 125,000 (Y1 20,000, Y2 35,000, Y3 32,000, Y4 22,000, Y5 16,000)
43	Design and print of training, awareness and educational materials Budget: 45,000 (Y1 5,000, Y2 15,000, Y3 15,000, Y4 5,000, Y5 5,000)
44	Capacity building related to ICFIS and Forest-Climate Vulnerability Atlas for 200 personnel Budget: 60,000 (Y3 20,000, Y4 20,000, Y5 20,000) Peatland restoration and fire-risk assessment training sessions for Bomba & JPNS Budget: 60,000 (Y1 5,000, Y2 20,000, Y3 15,000, Y4 15,000, Y5 5,000) Inter-institutional coordination and SOP inception workshop Budget: 45,000 (Y1 15,000, Y2 10,000, Y3 10,000, Y4 7,000, Y5 3,000) Restoration and hydrology training workshops Budget: 15,000 (Y2 10,000, Y3 3,000, Y4 2,000) Dashboard and adaptive management training — live-dashboard demonstration on commissioned IoT monitoring system. Budget: 10,000 (Y3 5,000, Y4 3,000, Y5 2,000) Consultations and capacity development of stakeholders (Forestry department, MADA, SADA) related to watershed management and forest enrichment Budget: 15,000 (Y3 5,000, Y4 5,000, Y5 5,000) SWAT modelling, reporting, and technical workshops/training for FRIM (Y3,Y5) Budget: 7,000 (Y3 3,500, Y5 3,500) Urban NbS planning, retention-pond management and adaptive maintenance training for municipal agencies Budget: 15,000 (Y3 5,000, Y4 5,000, Y5 5,000)

	Monitoring system operation training (Dashboard, sensor-system and monitoring-protocol) for MPKP staff Budget: 10,000 (Y3 5,000, Y4 2,500, Y5 2,500) Technical training related to BRAHMS database to provide hands-on training, customize the database for MPKP's native nursery, and transfer technical knowledge to FRIM and MPKP staff Budget: 5,000 (Y1 5,000) Bioacoustic and biodiversity monitoring technical training for municipal/technical personnel Budget: 13,000 (Y2 4,000, Y3 3,000, Y4 3,000, Y5 3,000)
45	SWAT modelling expert from Universiti Malaysia Terengganu (UMT) Budget: 3,000 (Y3 1,500, Y5 1,500)
46	Design, development of knowledge management strategy, NbS Knowledge Portal and NbS materials Budget: 40,000 (Y1 20,000, Y2 20,000) Design and development of knowledge products, policy briefs and case studies Budget: 60,000 (Y3 20,000, Y4 20,000 Y5 20,000)
47	Digital camera, projector, licenses and audiovisual equipment for communications Budget: 15,000 (Y1 15,000)
48	National dissemination event, three sub-national learning events Budget: 70,000 (Y4 20,000, Y5 50,000)
49&50	UNDP Operational Support Services costs with annual allocation of 18,224, totalling 91,120. The services include HR related process, procurement of goods and services, financial processing, administration supports, etc.
51	Journal publication fees, Printing of awareness and training materials, case studies and other project materials Budget: 35,000 (Y1 7,000, Y2 7,000, Y3 7,000, Y4 7,000, Y5 7,000)
52	Short term project support for data collection and field verification (4 people) Budget: 100,000 (Y1 20,000, Y2 20,000, Y3 20,000, Y4 20,000, Y5 20,000) Short-term project support for stakeholder consultations, validation activities, data checking and documentation support (1 person) Budget: 45,000 (Y2 15,000, Y3 15,000, Y4 15,000)
53	PMU workstations/laptops, IT equipment, software licences Budget: 22,456 (Y1 13,956, Y2 1,500, Y3 4,500, Y4 1,500, Y5 1,000)
54	Office set-up (furniture etc) Budget: 15,000 (Y1 15,000)
55	Office supplies and operational expenditures Budget: 9,000 (Y1 2,000, Y2 2,000, Y3 2,000, Y4 2,000, Y5 1,000)
56	Inception workshop (10,000 Y1), Project Board/TWG meetings (5,000/annually) Budget: 35,000 (Y1 15,000, Y2 5,000, Y3 5,000, Y4 5,000, Y5 5,000) Stakeholder consultations related to methodologies/model mapping and assessment Budget: 15,000 (Y1 15,000) Stakeholder consultations and validation workshops supporting sustainable finance assessment, institutional uptake, replication and scaling of project approaches Budget: 40,000 (Y1 10,000, Y3 10,000, Y4 10,000, Y5 10,000) Technical working group meetings, stakeholder consultations and validation workshops supporting ICFIS development, testing and coordination Budget: 55,000 (Y1 15,000, Y2 15,000, Y3 10,000, Y4 10,000, Y5 5,000) PMU, FRIM and key stakeholder capacity development workshops (project implementation, safeguards, monitoring, gender) Budget: 30,000 (Y1 10,000, Y3 10,000, Y5 10,000) PMU/FRIM workshops Y1-5 Budget: 40,000 (Y1 8,000, Y2 8,000, Y3 8,000, Y4 8,000, Y5 8,000) GESI, safeguards, grievance redress and inclusive-participation stakeholder consultation workshops and training for FRIM and key stakeholders Budget: 30,000 (Y1 10,000, Y3 10,000, Y5 10,000)
57	PMU and EE travel for project monitoring and implementation supervision Budget: 50,000 (Y1 10,000, Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000) Domestic travel for technical assessments, meetings with data providers, field verification, validation and system testing Budget: 50,000 (Y1 10,000, Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000) Travel costs for regional, national and sub-national learning events, regional exchange visits and cooperation Budget: 60,000 (Y2 20,000, Y3 20,000, Y4 20,000) Travel supporting institutional consultations, stakeholder engagement, knowledge exchange, validation activities and dissemination events under Output 1.3 Budget: 20,000 (Y1 5,000, Y3 5,000, Y4 5,000, Y5 5,000) Municipal exchange visits and site demonstrations (Y2-Y5). Budget: 18,000 (Y2 5,000, Y3 5,000, Y4 5,000, Y5 3,000) Field travel for implementation, including seed collection, wildling rescue and propagation programme Budget: 25,000 (Y1 5,000, Y2 5,000, Y3 5,000, Y4 5,000, Y5 5,000) Field implementation travel Budget: 50,000 (Y1 10,000, Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000) Field travel supporting stakeholder consultations, field verification and validation activities Budget: 40,000 (Y2 10,000, Y3 10,000, Y4 10,000, Y5 10,000)

