ADAPTATION FUND

# CONCEPT NOTE PROPOSAL FOR SINGLE COUNTRY

## PART I: PROJECT/PROGRAMME INFORMATION

| | |
|---|---|
| **Title of Project/Programme:** | Strengthening Resilience and Adaptive Capacity by Piloting Nature Based Solutions for Water Management in Malaysia |
| **Country:** | Malaysia |
| **Thematic Focal Area:** | Nature Based Solutions, Flood Management |
| **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 concept has been submitted before

☐ This is the first submission ever of the concept proposal

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

First submission: 6 Jan 2026, 1st technical review: 6 Feb 2026, 2nd technical review 3 March 2026

**Please note that concept note documents should not exceed 50 pages, including annexes.**

# Project/Programme Background and Context

## A. Country context and Climate Change rationale

Malaysia is an urbanized, upper-middle-income country with a diverse population of 34.1 million (2024), driven by its services and manufacturing sectors. The nation is recognized as one of the world's 17 megadiverse countries; however, this biodiversity is threatened by deforestation, pollution, and escalating climate change impacts.

Malaysia faces profound and escalating challenges related to national water security, food production systems, and urban resilience, driven by intensifying climate extremes. The country is exposed to a wide spectrum of natural hazards amplified by climate change, including extreme weather events, flooding, drought, sea-level rise, and increasing temperatures. These pressures necessitate systematic adaptation action to enhance national resilience, benefiting people, livelihoods, and ecosystems.

### 1. Climate impacts and hazards[1]

Climate change has heightened the frequency and destructive impact of both sudden-onset disasters and slow-onset events, imposing substantial socioeconomic and environmental losses across Malaysia.

- **Intensifying flooding:** Flooding events are becoming increasingly frequent and severe, causing catastrophic loss of lives and livelihood. Official flood reports have increased exponentially, from 91 in 2002 to 1,057 in 2021. Currently 10.1% of the country's total land area (approximately 33,300 km2) is identified as flood prone. This intensification is a primary driver of sudden-onset disasters across the peninsula and East Malaysia.
- **Drought and catastrophic fire risk:** Prolonged dry spells and rising heat accelerate soil-moisture depletion, causing irreversible desiccation in peatlands. This threat is demonstrated by events such as the 2021-2022 drought, which precipitated a significant water crisis across Selangor and elevated the risk of severe peatland fires. This vulnerability is historically evident in the Kuala Langat North Forest Reserve (KLNFR), where approximately 360 hectares were burnt between 2012 and 2017.
- **Coastal and marine threats:** Coastal zones face acute vulnerability to storm surges and inundation influenced by sea-level rise, causing significant coastal erosion. Furthermore, marine ecosystems, notably coral reefs, suffer from coral bleaching during extreme temperature events.
- **Increasing temperatures:** Malaysia is experiencing a steady rise in surface temperatures, which acts as a force multiplier for existing vulnerabilities. Beyond the environmental impact on water evaporation rates and crop yields, high temperatures pose a severe risk to public health, including a surge of vector-borne diseases, such as dengue. Under high-emission scenarios, heat-related mortality is projected to increase significantly, potentially reaching 45 deaths per 100,000 by 2080.

### 2. Vulnerability assessment[2]

The adverse impacts of these climate hazards are felt unevenly, concentrating risk within specific geographic areas, economic sectors, and demographic groups.

- **Urban exposure:** 75% of the population resides in cities, facing intensifying threats from recurrent flash floods and escalating urban heat island effects. While typical heat island

[1] Ministry of Finance, Ministry of Natural Resources and Environmental Sustainability, National Disaster Management Agency, Sarawak Forestry Department, World Bank report "Climate Risk Country Profile: Malaysia" (2021), World Bank and Bank Negara Malaysia, 2021 "Floods and Finance: Building Resilience of Malaysian Businesses".

[2] Department of Statistics Malaysia (DOSM) National Population & Housing Census (2020), Department of Agriculture, Muda Agricultural Development Authority (MADA), World Bank "Country Climate and Development Report (CCDR) for Malaysia (2022), "Murdiyarso et al. (2010). The opportunity of peatlands in global climate change mitigation."

increases are 2–3°C, observed increases have reached up to 6.33°C in some cities significantly increasing the sensitivity of urban dwellers to heat stress. This vulnerability is compounded by rapid urbanization and the loss of natural 'sponge' capacity in catchments, which reduces the landscape's ability to absorb and slow down flood waters.

- **Vulnerable ecosystems and Indigenous Peoples:** Intensifying climate variability undermines strategic forest and peatland ecosystems, threatening their vital role in water security and carbon storage. This directly jeopardizes the livelihoods and cultural practices of Indigenous Peoples (e.g. Orang Asli Temuan) who are dependent on these ecosystems and highly exposed to water scarcity and fire hazards.
- **Agricultural livelihoods:** The agriculture sector is highly sensitive to climate shifts. Paddy farmers face potential yield reductions of up to 31% by 2050. Recent localized catastrophes, such as the 2024 floods in major agricultural zones, highlight the immediate threat to national food security and the high-stakes necessity for resilient infrastructure.
- **Water security and the "water paradox":** Critical catchments are functionally compromised by land degradation, jeopardizing stable water supply for millions. This creates a current water stress paradox: 97% of the population relies on surface water, making them simultaneously vulnerable to flood-driven sediments that clog infrastructure and drought-driven depletion that cuts off supply. Degraded peatlands face severe fire risk, compromising massive carbon stores (estimated at 9.1 billion tonnes nationwide).
- **Economic loss:** Between 2021 and 2023, flood-related losses alone amounted to RM 7.9 billion (approx. USD 1.872 billion), highlighting the vulnerability of national financial stability to climate shocks.
- **Social and gender vulnerability:** Climate-induced losses and stress disproportionately affect female-headed households and the poorest farmers. The increased burden of water collection for domestic use during drought events falls primarily on women and girls. Further, women's ability to participate in and influence formal water governance and adaptation planning is limited, compounding their climate vulnerability.

## 3. Climate trends and projections[3]

The necessity for adaptation action is supported by quantitative climate data illustrating ongoing and projected risks based on available scientific information. Malaysia is experiencing clear and accelerating impacts of climate change, with historical data showing a consistent temperature rise of 0.13-0.24° C per decade over the past 50 years. National projections indicate the average annual temperature will rise by 1.1° - 1.5°C by 2050, with higher increments expected in Sabah and Sarawak.

Climate models project that the intensification of the water cycle will lead to more frequent and intense heavy precipitation events, significantly increasing flood risk, and further exacerbating the "water stress paradox" where catastrophic flooding coexists with chronic water scarcity. While 10.1% of the land area faces increased flooding, northern regions face projected dry-season rainfall reductions of up to 22% by 2050. This scientific volatility confirms that chronic water shortages and catastrophic flooding will increasingly coexist. Further, the coastline also faces the long-term threat of sea level rise, projected to reach a maximum of 0.74 meters by 2100.

*Table: Key climate trends and projections for Malaysia*

| Climate hazard | Observed trend | Projections for the 2050s |
|---|---|---|
| Rising temperatures and heatwaves | Increasing 0.13°-0.24° C/decade. | Certain increase.<br>National policy projects a rise of 1.1°C to 1.5°C by 2050. Climate models indicate a range of +0.8°C to +1.5°C (medium scenario) to +1.8°C to +3.0°C (high scenario) for the 2050s period, with higher warming in East Malaysia. |

[3] Sources: Met Malaysia, NADMA, Malaysia's National Communication to UNFCCC, IPCC AR6.
Scenarios: Medium/Low (RCP4.5), High (RCP8.5).

| | | |
|---|---|---|
| Extreme rainfall and flooding | More intense heavy rain events; 10.1% of land is flood-prone. | Certain increase in intensity.<br>Heaviest 1-day rainfall events are projected to intensify by ~8-15% (medium scenario) to >15-30% (high scenario), making extreme floods more frequent and severe. |
| Drought and water scarcity | More pronounced and frequent dry spells. | Likely increase in risk.<br>Dry season (March-May) rainfall in northern regions may decrease by ~10-15% (medium scenario) to ~15-22% (high scenario), increasing drought frequency and severity, significantly compounding water stress. |
| Sea-level rise | Measured increase in coastal inundation. | Certain increase.<br>Continued and accelerated rise of 0.2-0.5m by 2050 (relative to 1995-2014), with the level significantly higher under the high-emission scenario, leading to accelerated coastal erosion, flooding, and salinization. |

## 4. Adaptation and Climate resilience pathways

To effectively counteract the identified climate impacts and vulnerabilities, the Project proposes a three-pathway strategy that systematically addresses these risks through Ecosystem-based (EbA) and Nature-Based Solutions (NbS), institutional strengthening, and local empowerment.

**Pathway 1: Enhanced Adaptive Governance and Scaling Capacity**

This pathway ensures long-term sustainability, dynamic adjustment, and national scalability of adaptation successes by establishing the necessary data, intelligence, and policy frameworks. This involves developing and operationalizing an integrated climate data and intelligence system, which systematically combines real-time field data with scientific projections and gender-disaggregated vulnerability assessments. The evidence generated by this system can then be used to develop and formalize a strategic, gender-responsive NbS policy scaling framework for guiding risk-based planning. This process culminates in the strengthening of targeted national and sub-national institutions, ensuring they formally adopt these tools and frameworks, thereby creating the blueprint for multi-city replication and preventing maladaptation.

**Pathway 2: Improved Physical Resilience and Water Security**

This pathway delivers concrete, on-the-ground physical adaptation measures across all target sites, addressing acute shared hydrological risks and vulnerability in three distinct landscapes: upstream catchments, key natural storage areas, and downstream urban zones. The strategy involves deploying innovative, localized Nature-based Solutions (NbS) and Ecosystem-based Adaptation (EbA) measures. Specifically, this includes installing modular floating water storage units to establish distributed water retention and storage in peatlands for fire mitigation, which is crucial for significantly reducing catastrophic fire hazards and securing reliable water for indigenous communities. Concurrently, EbA measures, such as Forest Enrichment and Erosion Control, will be implemented in degraded upstream forested catchments to improve hydrological function, delay runoff, and strengthen water security. Finally, in urban areas, Nature-Based Solutions (NbS) assets , including the ecological upgrading of retention ponds, vegetated berms, and drainage channels into multi-functional blue-green infrastructure, will be implemented to enhance flood buffering capacity and provide measurable microclimate regulation and urban cooling benefits.

**Pathway 3: Strengthening Local Capacity, Livelihoods, and Sustainability**

This pathway focuses on the "human dimension" of adaptation, ensuring local ownership, economic empowerment, and sustainability. This is achieved by establishing climate-smart livelihood models, such as Women-Prioiritized Community Nurseries, to provide sustained, diversified income and ensure planting material for ecosystem restoration. Furthermore, the Project will foster community-level adaptive capacity through citizen science initiatives (e.g., bioacoustic monitoring) and formalizing inclusive local decision-making mechanisms (Water User Associations) to manage NbS assets and secure community benefits. The pathway is completed

by strengthening institutional and community capacity (training over 600 individuals) and establishing a National Climate Knowledge Portal to systematically capture, package, and disseminate adaptation knowledge and lessons learned across the country, ensuring the long-term viability of the project's investments.

**5. Integration with Malaysia's policies/strategies[4]**

The Project is designed for full alignment with Malaysia's adaptation mandate, directly supporting the upcoming National Adaptation Plan (MyNAP 2026–2035), the Nationally Determined Contribution 3.0 (NDC 3.0), National Climate Change Policy 2.0 and the Thirteenth Malaysia Plan (2026–2030) by focusing on integrated, risk-based planning and resilience measures in water, infrastructure, and ecosystems.

- **National Adaptation Plan (MyNAP 2026–2035):** The project provides the foundational data, technical expertise, and institutional protocols necessary for the effective, evidence-based implementation of Malaysia's first NAP (expected finalization in 2026)
- **Nationally Determined Contribution 3.0 (NDC 3.0. 2025):** The Project directly supports adaptation strategies outlined in the NDC 3.0., focusing on resilience in water resources, agriculture, infrastructure, and ecosystems.
- **National Climate Change Policy 2.0 (NCCP 2.0. 2024):** The strategy directly supports Strategic Thrust 3 (to emphasize adaptation and climate resilience measures) by mandating risk-based planning and undertaking integrated approaches.
- **Thirteenth Malaysia Plan (2026–2030):** The approach is fully consistent with the Thirteenth Malaysia Plan (2026–2030), directly supporting the objective of strengthening Climate Mitigation and Adaptation.

However, despite the strong national policy framework for climate change action, a number of systemic, non-climatic barriers impact the effective implementation of adaptation measures. These barriers—rooted in governance fragmentation, reliance on non-contextual data, challenges in land-use enforcement, and socio-economic inequities—currently prevent local successes from translating into national, scalable resilience:

- **Policy/institutional and Jurisdictional fragmentation:** Effective adaptation is hindered by fragmented governance and policy misalignment across federal, state, and local levels. This gap hinders inter-institutional coordination, making it difficult to translate successful pilots into standardized, scalable national policy frameworks. The jurisdictional complexity of regions like Sarawak and Sabah exacerbates this challenge to unified national action.
- **Gaps in applied, context-specific Ecosystem-based Adaptation (EbA) and Nature-based Solutions (NbS):** Implementation of EbA and NbS is impacted by a significant knowledge gap regarding their efficacy in Malaysia's tropical environment. A heavy reliance on non-contextual data from temperate regions risks the oversimplification and misuse of NbS by decision-makers. This absence of proven local models increases the risk of maladaptation and poor environmental outcomes.
- **Weak enforcement and land-use instability in critical catchments:** Ecosystem resilience is fundamentally compromised by the lack of enforcement of sustainable land-use practices in critical areas like the Ulu Muda watershed. Land conversion and logging cause severe erosion and sedimentation, which directly threatens national water security and food production. Addressing this requires institutional frameworks to target the root drivers of land-use change beyond traditional mandates.
- **Insufficient climate data integration and adaptive management:** Decision-making is constrained by a data fragmentation gap across agencies, preventing the effective fusion of real-time field data with climate projections. This lack of Integrated Climate–Forest Intelligence impacts evidence-based planning and risk-informed decision-making. Furthermore, protocols often lack the adaptive governance mechanisms necessary to adjust infrastructure

[4] Malaysia NDC 3.0 to UNFCCC 2025, National Climate Change Policy 2.0, Ministry of Natural Resources and Environmental Sustainability (NRES), World Bank.

maintenance based on dynamic ecological indicators.

- **Socio-economic inequity and gender-differentiated vulnerability:** Climate impacts disproportionately affect marginalized groups. This is rooted in pre-existing social norms, which impose the primary burden of water security on women while limiting their representation in formal governance. This necessitates dedicated efforts to apply principles such as Free, Prior, and Informed Consent (FPIC) for Indigenous Peoples and enforce mandatory social inclusion mechanisms.
- **Technical capacity and financial resource mobilization:** Scaling successful local innovations is challenged by significant barriers in knowledge transfer and capacity building. Critically, Malaysia faces a large climate financing gap estimated at nearly RM 392 billion or approximately USD 83.3 billion for adaptation over the next 50 years *(NPCC 2.0)*. This systemic challenge in mobilizing long-term investment undermines the sustainable operation and maintenance of climate resilience systems.

## B. Project sites

Focusing on Peninsular Malaysia, the Project will implement interventions in the states of Selangor and Kedah, alongside the Federal Territory of Kuala Lumpur (KL). These sites are linked by their severe exposure to water-related climate threats (flash floods, drought, and heat stress) and represent critical ecosystems requiring urgent Nature-based Solutions (NbS). The Project strategically targets NbS adaptation across three critically vulnerable systems:

- Peat Swamp Forests (Selangor): Essential for carbon storage and securing water for indigenous communities.
- Terrestrial catchments (Kedah/Ulu Muda): Vital for regulating water supply for national rice production and millions of downstream users.
- Vulnerable urban/peri urban areas (Kedah/Kubang Pasu, Selangor, Kampung Cempaka, Petaling Jaya and Kuala Lumpur/Kampung Pasir Baru): Requiring NbS to enhance flood mitigation and urban cooling.

*Map of Project sites:*


*Table: Project sites and component linkages*

| State | Project Site | Project Component(s) |
|---|---|---|
| **Nationwide (Cross-cutting)** | National Institutions and all project sites | **Component 1:** Focuses on national relevance by establishing the Integrated Climate–Forest Intelligence System (ICFIS) and the National Vulnerability Atlas. This system integrates data from all physical sites to provide evidence-based decision-making tools and institutionalize adaptive planning capacity at the national and state levels. |
| **Selangor** | Raja Musa | **Component 2:** Physical deployment of the AquaVault as a core EbA intervention ) |

| | | |
|---|---|---|
| | Forest Reserve and Kuala Langat Utara Forest Reserve (KLNFR) (Rural Site) | to stabilise peat moisture and reduce fire risk while providing reliable water supplies for the indigenous Orang Asli Temuan communities.<br>**Component 3:** Local capacity and citizen science monitoring, specifically focused on peatland ecosystem monitoring, co-management, and maintenance of the NbS infrastructure. |
| **Selangor** | Kampung Cempaka, Petaling Jaya (Urban Site) | **Component 3:** Local capacity, citizen science, Women-Prioritized livelihood initiatives, and small-scale NbS pilot for validating the Urban Resilience Toolkit and collecting data relevant to urban water security and flood risk reduction. |
| **Kedah** | Ulu Muda Watershed (Rural Site) | **Component 2:** Physical pilot for upstream catchment management, including forest enrichment and erosion control (EbA) to enhance the water security of the Muda Dam.<br>**Component 3:** Local capacity and citizen science monitoring, providing ecological monitoring and community support for the upstream Nature-Based Solutions (NbS). |
| **Kedah** | Kubang Pasu District (Urban/Municipal Site) | **Component 2:** The urban resilience pilot for Northern Malaysia, including upgrading retention ponds with NbS and deploying mini-forests for flood and heat reduction.<br>**Component 3:** Local capacity, citizen science, and the establishment of Women-Prirotized Community Nurseries to support the implementation and long-term maintenance of the urban NbS infrastructure. |
| **Kuala Lumpur** | Kampung Pasir Baru (Urban Site) | **Component 3:** Local capacity and citizen science monitoring, including the small-scale NbS pilot for validating the Urban Resilience Toolkit, and collecting data relevant to high-density urban flood risk. |

**Description of Project sites**

**Kuala Langat North Forest Reserve (KLNFR), Selangor**

The Kuala Langat North Forest Reserve (KLNFR), Selangor, is one of the last remaining peat swamp ecosystems in Peninsular Malaysia, though it has been severely reduced to just 957.6 hectares due to decades of drainage and fragmentation. Ecologically, it is highly significant for its role in carbon sequestration (protecting massive carbon stores), groundwater regulation, and biodiversity support, hosting endangered species such as the Malayan Sun Bear. Critically, the Temuan Orang Asli communities—totaling approximately 750 people across Kampung Busut Baru and Kampung Bukit Tadom—rely heavily on this ecosystem for their water, food sources, cultural practices, and daily livelihoods, making them directly vulnerable to any further peatland degradation. The reserve is under severe climate-related stress: hydrological disruptions combined with climate-induced droughts and high heat anomalies accelerate peat drying. This has resulted in a high risk of catastrophic fire events, notably in 2014 when over 350 hectares were lost, compromising the massive carbon sink and local air quality.

**Kampung Cempaka, Petaling Jaya, Selangor**

Kampung Cempaka is a compact residential settlement situated within the active floodplain of the Kayu Ara River, highly vulnerable to sudden flash floods and heat stress. Climate change-driven high-intensity storms are now more frequent, causing the river to respond rapidly; for instance, a two-hour storm in 2025 delivered 103 millimeters of rain and caused sudden flooding that entered 40 homes. A similar situation occurred in 2024 when the river exceeded its alert level during a severe downpour. Hydrological studies show that the catchment has one of the fastest runoff responses in the region. Flood histories and community accounts describe repeated inundations dating back to the early 1990s, often occurring with little warning. These acute events are compounded by decades of upstream urbanisation. The settlement has a large proportion of elderly residents, increasing its social sensitivity to these rapid-onset disasters. Environmental conditions along the river corridor show stress from sedimentation and pollution events, but the corridor retains ecological value.

**Ulu Muda Watershed, Kedah**

The Ulu Muda forested catchment, Kedah plays a vital role in ensuring water security for northern Peninsular Malaysia, supplying raw water to the Muda and Pedu dams. The forest reserve's ecosystem services are crucial for the region's population and economy, providing essential water for domestic, industrial, and agricultural use in three states: Kedah, Penang, and Perlis. In total, the Ulu Muda Forest Reserve provides water for an estimated population of over 4.15 million people across the three states. A gender analysis for the MADA region indicates that 35% of smallholder farmers are women (MADA, 2023), who are overrepresented in informal agricultural work and bear the primary responsibility for household water security, yet face limited access to formal climate information and irrigation resources. This social context requires a fully inclusive, gender-responsive approach to water management to address the underlying hydrological instability of critical water source catchments.

**Kubang Pasu District, Kedah**

The Kubang Pasu District, Kedah is a strategically important administrative and economic hub in northern Peninsular Malaysia, featuring a population of approximately 250,000 residents. Its economy is underpinned by agriculture, with 35% of land (33,773 hectares) under the Muda Agricultural Development Authority's (MADA) irrigation system, contributing substantially to Kedah's rice production. Further, the district includes the Bukit Kayu Hitam ICQS Complex, a critical national asset, serving as Malaysia's busiest land crossing with over 1.2 million cross-border movements annually. Climate change presents escalating threats, demonstrated by the catastrophic 2024 floods which ranked Kubang Pasu among Kedah's top three most affected districts for residential damages. The floods inflicted severe damage, causing RM 9.4 million (approx. USD 2.2 million) in residential losses and paralyzing the vital Bukit Kayu Hitam ICQS Complex for over 72 hours. Scientific projections warn of a potential 3° C temperature increase by 2100, which could diminish rice yields by 15-20% and exacerbate existing agricultural vulnerabilities.

**Kampung Pasir Baru, Kuala Lumpur**

Kampung Pasir Baru is a long-established, dense urban settlement in Kuala Lumpur, highly exposed to recurrent deep flooding and intensifying heat stress. It comprises approximately 433 homes with a population of 1,339 people (2024). Recent severe rainfall events (e.g. >100 mm in three hours) have caused significant impacts, including the evacuation of 146 people to temporary shelters during the 2021 and 2022 storms. The primary climate risks are compounded by a low elevation beside the Klang River, rapid runoff from the Bukit Gasing catchment, and long-standing vulnerabilities in constrained drainage outlets and the reliability of the pump house system. These pressures affect daily life, with disruptions to work and mobility, and are exacerbated by the fact that households and small businesses typically have no access to flood insurance, increasing financial exposure. Despite these challenges, Kampung Pasir Baru exhibits strong social cohesion, with the Residents' Association having initiated community disaster plans and volunteer response teams.

## Project Objectives

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.

## Project/Programme Components and Financing

| Programme Components | Expected Concrete Outputs | Output Level Budget (USD$) | Expected Outcomes | Amount (US$) |
|---|---|---|---|---|
| **Component 1: Strengthening Institutional Governance and Evidence-Based Decision-Support Systems** | **1.1:** Integrated Climate–Forest Intelligence System (ICFIS) and Site-Specific Risk Assessment Reports operationalized. | 600,000 | **Outcome 1: Institutions applying climate intelligence and unified policy frameworks in adaptive planning.** | 1,750,000 |
| | **1.2:** National Forest-Climate Vulnerability Atlas and Integrated Water-Resilience NbS Planning Protocols endorsed. | 550,000 | | |
| | **1.3:** Multi-City Adaptive Governance Scaling Framework and Urban Resilience Toolkits formally adopted. | 600,000 | | |
| **Component 2: Implementation of Ecosystem-based Adaptation (EbA) and Integrated Nature-based Solutions for Climate Resilience** | **2.1:** Climate-Resilient Water Storage and Infiltration Infrastructure (AquaVault) deployed in priority peatlands. | 1,500,000 | **Outcome 2: Ecosystems delivering restored hydrological and buffering functions.** | 5,000,000 |
| | **2.2:** Ecosystem-Based Adaptation (EbA) and Forest Enrichment implemented in upstream watersheds. | 2,000,000 | | |
| | **2.3:** Integrated Urban and Peri-Urban NbS Assets deployed for multi-city flood/heat resilience. | 1,500,000 | | |
| **Component 3: Institutionalizing Capacity and Sustainable Livelihoods** | **3.1:** Community-led Livelihoods and Adaptive Water Governance Models established | 750,000 | **Outcome 3: Communities sustaining NbS assets through formalized stewardship and diversified income.** | 1,591,014 |
| | **3.2:** National and Sub-National Technical Capacity for Climate Intelligence and EbA Monitoring operationalized. | 641,014 | | |
| | **3.3:** National Knowledge Portal and Scaling Framework for EbA Sustainability operationalized. | 200,000 | | |
| | Total component cost | | | 8,341,014 |
| | Project/Programme Execution cost | | | 875,576 |
| | Total Project/Programme Cost | | | 9,216,590 |
| | Project/Programme 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 project's Theory of Change (ToC) is built on the logic that resolving Malaysia's "water stress paradox" - the coexistence of catastrophic flooding and chronic water scarcity - requires moving beyond fragmented, reactive disaster management toward a proactive, landscape-based resilience model. The project moves from reactive management to a proactive landscape model. This is achieved by using Component 1 evidence to strategically deploy Component 2 physical

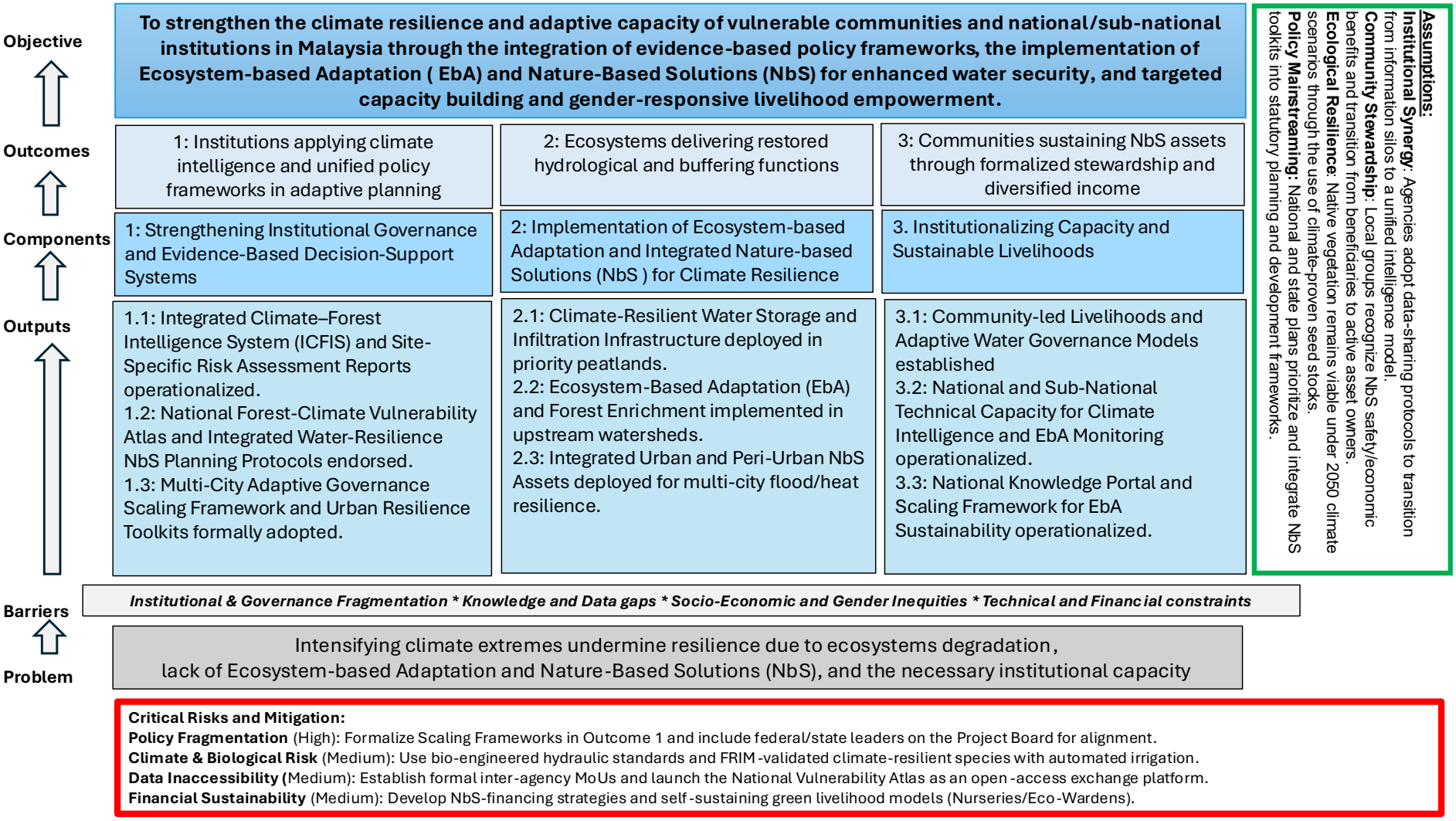
assets, which in turn demonstrate the tangible benefits required to catalyze Component 3 community-led management and long-term maintenance.

| Component | Logic Statement | Causal Link to Outcome/Objective | Key Assumptions |
|---|---|---|---|
| **Component 1:** Strengthening Institutional Governance and Evidence-Based Decision-Support Systems | **IF** the ICFIS "intelligence hub" and National Vulnerability Atlas are established and operationalized, **THEN** national and municipal agencies gain the capacity to transition from reactive responses to proactive, data-driven adaptation planning. | **LEADING TO** the formal institutionalization of climate-risk data into statutory municipal planning and national policy. This creates a shift from reactive, emergency-based responses to proactive, risk-informed governance where data directly triggers decision making (Outcome 1). | **Institutional synergy:** Inter-agency data-sharing protocols are established, and technical staff are retained to maintain the digital infrastructure. |
| **Component 2:** Implementation of Ecosystem-based Adaptation (EbA) and integrated Nature-based Solutions for Climate Resilience | **IF** modular NbS like "AquaVault", forest enrichment in critical watersheds, and urban EbA are deployed, **THEN** restored ecosystem services will stabilize “impacts of” hydrological cycles and buffer against extreme climate variability. | **LEADING TO** the restoration of ecosystems that deliver quantifiable buffering functions. This includes measurable reductions in flood peaks, stabilized water tables during drought, and a significant decrease in peatland fire frequency across the targeted landscapes (Outcome 2). | **Ecological resilience:** Native vegetation and climate-proven seed stocks remain biologically viable under localized 2050 temperature and precipitation projections. |
| **Component 3:** Institutionalizing Capacity and Sustainable Livelihoods | **IF** a certified community workforce and women-prioritized supply chains are established, **THEN** localized maintenance protocols and diversified economic safety nets are institutionalized. | **LEADING TO** local communities sustaining and protecting physical assets through formalized co-management structure. This results in the long-term operational viability of NbS infrastructure through local O&M capacity and the creation of diversified, climate-resilient economic safety nets (e.g., women-led nurseries) (Outcome 3). | **Community stewardship:** Local communities perceive the tangible safety and economic benefits of the interventions, ensuring high levels of participation and asset ownership. |

**Critical Risks and Mitigation Measures:**

- **Policy & Jurisdictional Fragmentation (High):** Overlapping federal and state jurisdictions regarding land and water management may lead to coordination bottlenecks that delay the scaling of EbA interventions. Mitigation: Formalize Scaling Frameworks in Outcome 1 and include senior federal/state officials on the Project Board to ensure vertical alignment.
- **Extreme Climate & Biological Vulnerability (Medium):** Intensified and more frequent floods, prolonged droughts or extreme heat may cause damage to assets and seedling loss. Mitigation: Use bio-engineered hydraulic standards and propagate climate-resilient species via FRIM research. Nurseries will use independent, automated rainwater irrigation for dry-spell survival.
- **Data Inaccessibility & Institutional Silos (Medium):** Limited sharing may impede the ICFIS. Mitigation: Establish formal MoUs during the PFG phase and design the National Vulnerability Atlas as a centralized, open-access platform to incentivize inter-agency data exchange.
- **Financial Sustainability & Maintenance Gaps (Medium):** Budgets may be insufficient to maintain assets. Mitigation: Develop EbA Financing Strategies. The Women-Prioritized Nursery and Eco-Warden models create self-sustaining units that internalize maintenance costs locally.

*Figure: Theory of change diagramme*




**Critical Risks and Mitigation:**
**Policy Fragmentation** (High): Formalize Scaling Frameworks in Outcome 1 and include federal/state leaders on the Project Board for alignment.
**Climate & Biological Risk** (Medium): Use bio-engineered hydraulic standards and FRIM-validated climate-resilient species with automated irrigation.
**Data Inaccessibility** (Medium): Establish formal inter-agency MoUs and launch the National Vulnerability Atlas as an open-access exchange platform.
**Financial Sustainability** (Medium): Develop NbS-financing strategies and self-sustaining green livelihood models (Nurseries/Eco-Wardens).

# PART II. PROJECT/PROGRAMME JUSTIFICATION

## A. Description of programme components

This Project is designed to fundamentally strengthen Malaysia's long-term climate resilience and adaptive capacity. It achieves this by systematically linking targeted, on-the-ground interventions with strengthened national and sub-national institutional capacity. The Project is structurally designed as a National Scaling Model: site pilots (Component 2) generate validated performance data and lessons that are directly fed into the policy framework (Component 1), thereby enabling streamlined replication. The Project is organized around three interconnected operational components, each designed to achieve a specific measurable change (Outcome):

- **Component 1: Strengthening Institutional Governance and Evidence-Based Decision-Support Systems**
  - **Outcome 1: Institutions applying climate intelligence and unified policy frameworks in adaptive planning.**

- **Component 2: Implementation of Ecosystem-based Adaptation (EbA) and Integrated Nature-based Solutions for Climate Resilience**
  - **Outcome 2: Ecosystems delivering restored hydrological and buffering functions.**

- **Component 3: Institutionalizing Capacity and Sustainable Livelihoods**
  - **Outcome 3: Communities sustaining NbS assets through formalized stewardship and diversified income.**

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

**Outcome 1: Institutions applying climate intelligence in adaptive planning.**

This component serves as the project's strategic intelligence backbone, moving beyond data collection to resolve fragmented governance. By establishing an innovative data-governance linkage, it provides the institutional blueprint to ensure adaptation efforts are evidence-based. Success is achieved when municipal and national agencies actively integrate the ICFIS, Atlas, and Planning Protocols into their statutory land-use frameworks and budgets, pioneering a nationally transferable model for NbS/EbA scaling.