IE fee breakdown

Category	Services Provided by UNDP	IE Fee (USD)
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Identification, Sourcing and Screening of Ideas	Provide information on substantive issues in adaptation and innovation associated with the purpose of the AF. Engage in upstream policy dialogue related to a potential application to the AF. Verify soundness & potential eligibility of identified ideas for AF.	39,171
Feasibility Assessment / Due Diligence Review	Provide up-front guidance on converting general ideas into a feasible project/programme. Source technical expertise in line with the scope of the project/programme. Verify technical reports and project conceptualization. Provide detailed screening against technical, financial, social and risk criteria and provide statement of likely eligibility against AF requirements. Determination of execution modality and local capacity assessment of the executing entity. Assist in identifying technical partners. Validate partner technical abilities. Obtain clearances from AF.	117,512
Development & Preparation	Provide technical support, backstopping and troubleshooting to convert the idea into a technically feasible and operationally viable project/programme. Source technical expertise in line with the scope of the project/programme needs. Verify technical reports and project conceptualization. Verify technical soundness, quality of preparation, and match with AF expectations. Negotiate and obtain clearances by AF. Respond to information requests, arrange revisions etc.	156,682
Implementation	Technical support in preparing TORs and verifying expertise for technical positions. Provide technical and operational guidance project teams. - Verification of technical validity / match with AF expectations of inception report. Provide technical information as needed to facilitate implementation of the project activities. Provide advisory services as required. Provide technical support, participation as necessary during project activities. Provide troubleshooting support if needed. Provide support and oversight missions as necessary. Provide technical monitoring, progress monitoring, validation and quality assurance throughout. Allocate and monitor Annual Spending Limits based on agreed work plans. Receipt, allocation and reporting to the AFB of financial resources. Oversight and monitoring of AF funds, including audit. Return unspent funds to AF.	352,535
Evaluation and Reporting	Provide technical support in preparing TOR and verify expertise for technical positions involving evaluation and reporting (including for the Mid-Term- and Terminal Evaluations). Participate in briefing / debriefing (including for the Mid-Term and Terminal Evaluations). Verify technical validity / match with AF expectations of all evaluation and other reports (including supervision/development of the Baseline Data Report, Project Performance Report, and Project Completion Report, the Mid-Term and Terminal Evaluations). Undertake technical analysis, validate results, and compile lessons Disseminate technical findings	117,512
Total IE Fee		783,410

H. Milestones and disbursement schedule

	Upon signature of Agreement	One Year after Project Start a)	Year 2b)	Year 3	Year 4 c)	Total
Scheduled date	1/2/2027	1/2/2028	31/1/2029	31/1/2030	31/1/2031	
Project Funds	1,941,007	2,245,405	2,264,265	1,678,191	1,087,722	\$9,216,590
Implementing Entity Fees	412,354	114,516	115,478	85,588	55,474	\$783,410
Total	2,353,361	2,359,921	2,379,743	1,763,779	1,143,196	\$10,000,000

a) Use projected start date to approximate first year disbursement

b) Subsequent dates will follow the year anniversary of project start