**Output 1.1: Integrated Climate–Forest Intelligence System (ICFIS) and Site-Specific Risk Assessment Reports operationalized**

Delivers the foundational data infrastructure and analytical intelligence required to anchor and target the project's technical interventions. It is organized into three core workstreams:

**Baseline Evidence and Vulnerability Mapping** The project will first produce three detailed gender-disaggregated Vulnerability and Risk Assessment (VRA) and Hydrological Assessment Reports across the peatland, watershed, and urban sites. This analysis combines predictive climate analysis (extreme rainfall, drought) with on-ground surveys and economic modelling to accurately map physical risk hotspots. Critically, these reports analyze household-level data to quantify economic losses and identify how water stress creates differentiated impacts, such as on female-headed households and the poorest farmers, ensuring interventions are tailored to those most in need.

**Digital Intelligence and Monitoring Infrastructure** Central to this output is the delivery of the Integrated Climate–Forest Intelligence System (ICFIS), a central data management and analysis hub. The system integrates and synchronizes 100% of key data streams, fusing real-time Internet of Things (IoT) sensor data from physical interventions (Component 2), high-resolution remote-sensing indicators, and structured citizen science observations. The central dashboard will be fully

operational, explicitly tracking and visualizing at least three core gender and social-disaggregated indicators. To ensure long-term sustainability, the ICFIS infrastructure is formally anchored within the National Hydraulic Research Institute of Malaysia (NAHRIM).

**Institutional Alignment and Policy Validation** To ensure the data leads to action, the project delivers/strengthens a High-Level Inter-Institutional Technical Platform (Steering Committee). This platform serves as the venue for the Ministry of Natural Resources and Environmental Sustainability (NRES), the Ministry of Energy Transition and Water Transformation (PETRA), and the Ministry of Economy to jointly review and validate adaptation strategies. This workstream reduces policy fragmentation by ensuring that national policy direction is co-developed and communicated consistently across all relevant agencies.

*Table: Output 1.1.*

| Activity | Stakeholders | Targets and Beneficiaries |
|---|---|---|
| **A.1.1.1: Multi-Site VRA & Hydrological Assessment.** Execute predictive modeling and household surveys to identify gender-differentiated water stress and economic loss mapping. | FRIM, NAHRIM, Local CBOs, Department of Statistics. | **Target**: Evidence-Based Targeting: 100% of project physical interventions (Component 2) sited based on high-resolution vulnerability and economic loss mapping. **Beneficiaries**: 68,230 Primary Beneficiaries (50% women) of the Project. |
| **A.1.1.2: ICFIS Dashboard & Server Development.** Integrate IoT, remote sensing, and citizen science streams into a unified visualization hub with 100% data synchronization. | NAHRIM, FRIM, MetMalaysia (Meteorology). | **Target**: Data-Triggered Budgeting: Real-time risk data utilized by national agencies to justify climate-adaptation budget allocations for 2027–2030. **Beneficiaries**: 200 national agency staff (50% women). |
| **A.1.1.3: Institutional Platform Operationalization.** Formalize/strengthen the Steering Committee to validate adaptation strategies and align cross-sectoral policy. | NRES, PETRA, Ministry of Economy. | **Target**: Policy Coherence: Validated adaptation strategies adopted across 3 ministries, reducing jurisdictional fragmentation in water management. **Beneficiaries**: Strategic oversight by agencies benefitting from ICFIS. |

**Output 1.2: Digital Forest-Climate Vulnerability Atlas and Integrated Water-Resilience Planning Protocols endorsed**

Addresses technical fragmentation by providing a unified, scientifically credible evidence base. It ensures that all subsequent climate adaptation planning and investments, especially for Nature-based Solutions (NbS), are built upon a common foundation guided by a unified procedure.

**Institutional Data Harmonization** The project will undertake a comprehensive assessment of the national institutional data landscape for climate, water, and socio-economic vulnerability across collaborating agencies. This foundational work is essential to identify existing data gaps and inconsistencies that drive fragmented planning. Based on this assessment, the project will establish a common framework for knowledge sharing and actively work to harmonize key climate and water datasets (from the project sites) among collaborating agencies. This focus on accessibility ensures that all technical decisions are built upon a common foundation, which is a prerequisite for effective inter-agency coordination.

**National Forest-Climate Vulnerability Atlas** Based on the harmonized foundation, a high-resolution, digital Forest-Climate Vulnerability Atlas (GIS-based) will be developed. This Atlas translates complex scientific data into a user-friendly national planning tool, integrating 30 years of historical data (1990-2026) with future climate projection models (2026-2100). Crucially, the Atlas will conduct multi-regional vulnerability assessments, explicitly including gender and social vulnerability layers derived from the VRA (Output 1.1). This tool will directly guide resource allocation and policy interventions toward the most vulnerable ecosystems and communities in support of the National Adaptation Plan (MyNAP2026-2035)..

**Integrated Planning Protocol and Policy Endorsement** To ensure technical coordination and utilization of the Atlas, the project will develop and institutionalize a National Integrated Water-Resilience Planning Protocol. These national protocols establish a mandatory, unified procedure for technical staff across sectors (e.g., JPSM, NAHRIM, DID, FRIM) to jointly screen, design, and validate all water-related NbS investments. These protocols serve as the operational manual for evidence-based planning. To ensure high-level uptake, the Atlas and accompanying protocols will be officially endorsed by at least three key national agencies (e.g., NRES, PETRA, and others), becoming the single source of authoritative data for climate-resilient water planning.

*Table: Output 1.2*

| Activity | Stakeholders | Targets and Beneficiaries |
|---|---|---|
| **A.1.2.1:** Data Harmonization and Assessment. Map institutional data landscapes and establish a common framework for knowledge sharing. | NAHRIM, DID, JPSM, FRIM. | **Target:** Institutional Synergy: Formal elimination of data silos; 4 major departments utilizing a single, synchronized baseline for water-resilience planning. **Beneficiaries**: 150 Agency Technical Staff (50% women) (s*ubset of the 200 national staff pool).* |
| **A.1.2.2:** GIS-based Climate-Forest Vulnerability Atlas Development. Integrate historical data and future projections with gender/social vulnerability layers. | FRIM, NAHRIM, NRES, PLANMalaysia. | **Target:** Statutory Alignment: The Atlas adopted as an evidence base for MyNAP (2026–20354) implementation and national resource allocation. **Beneficiaries**: 200 national agency staff. |
| **A.1.2.3:** Development of a National Integrated Water-Resilience Planning Protocol. Draft and institutionalize unified procedures for NbS screening and validation. | JPSM, NAHRIM, DID, FRIM. | **Target:** Standardized Engineering: Unified NbS design protocols mandated for all future federally funded water-infrastructure projects. **Beneficiaries:** Technical staff across 4 major national departments (NRES, DID, JPSM, FRIM) (s*ubset of the 200 national staff pool).* |

**Output 1.3: Multi-City Adaptive Governance Scaling Framework and Urban Resilience Toolkits formally adopted**

Acts as the critical bridge for scaling the project's impact. It systematically consolidates technical lessons from the local pilot interventions (Component 2) into a nationally replicable framework, providing municipal authorities with the policy templates, operational handbooks, and financial strategies required to institutionalize Nature-based Solutions.

**Local Institutionalization and Community Co-Management** This workstream establishes the essential governance structures needed for scalable adaptation. It secures the official adoption of the Integrated Policy-to-Practice Scaling Framework (IPPSF) principles into Local plans (Rancangan Tempatan) and Municipal Development Guidelines by the three implementing authorities: Kubang Pasu Municipal Council (MPKP), Kuala Lumpur City Hall (DBKL), and Petaling Jaya City Council (MBPJ). Complementing this top-down institutional work, the project establishes and formally recognizes three (3) Locally Led Adaptation (LLA) Co-Management Bodies. These bodies ensure community ownership and inclusive, gender-responsive decision-making, formally linking bottom-up stewardship with municipal policy.

**Adaptive Protocols and Risk Dashboards** To operationalize the new governance frameworks, the project delivers three (3) local Climate Risk & NbS Performance Dashboards. These digital tools are designed to synchronize citizen-collected data—including bioacoustic and hydrological observations from Output 3.2—with municipal management systems. This provides local decision-makers with real-time risk intelligence and the Standard Operating Procedures (SOPs) necessary for the adaptive maintenance and condition-based management of the physical NbS assets installed under Component 2.

**Tools, Finance, and National Scaling** The final workstream focuses on long-term sustainability and national reach. It consolidates all cross-cutting knowledge into a comprehensive Urban Resilience Toolkit and three dedicated Municipal NbS Operational Handbooks. These packages facilitate the rapid adoption and upgrading of thousands of retention ponds nationwide. Crucially, the project partners with the Climate Finance Innovation Lab (CFIL) to develop tailored NbS Financing Strategies. These strategies outline innovative mechanisms—such as Green Bonds, blended finance, and payment for ecosystem services (PES)—to overcome the primary barrier of resource mobilization for replication beyond the grant period.

*Table: Output 1.3*

| Activity | Stakeholders | Targets and Beneficiaries |
|---|---|---|
| **A.1.3.1: Establish LLA Bodies and Secure Policy Adoption.** Formally establish and recognize community co-management bodies and secure council-level adoption of IPPSF principles. | MPKP, DBKL, MBPJ, JAKOA, local NGOs, PlanMalaysia. | **Target**: Institutionalized Stewardship: Adaptation principles integrated into 3 Local Plans (Rancangan Tempatan), making NbS a mandatory requirement for urban development. **Beneficiaries**: 10,000 Urban Residents (50% women) |
| **A.1.3.2: Operationalize Municipal Dashboards & Protocols.** Deploy localized risk dashboards and establish SOPs for adaptive asset management and maintenance protocols. | FRIM, NAHRIM, Municipal Public Works. | **Target**: Predictive Maintenance: 3 Municipalities transitioning to maintenance triggered by real-time IoT/Citizen data. **Beneficiaries**: 30 Municipal Staff (40% women). |
| **A.1.3.3: Consolidate Scaling Toolkits & Financing Strategies.** Develop national toolkits and innovative finance mechanisms with the CFIL. | CFIL, Ministry of Finance, NRES, PlanMalaysia. | **Target**: Financial Scalability: A validated NbS financing model ready for replication across 10,000+ national sites beyond the life of the grant. **Beneficiaries**: National-scale potential for replication across >10,000 sites. |

## Component 2: Implementation of Ecosystem-based Adaptation (EbA) and Integrated Nature-based Solutions for Climate Resilience

**Outcome 2: Ecosystems delivering restored hydrological and buffering functions.**

This component constitutes the project's core physical investment. It moves beyond the "deployment of infrastructure" to achieve a measurable ecological shift: restoring the natural capacity of landscapes to regulate water. Success is defined by the transition of three high-vulnerability landscapes (peatland, watershed, and urban) into functional "sponges" that attenuate peak flood flows, sustain baseflows during droughts, and reduce fire risks. These physical assets provide the empirical foundation for the adaptive governance system (Component 1) and are maintained through the community stewardship models (Component 3).

### Output 2.1: Climate-Resilient Water Storage and Infiltration Infrastructure deployed in Priority Peatlands

Deploys the "AquaVault" modular floating system, a specialized Nature-Based Solution validated by FRIM[5] as an effective strategy for peatland rewetting. In line with the IUCN Global Standard for Nature-based Solutions[6], this technique qualifies as an NbS because it is a validated strategy to protect, sustainably manage, and restore a natural ecosystem to address societal challenges, specifically disaster risk reduction, while simultaneously providing human well-being and biodiversity benefits. By mimicking natural flood-pulse dynamics and avoiding hard-engineered drainage, the system maintains the ecosystem's natural functionality in accordance with the IUCN Global Standard.

[5] Mohd Rizuwan M., Marryanna L., Nurul Faihira K. & Abdul Razak A.R. (2024). Inovasi Floating Nursery dan Floating Lotus untuk konservasi teratai di Tasik Chini. FRIM Technical Information Handbook No. 60. Institut Penyelidikan Perhutanan Malaysia (FRIM). ISBN 978-967-2810-82-7

[6] IUCN 2020: Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of NbS. 1st ed. Gland, Switzerland, IUCN.

**Deployment of Fire Risk Mitigation (Rewetting) Units** To safeguard critical carbon stocks and air quality, two AquaVault units will be installed within the Raja Musa Forest Reserve buffer zone. These units are configured to stabilize surface moisture against fire risks by capturing surplus monsoon water. The deployment mimics natural flood-pulse dynamics, maintaining peat moisture above the high-risk threshold (<40 cm below ground) for 90% of the dry season. This action protects approximately 500 hectares of peatland and provides indirect environmental benefits (smoke/haze reduction) to approximately 17,000 people in seven surrounding villages.

**Deployment of AquaVault Water Security (Community Use) Units** Two AquaVault units will be positioned to serve the Temuan Orang Asli and local village communities, including Kampung Cheeding, Kampung Busut Baru, and Kampung Pulau Kempas. These units act as a stabilizing buffer during supply interruptions by providing treated water through a four-stage nature-based filtration chain. This ensures reliable access to safe water, directly reducing the domestic "time poverty" and water-collection burden that disproportionately affects women and girls in these water-stressed areas.[7]

**IoT Integration and Real-Time Hydrological Monitoring** To ensure adaptive management, an Integrated Monitoring and Early-Warning System will be established across 500 critical hectares. A sensor network will be deployed to track hydrological and surface-moisture dynamics in real-time. This data is fed directly into the ICFIS (Output 1.1), allowing Community Management Committees to respond to dropping water levels before they reach the high-risk "catastrophic fire" range (12–95 cm below ground) during El Niño events or prolonged dry seasons.

*Table: Output 2.1*

| Activity | Stakeholders | Targets and Beneficiaries |
|---|---|---|
| **A.2.1.1: Installation of Fire Mitigation (Rewetting) Units.** Deployment of 2 AquaVault units in Raja Musa to maintain peat moisture above the 40cm fire-risk threshold. | FRIM, Selangor State Forestry Dept | **Target**: 500 ha of peatland functionally protected from catastrophic fire. **Beneficiaries**: 17,000 people (50% women) protected from haze. |
| **A.2.1.2: Deployment of Community Water Security Units.** Installation of 2 AquaVault units with 4-stage filtration near Kampung Cheeding and indigenous settlements. | FRIM, JAKOA, Local Community Management Committees. | **Target**: 100% reliable access to safe water during drought peaks. **Beneficiaries**: 8,000 people (50% women), including 750 Temuan Orang Asli. |
| **A.2.1.3: Establishment of IoT Early-Warning Network.** Deployment of surface-moisture and water-level sensors across deployment sites. | FRIM, NAHRIM, Local Eco-Wardens. | **Target**: Data integration into ICFIS to trigger 48-hour advance fire-suppression protocols. **Beneficiaries**: 200 national agency staff and community wardens. |

**<u>Output 2.2: Ecosystem-Based Adaptation (EbA) and Forest Enrichment implemented in Upstream Watersheds</u>**

Addresses the long-term integrity of the nation's water supply by focusing on the adaptive management of a critical watershed. The approach utilizes Forest Enrichment Planting and Erosion Control as an Ecosystem-based Adaptation (EbA) to address the root causes of hydrological instability: degradation from historical logging and soil erosion.

**Enrichment Planting and Assisted Natural Regeneration** Physical works involve implementing assisted natural regeneration and enrichment planting across at least 800 hectares of forested catchment, prioritizing steep slopes and riparian zones within the Ulu Muda Forest Reserve. This NbS significantly strengthens the forest's natural water-retention function and increases the forest floor's "sponge capacity." By increasing vegetative cover, the intervention slows runoff velocity

[7] While this infrastructure enhances general landscape water availability, it is operationally distinct from the livelihood-focused "Women-Prioritized Nurseries" (Output 3.1), which utilize independent water management systems that is not monitored, or evaluated under this output.

and regulates baseflow during the dry season, mitigating flash flood impacts and reducing reliance on costly water transfers for downstream agriculture.

**Erosion Control and Sedimentation Reduction** The intervention is highly targeted at the Ulu Muda catchment, the core water source for Malaysia's "rice bowl." By stabilizing steep slopes and riparian corridors, the project aims to reduce sedimentation rates at the Muda Dam and key river sections by 10%. This directly protects the lifespan of the Muda Dam reservoir and ensures long-term water quality. These actions pre-empt projected yield reductions of up to 31% by 2050 for downstream paddy farmers, who face existential socioeconomic vulnerability due to increasing climate-induced water instability.

**Equitable Governance and Livelihood Integration** To address governance barriers and social vulnerability, the project ensures the equitable participation of women and local communities in watershed management. The project will train and employ 150 local community members in EbA tree-planting and maintenance techniques. This directly links asset creation to livelihood strengthening, specifically targeting female-headed households among smallholder farmers who are traditionally excluded from irrigation and watershed management decisions. This participation is formally linked to the capacity-building frameworks established in Output 3.1.

*Table: Output 2.2.*

| Activity | Stakeholders | Targets and Beneficiaries |
|---|---|---|
| **A.2.2.1: Enrichment Planting and Riparian Restoration.** Implementing assisted natural regeneration across 800 hectares of degraded catchment. | Kedah State Forestry Dept, Muda Agricultural Development Authority (MADA), FRIM. | **Target**: 10% reduction in sedimentation at Muda Dam to protect reservoir lifespan. **Beneficiaries**: 60,000 downstream paddy farmers (50% women) based on MADA registry. |
| **A.2.2.2: Local EbA Workforce Mobilization.** Training and employing local community members for planting and long-term maintenance. | Kedah State Forestry Dept, Local CBOs, Kedah Regional Development Authority (KEDA). | **Target**: Formalized community stewardship of watershed assets. **Beneficiaries**: 150 households with direct income (50% female-headed). |
| **A.2.2.3: Watershed Monitoring and Evaluation.** Tracking sediment reduction and water regulation efficiency at the Muda Dam. | NAHRIM, MADA. | **Target**: One operational monitoring protocol integrated into MADA's dam-release decision-matrix. **Beneficiaries**: National water and food security agencies. |

**Output 2.3: Integrated Urban and Peri-Urban NbS Assets deployed for Multi-City Flood/Heat Resilience**

Delivers direct, high-impact, site-based Nature-based Solutions (NbS) to address the escalating climate threats of flooding and urban heat stress in Malaysia's dense municipal settings. By leveraging and ecologically upgrading existing urban drainage assets, the project demonstrates a high-impact, low-cost methodology that is 50–100 times cheaper than traditional new construction.

**Ecological Upgrading of Retention Ponds and Mini-Forests (Kubang Pasu)** In the peri-urban agricultural and village drainage systems of Kubang Pasu (MPKP), the project will ecologically upgrade 200 retention ponds. These interventions utilize NbS measures such as bio-engineered bank stabilization, enhanced water retention capacity, and the establishment of vegetated buffer zones. To deliver localized cooling and strengthen ecological connectivity, Miyawaki mini-forests—utilizing high-quality native plants supplied by the Output 3.1 community nurseries—will be established at selected pilot pond sites. This model carries massive national scaling potential, with an estimated 10,000 similar ponds nationwide available for future replication.

**Riverine Bio-Engineering and Berm Strengthening (Kuala Lumpur)** In the river-adjacent settlement of Kampung Pasir Baru (DBKL), the project will strengthen one bio-engineered vegetated berm to improve river flood protection. This site-specific NbS replaces or reinforces

traditional hard infrastructure with resilient, nature-based components designed to absorb flood energy and stabilize the river interface. The intervention targets a 20–25% reduction in flood damage for high-density residential areas while providing immediate protection to the community.

**Drainage Corridor Restoration and Riparian Planting (Petaling Jaya)** Focusing on the dense neighborhood of Kampung Cempaka (MBPJ), the project will restore one urban drainage corridor. The restoration involves bank stabilization, riparian planting, and the strategic placement of shade trees to mitigate urban heat stress. These physical assets are designed to achieve 1.5–3.0°C local cooling in adjacent areas (50–150m radius). The corridor serves as a live testing ground for the Adaptive NbS Governance Protocols institutionalized under Output 1.3 and is monitored through the citizen science system established under Output 3.2.

*Table: Output 2.3*

| Activity | Stakeholders | Targets and Beneficiaries |
|---|---|---|
| **A.2.3.1: Ecological Upgrading of Urban Retention Ponds.** Implementing bio-engineered stabilization and Miyawaki plots at 200 sites. | MPKP, DID, FRIM, PlanMalaysia. | **Target**: 20-25% flood damage reduction for peri-urban zones. **Beneficiaries**: 6,000 residents (50% women). |
| **A.2.3.2: Bio-engineered River Berm and Corridor Restoration.** Strengthening riverine and drainage infrastructure in DBKL and MBPJ. | DBKL, MBPJ, JPS, Local Residents Associations. | **Target**: 1.5–3.0°C localized cooling and stabilized river interfaces. **Beneficiaries**: 4,000 high-density urban residents (50% women). |
| **A.2.3.3: Microclimate and Hydrological Performance Monitoring.** Deploying sensors to track 1.5-3.0°C cooling and flood velocity reduction. | NAHRIM, FRIM, Municipal Public Works Depts. | **Target**: Validated EbA and NbS performance data integrated into 3 Local Plans (Rancangan Tempatan) to mandate resilient infrastructure standards. **Beneficiaries**: 30 subnational staff (40% women). |

**Component 3: Institutionalizing Capacity and Sustainable Livelihoods**

**Outcome 3: Communities sustaining NbS assets through formalized stewardship and diversified income.**

This component builds the essential social capital and resilient supply chains required for the long-term maintenance of the project's physical and policy assets. The intended change is a transition from community-level vulnerability to institutionalized local stewardship. By empowering women and indigenous residents as certified co-managers and technical monitors, the project ensures that the EbA/NbS interventions (Component 2) are not only physically restored but economically and socially integrated into the local fabric, ensuring their survival beyond the grant period.

**Output 3.1: Community-led Livelihoods and Adaptive Water Governance Models established**

Supports local resilience through economic empowerment and institutionalized equity in resource management, recognizing that building human capacity and a resilient supply chain is essential for the long-term sustainability and equitable management of all project interventions. The focus is on empowering vulnerable groups, particularly women and indigenous residents, to address their socioeconomic vulnerabilities and become active co-managers of climate resilience infrastructure.

**Women-Prioritized Supply Chain and Livelihoods** The project will establish three Community Nursery hubs across the target municipal areas (Kubang Pasu, Kampung Pasir Baru, and Kampung Cempaka). While open to broader community participation, these hubs specifically prioritize women's leadership and employment to address gendered economic vulnerabilities. In Kubang Pasu, these hubs will leverage the high density of existing retention ponds to integrate floating nursery models into local water management. The project aims for a minimum of 70%

female participation in technical and managerial roles. This "women-prioritized" approach ensures that while the hubs are inclusive of the wider community (recognizing mixed demographic realities), the training, financial literacy, and livelihood benefits are strategically directed toward empowering women as lead stewards of the "green supply chain. Each nursery hub is designed as a self-sufficient unit with dedicated water management (e.g., rainwater harvesting), ensuring operational stability independent of the large-scale rewetting infrastructure in Output 2.1.

**Watershed Employment and EbA Skill Transfer** To ensure local ownership of the forest enrichment work in the Ulu Muda catchment (Output 2.2), the project will train and employ 150 local community members (75 women / 75 men) in Ecosystem-based Adaptation (EbA) techniques. This workstream directly links the physical restoration of 800 hectares to direct job creation, providing a vital economic buffer for households vulnerable to climate-induced agricultural losses.

**Adaptive Water Governance and Equity** Formalizing inclusive governance is critical to overcoming systemic social exclusion. In the MADA region and peatland sites, the project mandates 50% female representation in local water management committees (Water Users Associations (WUA) and Community Management Committees). For the peatland sites (Output 2.1), 20 local indigenous Temuan representatives will be trained and certified in the co-management and technical maintenance of the AquaVault systems, ensuring these assets are sustained by local expertise.

**Community-Based Adaptation (CBA) Package** A targeted CBA package addresses socioeconomic risks in the MADA farming community. This includes specialized disaster finance literacy workshops for 200 vulnerable households, a “Young Farmers Mindset Transformation Program” for 30 young farmers, and 120 farmers trained in sustainable technical practices. In total, 350 farmers will be equipped with the financial and technical skills necessary to manage climate shocks and adopt sustainable practices for long-term watershed resilience.

*Table: Output 3.1.*

| Activity | Stakeholders | Targets and Beneficiaries |
|---|---|---|
| **A.3.1.1: Establishment of Women-Prioritized Nurseries** Developing 3 community nursery hubs with independent water harvesting. Includes technical training with preferential enrollment for women. | FRIM, Local Councils, Women’s Cooperatives. | **Target:** Financial sustainability established (70% of nursery operational costs covered by independent seedling sales/revenue by Year 4). **Beneficiaries:** 30 Community members (70% women) with sustained income. |
| **A.3.1.2: EbA Workforce Mobilization** Training and employing 150 local residents for the Ulu Muda forest enrichment and maintenance. | JPSM, State Forestry Dept, KEDA. | **Target:** Workforce Professionalization: 150 community members transitioned into a formal "green-sector" labor pool for national forest restoration. **Beneficiaries:** 150 people (min 40% women). |
| **A.3.1.3: Water Governance & Indigenous Certification.** Formalizing co-management bodies and certifying indigenous reps in NbS maintenance. | JAKOA, MADA, NAHRIM, Local CBOs. | **Target:** Institutionalized Stewardship: 20 Indigenous reps certified in NbS maintenance; 50% Female representation in Water Users Associations. **Beneficiaries:** 20 Indigenous households (50% women). |
| **A.3.1.4: Delivery of CBA & Disaster Finance Training.** Executing financial literacy and young farmer leadership workshops. | MADA, Dept of Agriculture, Local Cooperatives. | **Target:** Socioeconomic Resilience: 350 farmers actively apply disaster-finance strategies and sustainable practices to mitigate climate shocks. **Beneficiaries:** 350 farmers (50% women). |

**Output 3.2: National and Sub-National Technical Capacity for Climate Intelligence and EbA Monitoring operationalized**

Implements comprehensive training and monitoring capacity development to build multi-level capacity and establish a real-time, socially inclusive feedback loop into the national decision-making system. This work is critical to overcome institutional and community barriers to utilizing climate intelligence, ensuring that the data systems (Component 1) and physical assets (Component 2) are sustained by skilled personnel at every level.

**Citizen Science Adaptive Monitoring System** A decentralized, community-driven monitoring system is established with community-based Eco-Warden monitoring teams and 400 local volunteers (minimum 50% women/vulnerable groups). These teams will collect real-time data on asset performance and ecosystem health using low-cost technology (e.g., bioacoustic sensors, water quality kits). This data feeds directly into the ICFIS (Output 1.1) and the local Performance Dashboards (Output 1.3), creating a continuous, data-driven feedback loop for adaptive maintenance. This institutionalizes a low-cost, local-level monitoring system, replacing reliance on expensive external consultants.

**Multi-Level Institutional and Technical Training** Comprehensive training programs will be implemented across three distinct levels to ensure the long-term utility of the project's digital and physical outputs:

- **National Level:** 200 staff (50% women) across at least three key national institutions will build technical capacity on ICFIS data interpretation (Output 1.1) and adaptive planning. This ensures that live data streams effectively feed into the Atlas development and use (Outputs 1.1, 1.2) for national-scale policy integration.
- **Municipal/State Level:** 30 municipal/state level staff (30-40% women) will be trained on the Adaptive NbS Governance Protocols and Climate Risk & NbS Performance Dashboards established under Output 1.3. Training focuses on practical application for routine inspection, maintenance prioritization, and localized flood-risk interpretation.
- **Community Level:** The Eco-Warden/citizen scientist training (400 people) operationalizes the community Bioacoustic Monitoring System as an innovative, low-cost tool. This feeds real-time ecological data directly into the ICFIS (Output 1.1) to inform local NbS adaptive maintenance and ensure asset longevity.

*Table: Output 3.2.*

| Activity | Stakeholders | Targets and Beneficiaries |
|---|---|---|
| **A.3.2.1: Citizen Science & Bioacoustic Integration.** Training volunteers to operate low-cost sensors that feed into the ICFIS (O 1.1). | NAHRIM, FRIM, Local CBOs, JPSM. | **Target:** Operational Feedback Loop: 400 Eco-Wardens active in a decentralized monitoring system that triggers local-level adaptive maintenance. **Beneficiaries:** 400 residents (50% women/vulnerable). |
| **A.3.2.2: National Technical Capacity Building.** Workshops on **ICFIS (O 1.1)** data interpretation and **Atlas (O 1.2)** planning. | NRES, NAHRIM, DID, JPSM. | **Target:** Policy Integration: 200 National staff applying climate intelligence to national infrastructure and risk-management planning. **Beneficiaries:** 200 national agency staff (50% women). |
| **A.3.2.3: Municipal Adaptive Management Training.** Hands-on training for **Dashboard (O 1.3)** use and maintenance SOPs. | MPKP, DBKL, MBPJ, PlanMalaysia. | **Target:** Functional Maintenance: 3 Municipalities utilizing real-time performance data to prioritize and budget for routine NbS asset upkeep. **Beneficiaries:** 30 subnational staff (40% women). |

**Output 3.3: National Knowledge Portal and Scaling Framework for EbA Sustainability operationalized**

Ensures that all project knowledge, methodologies, and data tools are systematically maintained and publicly accessible for long-term national dissemination, scaling, and institutional capacity building. By centralizing the project's intellectual assets, the portal serves as a bridge between pilot-phase innovation and national-scale adoption.

**Centralized Knowledge and Tool Distribution** A user-friendly National Climate Knowledge Portal is fully operationalized, serving as the primary conduit for disseminating the Forest-Climate Vulnerability Atlas (Output 1.2), user-friendly GIS tools, and the Urban Resilience Toolkit (consolidated under Output 1.3). The portal also hosts the NbS Financing Strategies and Toolkits, providing future implementers and municipalities with practical, step-by-step guidelines on how to structure NbS projects to attract public funds, private sector investment, and international grant resources for replication.

**Inclusive Learning and Social Equity** To maximize utility for local and vulnerable groups, the portal will include at least 5 capacity-building modules specifically tailored for local communities. These modules are made accessible in appropriate local languages and formats, ensuring that women's groups and indigenous communities can independently access the knowledge needed for climate adaptation. This decentralized approach ensures that the project's technical advancements do not create a "digital divide" but rather empower marginalized populations.

**Long-Term Sustainability and Governance** Sustainability is secured by formalizing at least 3 long-term data-sharing agreements with key national agencies (e.g., DID, Forestry Department, and Meteorological Department), ensuring the portal is continuously updated and officially recognized as a central climate intelligence resource. Furthermore, the portal will facilitate the formal recognition of the LLA Decision-Making Bodies (established under Output 1.3), ensuring that community stewardship of knowledge is institutionalized and protected.

*Table: Output 3.3*

| Activity | Stakeholders | Targets and Beneficiaries |
|---|---|---|
| **A.3.3.1: Knowledge Portal Operationalization.** Hosting the Atlas (O 1.2), Scaling Toolkits, and Finance Strategies (O 1.3) for national access. | NAHRIM, NRES, Ministry of Economy. | **Target:** National Standardization: 1 Portal recognized as the mandatory central resource for EbA scaling and NbS financing models across Malaysia. **Beneficiaries:** National-scale stakeholders (Public/Private/NGO). |
| **A.3.3.2: Community-Tailored Learning Modules.** Developing 5 modules in local formats/languages for vulnerable and indigenous groups. | Local NGOs, Women's Groups, JAKOA. | **Target:** Knowledge Equity: 5 Specialized modules deployed to bridge the digital divide and enable independent community-led adaptation stewardship. **Beneficiaries:** Indigenous and marginalized women's groups. |
| **A.3.3.3: Institutional Sustainability Agreements.** Formalizing data-sharing SOPs with DID, Forestry, and METMalaysia for continuous updates. | NRES, DID, JPSM, MetMalaysia and PLAN Malaysia (Town and Country Planning Department). | **Target:** Permanent Inter-agency Synergy: 3 Formalized data-sharing agreements signed to ensure permanent, live data flow beyond the project grant period. **Beneficiaries:** National planning and research agencies. |

## B. Economic, Social and Environmental benefits

The project is designed to support the Adaptation Fund's goal of assisting vulnerable communities through concrete EbA interventions. The project contributes to the AF Strategic Results Framework Outcome 5 by increasing ecosystem resilience across 1,300+ hectares of peatlands and watersheds, and Outcome 8, supporting the development and diffusion of innovative adaptation practices and tools across national and sub-national institutions.

To achieve these goals, Component 1 strengthens stakeholder capacity to capture and disseminate climate intelligence via the ICFIS and Vulnerability Atlas (AF Output 3.2) while ensuring the formal adoption and acceleration of urban resilience toolkits within municipal governance (AF Output 8). Component 2 focuses on strengthening natural resource assets and

development sectors through the improved hydrological management of critical ecosystems (AF Output 5) and the ecological upgrading of 200+ urban drainage assets to withstand climate-induced flood and heat stress (AF Output 4). Finally, Component 3 builds the capacity of sub-national networks to respond to extreme weather by training 630+ personnel and Eco-Wardens (AF Output 2.1) and strengthens community livelihood strategies through the establishment of three women-prioritized nurseries as tangible adaptation assets (AF Output 6).

**Project Beneficiaries**

The project is expected to reach **68,230 unique direct beneficiaries (50% women)**. An overall 50% gender target is applied to ensure that women are not only recipients of water security but active leaders in nature-based adaptation. To avoid double counting, the project counts direct beneficiaries as those receiving direct physical or institutional benefits, including subsets of those receiving specialized training or employment.

Beyond direct interventions, the project provides critical ecosystem stabilization for **4.177 million indirect beneficiaries (50% women)**. This includes safeguarding raw water security for 4.15 million people in Kedah, Perlis, and Penang, aiming to increase dry-season consistency by 15–20% via watershed restoration (O. 2.2). Additionally, peatland rewetting (O. 2.1) protects 17,000 North Selangor residents from peat-fire haze, while urban "sponge city" pilots (O. 2.3) mitigate 1-in-50-year flood risks for 10,000 residents in pilot cities. These targets are based on DOSM demographic data mapped against project hydrological and fire-risk zones.

*Table: Project Beneficiaries*

| **Primary beneficiaries** | | | | | | |
|---|---|---|---|---|---|---|
| **Output** | **Direct Beneficiaries** | **Total** | **Women** | **Men** | **Gender Target** | **Methodology & Data Source** |
| O. 2.2 | Farmers benefiting from watershed water security (MADA) | 60,000 | 30,000 | 30,000 | 50% | Based on MADA's registry of active paddy farmers in the Muda Irrigation Scheme (Blocks A-D). |
| O. 2.1 | Vulnerable people with improved water access (Peatlands) | 8,000 (750 Orang Asli Temuan indigenous people) | 4,000 | 4,000 | 50% | Calculated via household service radius of planned AquaVault units and DOSM local population data. |
| O. 3.2 | National/Sub-National Staff Trained | 230 | 112 | 118 | National 50% Sub-national 40% | HR assessment of relevant government departments. |
| **TOTAL** | **Direct Beneficiaries** | **68,230** | **34,112** | **34,118** | **50%** | |
| **Targeted Capacity-Building & Livelihood Subsets** | | | | | | |
| O. 3.1 | Farmers trained in CBA/Disaster Finance | 350 | 175 | 175 | 50% | Selection from primary MADA pool (O. 2.2) based on vulnerability criteria and regional cooperative capacity. |
| O. 3.1 | Community members employed in EbA (O. 2.2) | 150 | 75 | 75 | 50% | Subset of local watershed residents employed in forest enrichment and restoration activities at target pilot sites. |
| O. 3.1 | Community members in Women-Prioritized Nurseries | 30 | 21 | 9 | 70% | Subset of marginalised residents with preferential |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | enrollment for women in 3 nursery hubs. |
| O. 3.2 | Citizen Scientists/Eco-Wardens Trained | 400 | 200 | 200 | 50% | Subset of community members engaged in environmental monitoring. |
| **Indirect beneficiaries** | | | | | | |
| **Output** | **Indirect Beneficiary Group** | **Total** | **Women** | **Men** | **Gender target[8]*** | **Methodology & Data Source** |
| O. 2.2 | Population with raw water supply security enhanced by a 15-20% reduction in drought-risk vulnerability (Kedah, Perlis, Penang)[9] | 4,150,000 | 2,075,000 | 2,075,000 | ~50% | Total population reliant on Muda River raw water; benefit defined as reduced supply risk. |
| O. 2.1 | Ecosystem Resilience (North Selangor) | 17,000 | 8,500 | 8,500 | ~50% | Population within 5km radius of peatland pilots benefiting from reduced fire/haze risk. |
| O. 2.3 | Urban Residents Protected (Pilot Cities) | 10,000 | 5,000 | 5,000 | ~50% | Residents in 1-in-50-year flood zones mitigated by urban NbS sponge-city pilots. |
| **TOTAL** | **Indirect Beneficiaries** | **4,177,000** | **2,088,500** | **2,088,500** | **~50%** | DOSM 2023 Population Data mapped against project hydrological zones. |

**Initial Gender Analysis**[10]

The project is designed to address the gender-differentiated impacts of climate change by moving beyond generic participation frameworks to directly tackle specific socio-economic vulnerabilities. In the target sites of Kedah and Selangor, evidence confirms women's central, yet often undervalued, role in household water security and community-based adaptation.

**Socio-Economic Context and Gender Baseline in Malaysia**

Structural gender gaps in Malaysia create a "resilience gap" that disproportionately exposes women to climate shocks. While women outperform men in terms of education enrolment, this does not translate into economic security:

- Economic Participation: The Female Labor Force Participation Rate (LFPR) is significantly lower at 56.5% compared to 83.0% for men, leaving women with fewer financial buffers for climate recovery.
- Income and Poverty: Women earn only RM 93.08 for every RM 100.00 earned by men, and poverty rates in female-headed households reach 59%, making them highly sensitive to resource scarcity.
- The Care Burden: Women spend 3.6 hours daily on unpaid care work (63.6% more than men). 62% of women outside the labor force cite housework as their primary barrier to employment.

**Addressing Site-Specific Climate Vulnerabilities**

[8] *Note: Indirect sex-disaggregation is based on regional demographic statistics from the Department of Statistics Malaysia (DOSM) rather than project-controlled targets.

[9] Methodology note on Water Consistency: The benefit for indirect beneficiaries is defined as a quantifiable reduction in raw water vulnerability. The project targets an improvement in water supply consistency by 15-20% during the critical dry season (January–March) for the northern region. This estimate is based on preliminary hydrological assessments of forest sponge-effect retention and will be validated through detailed water-balance modelling during the Project Formulation Grant (PFG) phase.

[10] This analysis is informed by the following sources: Department of Statistics Malaysia (2020). Report on Household Income, Expenditure and Basic Amenities Survey and Report on Time Use Survey; Statistics on Women empowerment; Malaysia Gender Gap Index; Freport on Time use survey; ; UNDP Malaysia (2020). Gender and Climate Change: Malaysia Assessment; UNICEF Malaysia: Living on the edge (2021/2023); UN Women (2018). Turning promises into action: Gender equality in the 2030 Agenda for Sustainable Development; World Bank (2021). Climate Risk Country Profile: Malaysia; United Nations (2015). Transforming our world: the 2030 Agenda for Sustainable Development; United Nations Office for Disaster Risk Reduction (2015). *Sendai Framework for Disaster Risk Reduction 2015-2030*; and vulnerability assessments of peatland communities consistent with findings from the Southeast Asian Climate Change Network (SEACAN).

Climate change acts as a systemic "threat multiplier" that exacerbates existing gender inequalities. Because women in Malaysia are overrepresented in the informal agricultural sector and among the bottom 40% income group (B40), they face a heightened risk of gendered poverty as climate-induced flooding and droughts devalue traditional livelihoods. This vulnerability is driven by a domestic "resilience gap" where women's high dependency on climate-sensitive natural resources, such as peatland products and paddy irrigation, is decoupled from their limited access to formal financial buffers and disaster-recovery assets. This localized trend manifests through the following site-specific vulnerabilities and interventions:

- **Kedah (Output 2.2 & 2.3):** In the northern "Rice Bowl," climate-induced water scarcity increases the time women spend securing domestic water by 25% or more. To reduce this "time poverty," Output 2.2 implements 800 hectares of forest enrichment and riparian restoration in the Ulu Muda catchment. By increasing the forest's "sponge capacity," the project stabilizes raw water supply for 60,000 farmers (50% women) downstream. In peri-urban Kubang Pasu (Output 2.3), the ecological upgrading of 200 retention ponds further mitigates flood and drought risks.
- **Selangor (Output 2.1):** For the indigenous Temuan Orang Asli and surrounding village communities, peatland degradation and fires threaten ecosystem services and livelihoods such as Non-Timber Forest Products (NTFPs). Output 2.1 deploys AquaVault modular units to stabilize moisture levels and provide treated water. This protects ecosystem services for 17,000 residents (50% women) and provides safe water access to 8,000 people (50% women), including 750 Temuan indigenous people.

**Integrated Livelihoods and Capacity Building Strategy (Component 3)**

Women currently represent less than 15% of formal water governance in the target regions. To transform women into empowered leaders, the project transitions women and indigenous groups from passive beneficiaries to active leaders and co-managers of climate infrastructure through a three-pronged livelihood strategy:

- **Women-Prioritized Nurseries:** The project establishes three Community with a minimum 70% female participation rate to enable women to lead the "green supply chain".
- **Workforce Mobilization**: Landscape restoration is directly linked to income generation for marginalized groups. In Kedah, the project will employ an EbA workforce of 150 local members (50% women) for forest enrichment in Ulu Muda. In Selangor, the project ensures community engagement by certifying 20 community representatives (50% women) as technical co-managers of the AquaVault rewetting units, ensuring local expertise to sustain these assets.
- **Targeted Capacity Building:** To address "time poverty" and the governance gap, the project implements high-impact learning and representation quotas:
    - Financial Resilience: 350 farmers (50% women) in Kedah will receive CBA and disaster finance training.
    - Climate Intelligence: 400 Eco-Wardens (min. 50% women/vulnerable groups) will be trained in citizen science and hydrological monitoring.
    - Leadership Mandates: The project formalizes equity by requiring 50% female representation in all local Water Users Associations and providing technical training to 230 national/sub-national staff with 50%/40% gender targets.

**Inclusive Participation and Consultations**

Recognizing that patriarchal norms may deter women in rural settings from formal plenary sessions, the project will use gender-sensitive participatory methods held in child-friendly domestic or community spaces to also accommodate caregiving responsibilities. Engagement with Temuan communities will strictly follow Free, Prior, and Informed Consent (FPIC), with the Tok Batin (Village Head) as the primary point of contact to respect traditional leadership and customary laws.

This initial analysis confirms the project's commitment to address documented gender-differentiated vulnerabilities with precise interventions. By institutionalizing gender-inclusive governance, the project aligns with the Sendai Framework and the Adaptation Fund Gender Policy, ensuring that resilience benefits are equitably distributed and socially sustainable. The comprehensive Gender Assessment and Gender Action Plan (GAP) to be developed during the Project Formulation Grant (PFG) phase will ensure that all activities contribute to gender equality and women's empowerment and compliance with the Adaptation Fund Gender Policy and Environmental and Social Principle 5.

**Detailed Assessment of Adaptation Benefits and Strategic Co-benefits**

The Project will generate significant and interlinked benefits across economic, social, and environmental dimensions:

- **Primary Adaptation Outcomes**: Economically, the Project ensures stability by significantly reducing flood damage and infrastructure maintenance costs through nature-based flood control. Environmentally, it secures vital water resources and stabilizes water tables to mitigate drought and fire risks.
- **Co-benefits:** Beyond these primary objectives, the Project generates significant social and environmental value. Socially, it integrates Gender Equality and Social Inclusion (GESI). Environmentally, it achieves critical ecosystem restoration (peatlands, forests) and provides carbon sequestration, while creating the institutional blueprint for national NbS scaling.

*Table: Economic, Social and Environmental benefits*

| Category | Quantified estimate | Methodology and Data Source |
|---|---|---|
| **ECONOMIC BENEFITS** | | |
| **Primary: Flood Mitigation (C2)** | 20-25% reduction in flood damage costs in target municipalities. | **Proxy:** Calculated based on projected peak flow reduction from upgraded retention ponds vs. historical local municipal damage claims. |
| **Primary: Fire Prevention (O. 2.1)** | Avoided economic loss from catastrophic peat fires and suppression costs. | **Proxy:** Historical fire-fighting expenditure data and estimated agricultural/tourism assets within the 500ha fire-vulnerable zone. |
| **Primary: Livelihood Resilience (C2)** | Safeguarding of primary income (paddy yields) for 60,000 farmers. | **Methodology:** Correlation between reduced sedimentation/drought-risk and stable crop yield maintenance (MADA historical yield data). |
| **Co-benefit: Green Employment (C2, C3)** | Creation of new roles in NbS maintenance and women-prioritized nurseries. | **Methodology:** Direct headcount based on planned project operational budget for community-led EbA management. |
| **Co-benefit: Fiscal Efficiency (C1)** | Reduction in maladaptation spending and financial waste. | **Methodology:** Evidence-based site selection via ICFIS, projected against historical costs of "grey-only" infrastructure failures. |
| **SOCIAL BENEFITS** | | |
| **Primary: Water Security (C2)** | 15-20% increase in water supply consistency during peak drought. | **Methodology:** Hydrological "sponge-effect" modeling of forest retention capacity in the Muda catchment area. |
| **Primary: Public Health (C2)** | 1.5-3.0°C local cooling effect in urban pilot sites. | **Methodology:** Estimates based on existing literature for green-blue infrastructure performance in tropical urban heat islands. |
| **Primary: Community Safety (C2)** | 60-80% reduction in fire ignition risk near residential areas. | **Methodology:** Technical link between stabilized peat water tables (maintained > -40cm) and fire ignition probability. |
| **Co-benefit: GESI (C3)** | 50% minimum women's participation; 15% budget for gender equality. | **Methodology:** Direct tracking via the Unified Beneficiary Tracking System and project procurement/budget markers. |
| **Co-benefit: Data Ownership (C3)** | Operationalization of local Eco-Warden/Citizen Science teams. | **Methodology:** Output-based count of community-led monitoring stations integrated into national Early Warning Systems. |

| ENVIRONMENTAL BENEFITS | | |
|---|---|---|
| **Primary: Hydrology Restoration (C2)** | Stabilization of water tables across 500 ha of peatland. | **Methodology:** In-situ sensor monitoring of piezometric levels compared to pre-intervention dry-season baselines. |
| **Primary: Watershed Quality (C2)** | 10% reduction in sedimentation rates in Muda Dam and river sections. | **Proxy:** Projected soil stabilization and erosion control impact from 800 ha of forest enrichment and rehabilitation. |
| **Co-benefit: Carbon Stock (O. 2.1)** | Protection of existing carbon stocks in 500 ha of peatland. | **Methodology:** TIER 2 emission factor estimates for avoided CO2 emissions from protected/rewetted peatlands. |
| **Co-benefit: Biodiversity (C2, C3)** | Enhancement of habitat connectivity and ecosystem functionality. | **Methodology:** Use of bioacoustic monitoring baselines and native species survival rates in green corridors. |

**Avoiding and Mitigating Negative impacts**

In compliance with the Adaptation Fund's Environmental and Social Policy (ESP) and Gender Policy (GP), and applying the UNDP Social and Environmental Standards (SES) and the UNDP Gender Policy, the project integrates mitigation measures directly into the design. Classified as Moderate Risk (Category B), the project commits to zero physical displacement and ensures that all physical works are focused on existing, disturbed areas using only native species to avoid harm to natural habitats.

The project proactively manages high-priority social risks, including risks to Indigenous Peoples, high public safety risks (e.g., drowning in rehabilitated ponds), and commits to the Prevention of Sexual Exploitation and Abuse (PSEA) and Gender-Based Violence (GBV) mitigation measures.

The framework for compliance, including the application of the UNDP Social and Environmental Standards (SES) and approach towards the further assessment and management of all risks identified during preliminary screening, is outlined in Section E and Section K (see also Annex 1 Abridged SES Procedure form).

## C. Cost-effectiveness

The Project maximizes cost-effectiveness through strategic investment in scalable Nature-based Solutions (NbS) that provide quantifiable economic returns and establish a scientific framework for replication. The three interconnected component structure achieves high cost-efficiency by leveraging the cross-cutting Integrated Climate–Forest Intelligence System (ICFIS) in Component 1 to ensure all adaptation measures are evidence-based, risk-informed, and ready for national mainstreaming, eliminating redundant design and validation costs for future scaling.

The project's investment in Nature-based Solutions (NbS) is significantly more cost-effective and financially sustainable than comparable 'grey' infrastructure alternatives over the project's lifetime, primarily by avoiding high capital costs, lowering long-term maintenance needs, and generating high-value ecosystem co-benefits (carbon sequestration).The full Project proposal will conduct a detailed Cost-Benefit Analysis to formally quantify the Net Present Value and return on investment of the NbS portfolio versus traditional alternatives.

*Table: NBS approach vs. Grey infrastructure alternative*

| Intervention | NbS Approach (Project) | Grey Infrastructure alternative | Cost-Effectiveness Rationale |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Water Supply/ Security | Modular Water Storage and Infiltration Systems deployment (O 2.1) and Forest Rehabilitation (O. 2.2) for water retention, surface-moisture stabilisation, and water supply consistency. | New concrete Dam/Reservoir: Estimated upfront cost in Malaysia often exceeds $100 million with high maintenance. | Primary Adaptation Outcome: NbS provides water security and drought resilience at a fraction of the cost, is decentralized, and requires lower maintenance.<br>Co-benefits: the NbS approach generates significant co-benefits (carbon sequestration, enhanced biodiversity) which are typically not valued in grey infrastructure. |
| Flood/Erosion Control | Retention Pond and NbS upgrades (O. 2.3) and Forest Enrichment (O. 2.2): Improved flood attenuation capacity through natural retention and reduced sedimentation. | Concrete Flood Walls/Dredging: High recurring capital costs for construction and maintenance, with no ecosystem co-benefits. | Primary Adaptation Outcome: NbS provides direct flood control by addressing root causes (erosion/sedimentation) and provides natural attenuation, demonstrating superior long-term return on investment and reducing the need for costly grey infrastructure maintenance (dredging).<br>Co-benefits: Provides additional co-benefits through ecosystem services (habitat restoration, air quality) not possible with concrete infrastructure. |

**Additional Cost-Effectiveness Factors**

- **Adaptive Efficiency (C1):** The ICFIS (O. 1.1) ensures adaptation spending is evidence-based and optimally sited, avoiding financial waste on ineffective projects, thereby ensuring that every dollar invested in C2 assets is targeted by high-resolution data.
- **Sustainability via Livelihoods (C3):** The investment in Women-Prioritized Community Nurseries and training of local community members (O. 3.1) creates a sustainable, low-cost supply chain for native plants and a compensated, local workforce for asset maintenance. This mechanism ensures the long-term viability of the physical assets (C2) without relying on expensive external contractors.
- **Policy Scaling (C1):** By developing and embedding the Integrated Policy-to-Practice Scaling Framework (IPPSF) (O. 1.3) within three municipal bodies, the Project creates a template for multi-city replication. This means future cities can adopt proven NbS models and policy protocols without incurring the full design and validation costs of a pilot, maximizing the initial grant investment's impact.
- **Leveraging Existing Infrastructure (C2 ):** The urban NbS approach (O. 2.3) focuses on leveraging and ecologically upgrading existing urban drainage assets (like retention ponds), which is 50-100 times cheaper than constructing new, large-scale grey infrastructure.

**Return on Investment (ROI)**

The financial viability of the Project is guaranteed by a strong Return on Investment (ROI). The following tables demonstrate the cost-effectiveness of the NbS portfolio, showing that the Total Financing requirement for the project is recovered in less than five months, preventing an estimated USD 10-12 in future losses for every USD 1 spent.

The tables below summarize the financial justification for the Project. The overall Total Project Cost (TPC) is used to calculate the Project's payback period, while direct component costs are used to calculate the individual ROI of each technical intervention

*Table: Overall Project Return on Investment (ROI)*[11]

| Element | Unit | ROI |
|---|---|---|
| **Total Project Costs (TPC)** | USD | USD 10,000,000 (RM 42.2M) |
| **Total Annual Savings (TAS)** | USD | USD 26,661,000 M (RM 92.2M) |

[11] Exchange Rate: All calculations use the established exchange rate of 1 USD = 4.22 RM

| | | |
|---|---|---|
| **Payback Period** | Months | <5 months |

*Table: Detailed Return on Investment calculation pr. component*

| Component | Cost-Effectiveness Justification | Initial Investment (USD) | Annual Benefit (USD) | ROI Timeline |
|---|---|---|---|---|
| **Component 1: Strengthening Institutional Governance and Evidence-Based Decision-Support Systems** | **Avoided Maladaptation & Innovation:** The Integrated Climate–Forest Intelligence System (ICFIS) and the Vulnerability Atlas protect the entire project investment by ensuring all physical assets (C2) are optimally sited and managed based on climate intelligence, preventing future financial waste and loss from maladaptation. The framework consolidates fragmented data, replacing expensive guesswork. | **$1,750,000** | **$3,571,000** | **< 6 months** |
| **Component 2: Implementation of EbA and NbS for Climate Resilience** | **Integrated Avoided Loss (Fire, Flood, Erosion):** This integrated investment secures the Ulu Muda watershed (protecting VPR for 4.15M people), avoids catastrophic peat fire losses (saving carbon and infrastructure), and provides measurable flood/heat reduction across 3 cities (upgrading 200 assets is 50–100X cheaper than new construction). | **$5,000,000** | **$23,614,000** ($7.5M fire + $11.9M watershed + $4.214M urban savings) | **< 3 months** |
| **Component 3: Building Capacity and Institutionalizing Sustainable Livelihoods** | **Institutional Cost Leverage & Livelihoods:** Investment establishes a low-cost, permanent monitoring network (Eco-Wardens/Citizen Science), replacing expensive manual inspections. Additionally, Women-Prioritized Nurseries create sustained revenue and resilient local supply chains, safeguarding the long-term maintenance costs of all C2 assets. | **$1,591,014** | **$476,000** | **< 40 months** |
| **Overall Project Totals** | **Adaptation-focused ROI: The Project's design principle dictates that every USD 1 spent prevents approximately USD 10–12 in future losses.** | **$8,341,014 (Component Cost)** | **$27,661,000 (Annual Mid-Point)** | **< 4 months** |

## D. National policy framework

The Project is highly consistent with Malaysia's national development strategies and climate policy frameworks. The project's activities are explicitly designed to align with and provide tangible, piloted inputs to key government priorities regarding climate resilience, flood mitigation, water security, and institutional capacity building.

**Consistency with National Strategy: Climate and Development**

**National Climate Change Policy 2.0 (NCCP 2.0, 2024):** The project contributes to two main strategic thrusts:

- Strategic Thrust 3 (Adaptation and Resilience): Promotes risk-based planning and integrated approaches. It achieves the strategy of maximizing co-benefits through Outcome 2 (Ecosystems delivering buffering functions) and Outcome 3 (Communities sustaining assets).
- Strategic Thrust 1 (Climate Governance and Capacity): Supports the goal of strengthening institutional capacity and data systems. Component 1 (Output 1.1) establishes the Integrated Climate–Forest Intelligence System (ICFIS), linking fragmented data streams (IoT, satellite, citizen science) to guide intervention and informed policy action.

**Thirteenth Malaysia Plan (13MP, 2026–2030):** The project directly supports the 13MP's focus on Strengthening Flood Mitigation and Adaptation. The scaling strategy ensures adaptation measures are integrated into state and national planning.

**Malaysia's Nationally Determined Contributions (NDC 3.0, 2025):** The project directly supports the implementation of adaptation strategies outlined in Malaysia's updated NDC, which focuses on six priority areas for the period 2026–2035:

- The Project improves water supply consistency, strengthens flood capacity in the national rice bowl (C2/O. 2.2), and deploys NbS for urban resilience (C2/O. 2.3).
- Ecosystem and Health Protection: It addresses health risks by reducing smoke from peat fires and enhancing ecosystem resilience through forest rehabilitation.

**National Adaptation Plan (MyNAP 2026–2035):** Malaysia is currently developing its first NAP expected to be finalized in 2026. The Project addresses multiple national priority areas:

- Managing Water Resources and Security
- Ensuring Agriculture Sustainability and Food Security
- Increasing Resilience for Infrastructure and Cities
- Protecting and Conserving Forests and Biodiversity Sustainably

**Water Sector Transformation 2040 (WST 2040):** The project enhances the resilience of the water sector against climate change, contributing to managing water-related risks such as flood, drought, and storm surge, which is a core agenda of WST 2040.

**Alignment with sub-national and institutional frameworks**

The Project ensures ownership and long-term sustainability by aligning with the specific plans and mandates of key state and regional authorities.

**State and municipal alignment**

- **Selangor**: The project interventions, specifically the AquaVault (C2/O. 2.1) in Raja Musa and the urban NbS deployment (C2/O. 2.3) in the Petaling Jaya municipality (MBPJ), directly support the **Selangor State Structure Plan 2035** (RSN Selangor 2035) and the **Selangor Smart Action Plan 2025**. The institutionalization of the Integrated Policy-to-Practice Scaling Framework (IPPSF) (C1/O. 1.3) within MBPJ operationalizes the state's vision for data-driven climate resilience and smart disaster management, ensuring that nature-based solutions are integrated into formal municipal planning and monitoring systems.
- **Kedah:** Component 1 is strategically designed to address critical institutional gaps for Nature-based Solutions (NbS) adoption within Kedah, aligning with the **Greater Kedah 2050 (Kedah Development Plan)** and its focus on agricultural sustainability and water security. It develops and internalizes the systematic Integrated Policy-to-Practice Scaling Framework (O. 1.3) within the Majlis Perbandaran Kubang Pasu (MPKP). This ensures the Project's physical assets (O. 2.3) are synchronized with the state's socio-economic goals for flood mitigation and national rice bowl protection.
- **Kuala Lumpur (Federal Territory)**: The Project's small-scale physical pilots (C2/O. 2.3) and community monitoring activities (C3/O. 3.2) support the city's resilience and sustainability goals, such as those outlined in the **Kuala Lumpur Climate Action Plan 2050** (KLCAP 2050) and **Kuala Lumpur Structure Plan 2040** (KLSP 2040). The institutionalization efforts under Component 1 (O. 1.3)—focused on adaptive protocols and toolkit validation— directly contribute to the city's "City for All" ambition, ensuring that physical growth is balanced with environmental sustainability and climate-proofed metropolitan planning. .

**Sectoral Alignment**

- **MADA Authority**: Within the agricultural landscape, the Project interventions in Ulu Muda (Component 2/O. 2.2) are designed to complement and enhance the existing work of the Muda Agricultural Development Authority (MADA). While MADA focuses on irrigation infrastructure, this project addresses the "upstream" source of water security. It shifts the focus toward proactive, nature-based buffering to protect the national rice bowl from the "water paradox" of

flash floods and prolonged droughts, ensuring synergy with MADA's mandate for national food security.

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 and specific permits will be finalized during the PFG phase as part of a comprehensive environmental and social safeguards assessment. While the project aligns with national law, additional international safeguard measures (detailed in Section K) will be applied where domestic frameworks—such as those regarding indigenous peoples' rights—require strengthening to meet UNDP SES and AF ESP requirements.

*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 assessments for activities affecting environmentally sensitive areas. | Outcome 2 (Output 2.1 & 2.2: Peatland rewetting and forest enrichment). | Procedural Step: Official screening submission to DOE during PFG phase. If triggered, a Schedule 1 or 2 EIA will be conducted by registered consultants for DOE approval prior to implementation. | Department of Environment (DOE) |
| **The National Land Code 1965** | Regulates land ownership and usage, specifically for Peninsular Malaysia and Labuan. Outlines the regulations and procedures for land ownership and registration. | Outcome 2 and 3 (Outputs 2.1, 2.2 and 2.3: Peatland rewetting, forest enrichment, urban NbS pilot infrastructure). | Procedural Step: Checking of detailed design/alignment to avoid land acquisition, access restrictions. | Ministry of Land and Mines |
| **Aboriginal Peoples Act 1954** | Governs the administration, protection, and regulation of Orang Asli communities in Peninsular Malaysia | Outcome 3 (Output 2.1 & 2.2: Peatland rewetting and forest enrichment). | Compliance with requirements governing customary areas of Orang Asli. Note that UNDP SES requires additional safeguards for affected IPs, including FPIC. | Department of Orang Asli Development |
| **State Forest Laws of Kedah and Selangor** | Govern gazettement and classification of forest areas, forest management planning, licensing and permitting of allowable activities | Outcome 2 (Output 2.1 & 2.2: Peatland rewetting and forest enrichment). | Screening and compliance requirements regarding ecosystem restoration activities (if any). Note that UNDP SES requires additional safeguards for affected IPs with customary lands/rights inside Forest Reserves. | State Forestry Departments |
| **National Water Quality** | Defines parameters for raw water quality | Outcome 2 (Output 2.2: Watershed | In Compliance: Baseline water quality testing and monitoring are | Ministry of Natural Resources and |

| | | | | |
|---|---|---|---|---|
| **Standards (NWQS)** | and aquatic life protection. | management and sedimentation reduction). | integrated into project design to align with Class II/III standards. | Environmental Sustainability (NRES) |
| **Manual Saliran Mesra Alam (MSMA) 2nd/3rd Ed.** | Technical standards for urban stormwater and "Sponge City" design. | Outcome 2 (Output 2.3. Urban NbS infrastructure) | Required: All urban NbS pilots (O. 2.3) will be designed to MSMA standards for 1-in-50-year ARI flood events. | JPS (Irrigation and Drainage) |
| **Uniform Building By-Laws (UBBL) 1984** | Standards for structural safety and drainage in urban environments. | Outcome 2 (Output 2.3: Urban NbS (Sponge City) pilot infrastructure). | Required: Detailed engineering designs will be submitted to municipal councils for Planning Permission (Kebenaran Merancang). | Local Authorities (MBAS/MPSP/ MBPJ/DBKL) |
| **Plan Malaysia Green Infrastructure Guidelines** | Standards for Nature-based Solutions in town planning. | Outcome 1 (Output 1.3. IPPSF) | Alignment: Ensuring the IPPSF Scaling Framework (O. 1.3) meets national urban planning standards. | PLAN Malaysia |
| **MS ISO 14001:2015 / Amd 1:2024** | Environmental Management Systems (EMS) standard including climate action. | Outcome 1 (National Forest-Climate Vulnerability Atlas and ICFIS). | Alignment: Project institutional framework will align with ISO 14001 principles to ensure systematic risk tracking and climate integration. | SIRIM QAS International |
| **Occupational Safety & Health Act (OSHA) 1994** | Ensures safety, health, and welfare of persons at work. | Outcome 3 (Output 3.1: Local community and contractor employment for EbA works). | Required: All contractors must submit a Safety and Health Plan. Site supervisors must hold valid OSH certifications. | Dept. of Occupational Safety & Health (DOSH) |
| **Street, Drainage & Building Act 1974** | Regulates the maintenance of drains and watercourses. | Outcome 2 (Output 2.3: Urban retention pond upgrades and NbS drainage). | Required: Technical review and approval of engineering designs by JPS for all modifications to existing water infrastructure. | Dept. of Irrigation and Drainage (JPS) |

## F. Other relevant projects/programmes

The proposed Project is designed to achieve maximum impact by avoiding duplication and creating strong synergies with existing government, multilateral, and bilateral investments in Malaysia. The project fills critical gaps by providing tangible, scalable Nature-Based Solutions (NbS) models where current initiatives primarily focus on policy frameworks, grey infrastructure, or small-scale research. The Project acts as a vital "missing middle," connecting national policy, research, and large-scale infrastructure with practical, community-engaged, and NbS.

*Table: Other relevant projects in Malaysia*

| **Project Title, Timeline, Location, Budget** | **Main Interventions & Target Population** | **Implementing Entity** | **Lessons Learned** | **Overlaps and Synergies with the Proposed Project** |
|---|---|---|---|---|
| **FRIM R&D and Pilot Projects**; Ongoing; National; **Budget:** Govt core funding | Technical pilots for climate-resilient water management and NbS (e.g., AquaVault modular floating water storage and controlled rewetting system). **Target:** Technical agencies and forestry sector. | Forest Research Institute Malaysia (FRIM) | Moving from Technology Readiness Level 7 to full implementation is a vulnerability; technology remains an "isolated success" without landscape-scale data validation. | **Synergy:** Provides the active water management required to achieve Outcome 2 (Ecosystems delivering restored functions), moving beyond GEC's passive model (see below). **No Duplication:** This project scales existing research into a community-integrated model. |

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| **GEC Peatland Restoration**; Ongoing; Selangor/Pahang; **Budget:** Donor-funded | Passive rewetting (canal-blocking) and fire patrolling. **Target:** Forest buffer zone communities. | Global Environment Centre (GEC) | Passive rewetting is effective but leaves sites vulnerable to fire during extreme drought; active pressurized water access is required. | **Synergy:** Builds on GEC's passive rewetting ('Eco-Warden') model with active modular water storage and controlled release (C2/O.2.1) to address drought-period fire hotspots. **No Duplication:** AquaVault complements, rather than replaces, canal-blocking. |
| **MADA: Irrigation & Climate Works**; Ongoing; Kedah; **Budget:** State/Local | Downstream irrigation and flood control for the "rice bowl." **Target:** ~31,800 paddy farmers in Muda. | Muda Agricultural Development Authority (MADA) | Downstream grey infrastructure is increasingly vulnerable to upstream forest degradation and sediment runoff, threatening rice-bowl security. | **Synergy:** Protects the upstream source (O. 2.2). **No Duplication:** MADA manages farm-level grey infrastructure; the project manage upstream "green" buffers. |
| **DID Urban Stormwater Management**; Ongoing; National; **Budget:** National | National guidelines and grey infrastructure (retention ponds). **Target:** Urban flood-risk populations. | Dept. of Irrigation & Drainage (DID) | Traditional grey infrastructure has inherent design limitations and functions most effectively when complemented by NbS and EbA to provide flexible buffering and adaptive capacity against extreme climate variability. | **Synergy:** Ecologically upgrades existing DID assets (C2/O. 2.3) to achieve Outcome 2. **No Duplication:** DID maintains standard grey assets; the project adds NbS resilience. |
| **Penang Island Urban NbS**; 2022–2027; Penang; **Budget:** USD 10M (AF) | Urban greening and sustainable drainage. **Target:** ~343,700 residents of George Town. | UN-Habitat / Think City | NbS models are vulnerable to maintenance failure without municipal and local council buy-in from the design phase. | **Synergy:** Leverages established Knowledge Transfer Platform. **No Duplication:** Geographically restricted to Penang Island. |
| **UNDP: Climate Promise & CFIL**; 2025–2026+; National; **Budget:** 1.25M | Policy and finance models for climate-resilient agriculture. **Target:** Govt and financial institutions. | UNDP | Policy models are vulnerable to inaction because they lack the tangible, "bankable" NbS field data (ROI) needed to trigger private sector investment. | **Synergy:** Provides validated NbS models and data (C1) needed to operationalize climate finance policy. **No Duplication**: Analytical policy work vs. field-level data validation. |
| **UNDP/MoA: Hill Paddy Resilience**; 2025–2028; Sabah; **Budget:** USD 750k | Resilience of hill paddy through improved practices. **Target:** Smallholder farmers in East Malaysia. | UNDP / MoA | Agricultural resilience is site-specific; local traditional knowledge is essential for seed variety selection. | **Complementary:** Focuses on a different agricultural system. **No Duplication:** Geographically restricted to Sabah. |
| **JICA: Flood Management**; Multi-year; National; **Budget:** Large-scale loans | Large-scale grey infrastructure (dams, levees). **Target:** Populations in major river basins. | JICA | Hard engineering is vulnerable to climate shocks; green buffers are needed to reduce sediment load and extend asset life. | **Synergy:** Green buffers (C2) reduce maintenance burdens on JICA-funded dams. **No Duplication:** Focuses on grey infrastructure. |
| **World Bank: Analytical Work**; | Macro-economic analysis and infrastructure loans. | World Bank | Pilot models for NbS are vulnerable to | **Synergy:** Serves as a pilot model that could be scaled |

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| Ongoing; National; **Budget:** Large-scale loans | **Target:** National government. | | scaling gaps; they must be proven at scale before integration into national loan structures. | up using World Bank lending. **No Duplication:** Analytical vs. Intervention. |
| **World Bank: Sustainable Forest Management**; 2023–2028; National; ~$100M (Loan) | Institutional capacity for forestry, reducing deforestation, and carbon stocks. | World Bank / JPSM | Conservation is vulnerable to “fringe pressure”; it requires community- based incentives to reduce illegal encroachment and degradation pressure. | **Synergy:** Livelihood resilience models (C3) provide the community economic incentives. **No Duplication:** Top-down federal policy and institutional forest regulation vs. bottom-up community stewardship. |
| **UNDP-Sida Gender-Responsive Climate Action**; 2021–2024; National; Sida-funded | Piloted frameworks for GESI (Gender Equality & Social Inclusion) in climate projects. | UNDP / NRES | GESI checklists established, however there is a “policy-to-practice” gap in operationalizing these without community-led NbS that provide measurable economic outcomes. | **Synergy:** Directly operationalizes GESI frameworks to achieve Outcome 3 (Communities sustaining assets) through tangible livelihoods. **No Duplication:** Moves from policy checklist to tangible livelihoods. |
| **GCF: FP181 NbS for Climate-resilient Landscapes and Communities**; 2023-2030; Kelantan; **Budget:** $30.2M | Integrated watershed management. **Target:** Rural smallholders in Kelantan. | Ministry of Natural Resources / GCF | Integrated landscape approaches are vulnerable to fragmented governance between forestry and agriculture. | **Synergy:** National data sharing on NbS ROI through Outcome 1.. **No Duplication:** Geographically restricted to the East Coast (Kelantan). |
| **REGIONAL: ASEAN NbS Scaling**; 2023–2028; SE Asia; **Budget:** Multi-donor | Regional policy and technical standards development. **Target:** ASEAN Member State technical staff. | ADB / ASEAN | Regional scaling is vulnerable to "data silos"; a lack of standardized ROI data prevents large-scale private sector investment; a lack of standardized regional "NbS ROI" data prevents large-scale private sector investment. | **Synergy (CAR4):** Provides Malaysia's contribution to regional NbS technical standards. **No Duplication:** No physical works. |

## G. Learning and knowledge management

The Project integrates a systematic Knowledge Management (KM) strategy across its design, ensuring that experiences and lessons learned are captured, analysed, and disseminated to enrich local, national, and global adaptation knowledge. This function is systematically embedded directly within the Adaptive Governance (C1) and Capacity & Livelihoods (C3) components, ensuring Knowledge Management is a central, continuous activity designed to trigger the institutional and behavioral shifts defined in Outcome 1 and Outcome 3.

**Embedded Knowledge Management Mechanisms**

Component 1 is the primary knowledge capture and analytical mechanism. It establishes the centralized Integrated Climate–Forest Intelligence System (ICFIS) (Output 1.1). This system

systematically aggregates raw data, monitoring results, and performance metrics from all physical intervention sites (C2: Physical Assets). The key KM outputs from this platform include:

- Validated NbS Models: Technical reports detailing the performance, cost-effectiveness, and replicability of the C2 assets (e.g., Modular Water Storage Systems, Urban NbS Upgrades) providing the Return on Investment (ROI) evidence base needed for national scaling.
- Policy Products: Formalized tools such as the Integrated Policy-to-Practice Scaling Framework (IPPSF) (Output 1.3) and targeted policy briefs to guide national mainstreaming.

Component 3 serves as the local knowledge generation, learning, and dissemination mechanism.

- Knowledge Generation and Feedback: It captures grassroots knowledge, technical data from the Eco-Warden Teams (Output 3.2), and local perceptions of project success, providing a crucial adaptive management feedback loop to achieve the institutionalized stewardship defined in Outcome 3.
- Dissemination and Learning: It establishes the National Climate Knowledge Portal (Output 3.3), a public-facing platform dedicated to disseminating key national-level KM products from C1 (e.g., the National Climate Vulnerability Atlas) and practical tools for community use.

**Dissemination and Learning**

The Knowledge Management strategy will focus on targeted dissemination of knowledge and lessons learned to accelerate understanding of effective adaptation interventions:

- **Dissemination Products:** Knowledge products will include the National Climate Knowledge Portal (for the public and practitioners), targeted policy briefs (for national stakeholders), and technical guidelines (for replication).
- **Knowledge Sharing Tools:** The Project will utilise a mix of tools, including the digital platform, targeted social media streams, and newsletters reflecting on progress and lessons. Complementary products like photos, videos, and presentations will be developed to communicate local impacts, particularly demonstrating Gender Equality and Social Inclusion (GESI) results.
- **Adaptive Learning:** Experiences gained from the project will be rigorously analysed periodically (e.g., through annual reports and mid-term evaluations) to inform national decision-making and accelerate the mainstreaming of successful NbS models across Malaysia, ensuring continuous improvement.

**Knowledge Tracking, Sustainability, and Scaling**

To ensure long-term impact the following arrangements are established:

- **International Dissemination:** the Project will disseminate lessons learned at the global level. This includes sharing results through the Adaptation Fund's knowledge sharing channels, UNDP's global adaptation networks (e.g., Adaptation Learning Mechanism), and presenting NbS results at regional and international forums.
- **Responsibility for Knowledge Tracking:** The Project Manager (PM) holds overall accountability for the successful implementation of the KM strategy and the integration of lessons learned into the project's adaptive management cycle. To ensure rigorous tracking, the PM will delegate day-to-day knowledge management functions (e.g., data collection, documentation, and portal maintenance) to a designated focal point within the PMU. Depending on the final PMU configuration to be determined during the PFG phase, this task will be integrated into the portfolio of the M&E, Communications, or Technical officer. FRIM and NRES will provide technical oversight to ensure that data from the ICFIS and Eco-Wardens are converted into technical publications and policy recommendations.
- **Sustainability and Post-Project Maintenance:** Knowledge generated will be sustained through long-term data-sharing agreements established during the project. The National

Climate Knowledge Portal will be officially handed over to NRES upon project conclusion. NRES will integrate the portal into its permanent institutional budget and IT infrastructure, ensuring it remains an officially recognized, central climate intelligence resource for Malaysia.

During implementation, the Project will finalize an outreach strategy and identify specific tools to ensure lessons are shared with the technical community and the broader public, aligning with the Adaptation Fund's principles for knowledge management.

## H. List of Stakeholders

**Stakeholder consultations held during concept stage**

Initial consultations and informal discussions were conducted with key government agencies and institutional partners during the project concept design phase to confirm site suitability, address potential conflicts, and incorporate input from key beneficiaries.

*Table: Summary of stakeholder consultations held during concept stage*

| Stakeholder Consulted | Date/ Timeframe | Total attendees (F/M) | Focus and issues discussed | Outcome and incorporation of interests (incl. gender and vulnerable groups) |
|---|---|---|---|---|
| Forest Research Institute of Malaysia (FRIM) | Ongoing since 17 December 2024 | 7 (6F/1M) | Executing Entity, Scientific oversight, and validation methodology | FRIM confirmed its role as the Executing Entity responsible for overall project coordination and technical delivery (C1-C3) and validated the Project methodology. **Incorporation:** FRIM provided methodology and confirmed all technical interventions and project locations. |
| Ministry of Natural Resources and Environmental Sustainability (NRES) | 30-31/10/ 2025<br><br>5/1/2026 | 4 (2F/2M)<br><br>5 (3F/2M) | Institutional Arrangements and Policy Scaling | Confirmed that the Project Board will be chaired by the Secretary-General of NRES. **Incorporation:** Ensured high-level policy support for national scaling of NbS. |
| Selangor State Forestry Department (SSFD) | 22 July 2025 | 13 (6F/7M) | Indigenous peoples Inclusion and Site Custodianship of Kuala Langat Utara Forest Reserve (KLUFR), water security for Orang Asli Temuan Communities. | SSFD identified specific community-proximate areas for modular water storage systems. **Incorporation:** Output 2.1 was redesigned to include high-frequency filtration, transforming the intervention from a 'technical asset' into a community-managed service (Outcome 3) that reduces time-poverty for indigenous women. |
| Muda Agricultural Development Authority (MADA) | 30-31 October 2025<br><br>18 November 2025 | 8 (2F/6M)<br><br>17 (2F/15M) | Non-duplication and Upstream alignment | MADA confirmed their plan to store excess water during extreme rainfall events. **Incorporation:** The project was designed to align with MADA by focusing upstream on ecosystem restoration and forest rehabilitation (C2) to protect the primary income and rice yields of low-income smallholder farmer households. |
| Kubang Pasu Municipal Council (Majlis Perbandaran Kubang Pasu, MPKP) | 2 July 2025,<br>26 Oct 2025, | 2 (1F/1M)<br><br>2 (1F/1M) | Local government engagement | MPKP confirmed custodianship of the 200 retention ponds. **Incorporation:** Guaranteed local government commitment to O&M, ensuring long-term safety and public health benefits for local residents (O. 2.3). |
| Kuala Lumpur City Hall (Dewan | 4 November 2025 | 2 (2F) | Local government leadership, | DBKL and C40 Cities provided the already developed comprehensive Community |

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| Bandaraya Kuala Lumpur, DBKL) and C40Cities | | | alignment with existing DBKL-C40 Cities climate resilience frameworks, and community-based adaptation initiatives. | Resilience Implementation Plan (CRIP). **Incorporation:** The CRIP identifies community vulnerabilities and co-created solutions for the Kampung Pasir Baru pilot site, ensuring full alignment with C40 GESI methodologies. |
| Selangor Climate Adaptation Centre (SCAC) | 12 Nov 2025 | 1M | State-level climate adaptation governance, climate-vulnerability site prioritisation, evidence-based planning, and alignment with Selangor's adaptation strategies | SCAC endorsed Kampung Cempaka as an adaptation site. **Incorporation:** Suitability confirmed based on flood risk and community vulnerability (high density of elderly/low-income residents), ensuring alignment with state social priorities., |
| Selangor State Economic Planning Unit - Local Authority Section (UPEN Selangor - PBT) | 12 Nov 2025 | 1 (1F) | State-level coordination with local authorities (PBTs) and alignment with Selangor's urban resilience priorities and NbS integration opportunities. | Selangor State Economic Planning Unit - Local Authority Section agreed that Kampung Cempaka is an appropriate pilot site due to flood risk and ecological potential. **Incorporation:** Confirmed support for expanding the NbS model based on ecological potential, with an emphasis on creating green employment for local youth and women. |
| Kedah Forestry Department. | 30-31 October 2025<br>18 November 2025. | 8 (2F/6M)<br>17 (2F/15M) | Forest management and water resource protection in the Ulu Muda Forest Reserve (FR) | Supports the plan to enhance the hydrological functions of the Ulu Muda FR for forest management, with the purpose of sustaining water resources for the Ulu Muda Dam. **Incorporation**: Enrichment planting and river slope management reduce the risk of soil erosion and incorporate the Nature-based technique for controlling river sedimentation in the Ulu Muda catchment. |

**Future consultations and process (Project Preparation Phase)**

The requested USD150,000 Project Formulation Grant (PFG) will be utilized to finance a comprehensive, gender-responsive stakeholder consultation process required for the f development of full project proposal. This iterative process will ensure full compliance with the Adaptation Fund's Environmental and Social Policy and Gender Policy and involve all direct and indirect stakeholders, moving from national and sub-national institutional engagement to deep-dive community-level verification.

**Key commitments:**

- **Gender Analysis and CSO engagement**: A robust Gender Analysis will be conducted, and a Gender Action Plan (GAP) developed, informed by consultations with the Ministry of Women, Family and Community Development (KPWKM) alongside women's and environmental rights Civil Society Organizations (CSOs).
- **Indigenous Peoples (IP) integration:** Consultation will be prioritised with Temuan Orang Asli representative groups to formally document Free, Prior, and Informed Consent (FPIC) as

required, and to ensure the specific interests and rights of Indigenous Peoples are integrated into the final institutional arrangements and benefit-sharing mechanisms.

- **Capacity Building and safeguards:** Pre-approval consultation workshops will be held to manage stakeholders and establish specific community safeguard measures (e.g., Drowning Risk mitigation). All participant lists will be disaggregated by sex and age to track the representation of marginalized voices.
- **Documentation and transparency:** The full consultation documentation will detail the techniques used (tailored per target group, including vulnerable populations), key findings, and how suggestions and concerns were integrated into the project design.

**List of Stakeholders to be consulted**

| Category | Specific Entity/Group | Role and Involvement |
|---|---|---|
| Project Implementing and Executing Entities | United Nations Development Programme (UNDP) | Implementing Entity (IE); provides oversight and ensures compliance with AF policies. |
| | Forest Research Institute Malaysia (FRIM) | Executing Entity (EE); leads project design, technical implementation, and R&D |
| Federal and State Government Agencies | Ministry of Natural Resources and Environmental Sustainability (NRES) | Project Executive/Chair of Project Board, providing policy and strategic direction. |
| | Department of Forestry Peninsular Malaysia - JPSM | Policy guidance and data for forest restoration and management |
| | Ministry of Economy | General oversight role |
| | Ministry of Finance | Provide strategic direction on climate financing for adaptation |
| | Ministry of Women, Family and Community Development (KPWKM) | Provides technical guidance on gender mainstreaming and the Gender Action Plan |
| | Ministry of Agriculture and Food Security | Provide policy and technical advice on food system/security |
| | Ministry of Plantations and Commodities | Provide policy and technical advice |
| | Ministry of Energy Transition and Water Transformation (PETRA) | Provide policy guidance on water management and adaptation action |
| | Selangor State Forestry Department | Site custodian for peatland reserves, long-term maintenance, and regulatory coordination. |
| | Kedah State Forestry Department | Site custodian for forest enrichment. |
| | Muda Agricultural Development Authority (MADA) | Authority for agricultural irrigation; ensure alignment with food security priorities. |
| | National Water Research Institute Malaysia (NAHRIM) | Water management coordination and hydrological data integration research |
| | Department of Irrigation and Drainage (DID) | Water management coordination |
| | Selangor State Economic Planning Unit (UPEN Selangor) | State-level coordination with local authorities |
| | JAKOA (Dept. of Orang Asli Development) | Liaison for FPIC, indigenous certification, and IPP compliance |
| | PLANMalaysia (Federal Department of Town and Country Planning) | Leads urban governance scaling and Digital Vulnerability Atlas development. |
| | Dept. of Statistics Malaysia (DOSM) | Provides household surveys and gender-disaggregated data |
| | MET Malaysia (MNA) | Supplies meteorological data streams for the ICFIS dashboard |
| | Majlis Perbandaran Kubang Pasu, Municipal Council (MPKP) | Local governments, responsible for validating pilot nature-based solutions (NbS) for flood control and urban cooling in their jurisdictions and formally adopting the |
| | Petaling Jaya City Council (MBPJ) | |

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| | | project's adaptive governance methods (Urban Resilience Toolkit) to scale up project impact (C4). |
| | Kuala Lumpur City Hall (DBKL) | |
| Vulnerable & Marginalized Communities | Indigenous Peoples (Orang Asli Temuan) | Primary focus for FPIC; Direct beneficiaries of water security and fire risk reduction; partners in co-management. |
| | Farmers and Smallholders (Kubang Pasu/MADA area) | Direct beneficiaries of flood mitigation and water security; targeted for economic analysis and capacity building in NbS |
| | Women and Youth | Targeted groups for empowerment(50% gender target) |
| | Urban and Peri-Urban Residents (Kubang Pasu, Kuala Langat Utara, Klang valley) | Direct beneficiaries of reduced flood risk, urban cooling, and improved water access. |
| Civil Society, NGOs, and Research | Global Environment Centre (GEC) | Provides expertise in peatland conservation, community outreach, and supports Component 1 synergy. |
| | Climate Finance Innovation Lab (CFIL) | Platform/partnership for development of NbS/EbA Financing Strategies. |
| | Academia and Technical Experts | Provides expertise for vulnerability assessments and data integration |
| | Women's and Environmental Rights CSOs | Will be consulted during the PFG phase to strengthen gender analysis and risk mitigation plans. |
| | Women's Cooperatives | Key partners in managing the three Women-Prioritized Community Nursery hubs |
| | Local Residents Associations | Participate in riverine/drainage corridor restoration in DBKL and MBPJ |

# I. Justification and adaptation reasoning

The proposed Project is a critical, full-cost adaptation investment required to counter the severe and systemic impacts of climate change that are challenging the economic, social, and environmental stability of vulnerable communities in Malaysia. The justification for this funding is rooted in moving beyond a costly, reactive "Business-as-Usual" (BAU) approach to implementing a proactive, integrated, and adaptive governance framework. The Project is strategically designed to deploy Nature-based Infrastructure across targeted watersheds and urban areas, ensuring both high impact at the local level and an evidence-based model for national scaling.

**Baseline Scenario: The cost of inaction (without Programme interventions)**

The existing conventional development and maintenance practices, which constitute the baseline scenario, are fundamentally inadequate to address the escalating threat of climate hazards—including more intense flooding, prolonged droughts, and catastrophic peat fires. The national and development programs baseline is defined by adherence to conventional sector-specific budgets which cover routine maintenance, existing infrastructure upgrades, and reactive disaster response, but which do not integrate a dedicated climate change adaptation mandate or the necessary financial instruments for systemic, preventative Nature-based Infrastructure designed for flood and water management.

Without this Project, the BAU scenario dictates a cycle of increasing vulnerability and compounding costs, where the long-term cost of inaction far exceeds the initial investment in adaptation:

- **Unsustainable Public spending and Short-Term fixes**: Existing Municipal Council and Public Works budgets are programmed for recurrent, reactive infrastructure repair (e.g., clearing debris, fixing damaged roads) post-flood events. These budgets lack the provision for proactive, functional Nature-Based Infrastructure such as the modular water storage and infiltration systems (O 2.1). Consequently, dependence on expensive, carbon-intensive emergency fire suppression methods will continue, combating the chronic risk of catastrophic peat fires, leading to significant recurring economic losses, human health impacts, and the continued release of stored carbon.

- **Persistent Livelihood Exposure and Inadequate Water Security**: Existing agricultural support and water utility programs focus primarily on conventional irrigation schemes and maintenance of existing, static retention infrastructure. These budgets do not allocate funds for upstream ecosystem-based adaptation designed to provide water security. Without the upstream forest rehabilitation (O. 2.2.) in critical water catchments and the ecologically upgraded retention infrastructure (O. 2.3), agricultural systems will remain directly exposed to climate shocks. This results in chronic, unpredictable crop losses, deepening the instability of smallholder farming livelihoods, increasing water treatment costs, and reducing the storage capacity of critical reservoirs due to climate-driven sedimentation.
- **Critical Governance and Policy Financing deficits:** Local and municipal governments, while aware of climate risk, lack the financial resources to invest in pioneering climate intelligence infrastructure. The baseline budget is sufficient for routine operational data but cannot finance the development and deployment of the Integrated Climate–Forest Intelligence System (ICFIS) (O. 1.1) necessary to break down complex climate data into usable, forward-looking planning forms. Without C1, planning efforts remain fragmented, wasteful, and fail to secure the evidence-based policy and financial foundations necessary for long-term, large-scale adaptation.
- **Exacerbated Social Inequality in Decision-Making:** Existing national development policies often advocate for Gender Equality and Social Inclusion (GESI) but lack the dedicated, ring-fenced financial and programmatic mechanism to ensure its implementation in climate action. The BAU path neglects to prioritize the specific vulnerabilities of excluded groups, particularly women, who remain excluded from technical roles and climate decision-making, thereby weakening overall community resilience.

**Full Cost of Adaptation and additionality of the AF investment**

The Project's three components represent necessary adaptation measures that collectively provide clear additionality by funding a systemic and integrated response which falls outside the scope, budget, or technical mandate of all current national and development financing envelopes. The requested AF funding covers the full cost of adaptation by financing interventions that represent a paradigm shift from conventional development to climate-proof, anticipatory governance.

*Table: AF additionality*

| Component | AF Additionality | Financing Gap |
|---|---|---|
| **Component 2, O. 2.1** | Hydrological restoration: Innovative, non-conventional NbS technology (Modular Water Storage Systems) specifically for proactive drought mitigation, water table stabilization, and flood buffering. | This is not a conventional Public Works budget item. It is a new, specialized, non-revenue generating adaptation service for climate mitigation and fire prevention and flood control which existing ministerial budgets do not cover. |
| **Component 2, O. 2.2 & O. 2.3** | Full-Watershed Ecosystem-Based Adaptation (EbA): Financing the link between upstream forest rehabilitation (O. 2.2) and downstream ecologically upgraded retention ponds (O. 2.3) to provide integrated flood attenuation. | The cross-sectoral coordination and financing challenge prevents this investment (Forestry, Water, Urban Development) from being financed by a single sector's limited budget. AF funds the critical nexus for systemic resilience, ensuring water stability and flood protection — services beyond standard forestry or municipal maintenance. |
| **Component 1 and Component 3** | Adaptive Governance & Climate Intelligence Infrastructure: Investment in the Integrated Climate–Forest Intelligence System (ICFIS) (C1) and the Citizen Science Project (C3) to provide community-level data for local Early Warning Systems (EWS) and to manage | This is a pioneering national investment in climate intelligence and dynamic management that national budgets do not currently allocate funds for. Conventional budgets finance static monitoring, not the full-cost development of a predictive, integrated planning platform for water management. AF funding is the “connective bridge” that finances the integration of IoT data (ICFIS) |

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| | flood and drought risks dynamically. | with community action (Eco-Wardens) to achieve Outcome 1. |
| **Component 1 O. 1.3** | Institutionalizing NbS: Development of the validated NbS models and monitoring protocols into the Integrated Policy-to-Practice Scaling Framework (IPPSF). | AF funding is used to create the first-of-its-kind, evidence-based blueprint for institutionalizing and enforcing Nature-based flood management at a national scale. This crucial policy-to-finance shift is a transaction cost of adaptation that is not covered by routine government operations or ODA projects. |

The requested funding is therefore essential not just to implement a series of projects, but to build an interconnected, institutionalized system that builds sustainable, long-term climate resilience and empowers communities to engage in meaningful, climate-informed development planning. The AF grant is the necessary catalyst to bridge the financial gap between conventional, reactive development (the Baseline) and proactive, systemic adaptation (the Full Cost of Adaptation).

## J. Sustainability

The long-term sustainability of the Project's adaptation benefits is fully integrated into the project design across all three components, addressing institutional, financial, economic, social, and environmental dimensions. The overall goal is to ensure the adaptation benefits are sustained after project completion, enabling replication and scaling up with other funds.

**Institutional and Knowledge Sustainability: Asset Ownership and Continuity**

Institutional sustainability is achieved by ensuring project outputs become permanent national assets, primarily through **Component 1** (Adaptive Governance).

- **Permanent Monitoring System:** Component 1 (O. 1.1) ensures institutional sustainability by embedding the monitoring systems within the Forest Research Institute Malaysia (FRIM)'s and the National Water Research Institute of Malaysia (NAHRIM)'s permanent research infrastructure and core budget. These entities will assume formal ownership of the ICFIS and Vulnerability Atlas, integrating data maintenance and system updates into their annual federal budget allocations. This creates a long-term Integrated Climate–Forest Intelligence System (ICFIS) that provides the scientific insights and real-time data needed for sustained adaptive management independent of project-based funding.
- **Policy and Scaling Blueprint:** Component 1 (O. 1.3) pioneers the systematic Integrated Policy-to-Practice Scaling Framework in Kedah, Kuala Lumpur, and Selangor. This framework will be integrated into Local Plans (Rancangan Tempatan) and municipal planning guidelines, establishing NbS-based climate-risk data as a technical requirement for future development and asset management approvals. This framework also provides a proven blueprint for the whole country, ensuring successful technical models can be replicated nationally to potentially transform thousands of retention ponds nationwide. This action strengthens the ability of local institutions (Municipal Councils) to apply climate-risk data to guide future planning.

**Financial and Economic Sustainability: O&M and Replacement Financing**

The Project is designed to deliver high economic returns and establish viable financing mechanisms for long-term maintenance, moving beyond grant dependency.

- **Municipal Budgeting for Operations & Maintenance (O&M):** For urban EbA assets (C2/O 2.3), the project will secure commitments from target Municipal Councils (e.g., MPKP, MBPJ) to integrate maintenance protocols into their Standard Operating Procedures (SOPs). The "NbS Operational Handbooks" (O 1.3) provide the technical frameworks required for municipal departments to adopt these activities, such as vegetation management and hydrological upkeep, as core institutional responsibilities within their existing disaster risk management workplans.
- **Revenue Generation and User Fees:** Financial sustainability for peatland and community interventions is supported by revenue-linked models. The 3 Women-Prioritized Community

Nurseries will operate as social enterprises, using seedling sales to fund operations. For decentralized water assets like the AquaVault (C2/O. 2.1), a community-agreed "Water Stewardship Fee" will be managed by LLA bodies to finance spare parts and routine repairs.

- **Cost-Efficient Maintenance:** The NbS approach provides high-cost efficiency, with pond upgrades (C2/O. 2.3) being 50-100 times cheaper than new grey construction, ensuring long-term local government adoption and reduced lifecycle maintenance costs.
- **Financing Strategy:** Component 1 (O. 1.3) includes partnerships (e.g., with the Climate Finance Innovation Lab) to establish a Kedah-level and National NbS financing strategy, exploring tools like green bonds and Payments for Ecosystem Services (PES), to secure long-term investment for NbS scaling.

**Social and Technical Sustainability: Professionalizing Community Stewardship**

Sustainability relies on local ownership, capacity building, and robust infrastructure, all integrated within Component 3 (Capacity & Livelihoods).

- **Community Co-Management and Social Ownership:** The Project builds social infrastructure by establishing Locally Led Adaptation (LLA) Co-Management Bodies and Eco-Warden teams (C3/O. 3.2). To ensure continuity, Eco-Warden teams will be formally linked to existing state disaster response networks or State Forestry Departments. This provides them with institutional recognition and integrates their environmental monitoring data into national reporting systems. Local communities, including Orang Asli Temuan and farmers, are trained and certified to perform operation and maintenance (O. 2.1), empowering them as long-term stewards of the adaptation assets.
- **Legal Status for LLA Co-Management:** All LLA bodies will be registered as formal legal entities (CBOs), allowing them to hold bank accounts, manage community fees, and enter into binding co-management agreements with government agencies for the long-term stewardship of NbS sites.
- **Gender and Youth Empowerment:** The project specifically targets 50% women and youth participation in technical training (C3/O. 3.1) and establishes women-prioritized nurseries (70% women), institutionalizing the roles of vulnerable groups in technical adaptation management.
- **Technical Longevity:** Physical installations (C2) are built with robust design principles and quality, acid-resistant materials (e.g., HDPE) for a 20 year operational life. Component 1 (O. 1.1) ensures Technical Sustainability through the use of open-source software, local technical capacity development, and formalized, documented protocols for independent system maintenance by FRIM and NAHRIM staff.

**Environmental Sustainability**

Environmental sustainability is achieved through direct restoration and ecological enhancement using NbS, guaranteeing the integrity of natural capital against climate stress.

- **Ecosystem Resilience: C**omponent 2 focuses on restoring ecological functions by implementing forest rehabilitation (EbA) in Ulu Muda (O. 2.2) and active peat rewetting (O. 2.1). This action safeguards critical ecosystem services, such as watershed function and massive carbon storage.
- **Biodiversity Enhancement:** The ecological upgrade of retention ponds and planting of mini-forests (C2/O. 2.3) creates stepping-stone habitats and enhances biodiversity, ensuring the longevity of natural buffers against climate-driven hydrological extremes.

## K. Environmental and social impacts and risks

UNDP, as accredited Implementing Entity of the Adaptation Fund, commits to implementing the proposed project in compliance with the Adaptation Fund's Environmental and Social Policy (ESP). UNDP will do so through its own Environmental and Social Management System (ESMS) and application of UNDP's Social and Environmental Standards (SES), explicitly recognized as

meeting the requirements of the Adaptation Fund ESP[12]. A preliminary SESP screening (annex 1) conducted during concept note development will be updated during the PFG phase (and during implementation when appropriate or required e.g. due to changes in activities, locations or operational context). While the project is expected to have mainly positive social and environmental impacts and integrate social and environmental standards in its design, a number of risks were identified.

As per UNDP's SES policy and the Adaptation Fund's ESP, the principles and standards outlined in the table below are triggered. Potential adverse social and environmental risks and impacts are few in number, limited in scale, largely reversible and can be identified with a reasonable degree of certainty and readily addressed through application of recognized good international practice, mitigation measures and stakeholder engagement during project implementation. **The overall project risk category is Moderate as per UNDP's SES policy** and **Category B** as per the Adaptation Fund's ESP. 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 concept, as identified during the 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[13]*

| **UNDP SES Principles (P)/Standards (S)** | **AF ESP Principles** |
|---|---|
| P1: Human Rights/Leave No One Behind | P2: Access & Equity<br>P3: Marginalised & Vulnerable Groups<br>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<br>P4: Human Rights |
| S1: Biodiversity Conservation & Sustainable Natural Resource Management | P9: Protection of Natural Habitats<br>P10: Conservation of Biological Diversity |
| S2: Climate Change & Disaster Risks | P11: Climate Change |
| S3: Community Health & Safety | P13: Public Health |
| S5: Displacement & Resettlement | P8: Involuntary Resettlement |
| S6: Indigenous Peoples | P7: Indigenous Peoples |
| S7: Labour & Working Conditions | P6: Core Labour Rights |

**Environmental & Social Assessment and Risk Management**

As a moderate risk project, an Environmental and Social Assessment (ESA) will be undertaken during the project preparation phase to further assess and consider key issues/risks, confirm this categorization, and develop an Environmental and Social Management Plan or Framework (ESMP/ESMF)[14]. The ESMF/ESMP will set out requirements for further assessment as well as approaches, steps and measures for the avoidance, management and mitigation of the range of environmental and social risks. This may include accompanying targeted management plans or standard codes of practice for particular activities.

In line with the Adaptation Fund's ESP Principle 1, the ESMF/ESMP shall reference and comply with the Malaysian legal framework providing relevant protections for the environment and

[12] See Articles 3 and 6 of the ESP.

[13] All triggered principles will be managed through the Environmental and Social Management Framework (ESMF) and specific management plans (IPP, GAP, SEP) to be developed during the PFG phase.

[14] Per the UNDP SES, projects for which an ESMF may be necessary include, but are not limited to, those that: a) support multiple small-scale subprojects; b) implement to-be-specified activities; c) include components that could not be assessed prior to submission (e.g. due to budgetary or time constraints); d) respond to crisis and emergency situations.

communities. The project will be implemented in partnership with the Government of Malaysia and shall wherever possible utilise the existing country safeguards systems and institutional arrangements. The specific national technical standards table and list of legislative acts are presented in section E.

**Additional Safeguards Measures**

Additional measures will ensure further compliance with best international practices. Specifically, the PFG phase will initiate a Free, Prior and Informed Consent (FPIC)[15] process to develop an Indigenous Peoples Plan (IPP). Furthermore, project preparation (PFG-phase) will include a gender assessment to finalize a Gender Action Plan (GAP) and a Stakeholder Engagement Plan (SEP) incorporating a Grievance Redress Mechanism (GRM). The project's screening covers all potential direct, indirect, and cumulative impacts resulting from proposed activities.

| Checklist of environmental and social principles | No further assessment required for compliance | 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 (C2) may inadvertently overlook specific technical standards or water quality regulations. **Mitigation**: Physical works (C2) require strict adherence to national/technical standards and competent authorities identified in section E. While an EIA is not currently triggered, further assessment will be conducted during the PFG stage to confirm all requirements for compliance with UNDP SES, AF ESP, and Malaysian law. FRIM/NAHRIM will secure all necessary regulatory approvals prior to construction. |
| *Access and Equity* | | **Magnitude: Medium.** There is a risk of maladaptation or unintentionally causing harm to non-beneficiaries by excluding them from water-security benefits. **Mitigation:** Conduct a detailed Stakeholder mapping and Social Assessment to map benefits; establish clear criteria for equitable distribution and ensure the Grievance Redress Mechanism (GRM) is accessible to all. |
| *Marginalized and Vulnerable Groups* | | **Magnitude: Medium.** There is a risk of marginalizing minority groups during resource allocation. **Mitigation:** Conduct a detailed Stakeholder mapping and Social Assessment during PFG phase. Prepare a Stakeholder Engagement Plan (SEP) during PFG phase and eEnsure clear criteria for equitable distribution and that the needs of vulnerable groups are specifically addressed in project design. Provision of access to a GRM. |
| *Human Rights* | | **Magnitude: Medium.** There is a risk to human rights concerning Indigenous Peoples' land tenure, safety, and adherence to core labour standards. **Mitigation:** Formal adherence to Free, Prior, and Informed Consent (FPIC) protocols; implementation of a strict Occupational Health and Safety (OHS) Plan and a functional GRM. |
| *Gender Equality and Women's Empowerment* | | **Magnitude: Low/Medium.** There is a risk of excluding women from technical decision-making roles (current participation <15% in target areas) and exacerbated "time poverty" for women in Kedah and Selangor, who currently spend up to 25% more time securing water during droughts. There is also a risk that interventions fail to account for the specific safety and livelihood needs of indigenous Orang Asli Temuan women. **Mitigation:** Implementation of a Gender Action Plan (GAP) based on the site-specific findings in Section II.A/B. Key measures include: (i) mandating a 50% gender target for LLA governance; (ii) establishing 70% Women-Prioritized Nursery Hubs (C3.1) to provide localized, safe income; and (iii) deploying active NbS infrastructure (C2) designed to reduce domestic water collection time. The GAP will include gender-responsive budget tracking and PSEA/GBV prevention measures, with a full assessment scheduled for the PFG stage to ensure compliance with the Adaptation Fund Gender Policy. |

[15] Broad community support for the interventions and consent to proceed will be secured during the preparation phase. Formal and full FPIC will be secured prior to the implementation of activities

| | | |
|---|---|---|
| *Core Labour Rights* | | **Magnitude: Medium.** There is a risk to worker safety during civil works and of unfair employment practices for community-led work. **Mitigation:** Implement a strict OHS Plan for all sites. Ensure all contracts adhere to national labour laws, fair wage standards, and fair employment practices for community activities. |
| *Indigenous Peoples* | | **Magnitude: Medium.** There is a risk that interventions in areas used by Temuan Orang Asli communities may affect their rights and interests. **Mitigation**: Development of an Indigenous Peoples Plan (IPP) to ensure rights are addressed, including formal adherence to FPIC, culturally-appropriate livelihood benefits and integration of representative groups into governance. |
| *Involuntary Resettlement* | | **Magnitude:** Low. There is a risk of perceived restricted access, though no physical or economic displacement is anticipated. **Mitigation:** Exclusion of activities leading to physical resettlement or land acquisition. Use of participatory consultation and FPIC to manage access risks; continuous monitoring to ensure zero resettlement occurs. |
| *Protection of Natural Habitats* | | **Magnitude: Medium.** There is a risk of ecosystem disruption from water retention deployment or using non-native species for interventions in sensitive peatlands. **Mitigation:** Focus NbS on existing, disturbed areas using only certified native plant species |
| *Conservation of Biological Diversity* | | **Magnitude: Medium.** There is a risk of NbS inadvertently causing conflicts or harming protected species in restoration areas. **Mitigation:** Ecological considerations in design of restoration models, uUse only certified native species, apply standard forest restoration guidelines (for species selection, model/stand design, seedling storage/transport, land preparation, planting, use of fire breaks, buffers etc) and implement continuous citizen science monitoring to track indicator species. |
| *Climate Change* | | **Magnitude: Low.** There is a risk of maladaptation (unintentionally increasing vulnerability to other climate impacts). As an adaptation project, the primary objective is to reduce climate risk. **Mitigation:** Ensure design aligns with multiple climate scenarios using the C1 Decision Support Platform to inform adaptive management. |
| *Pollution Prevention and Resource Efficiency* | | **Magnitude:** Low. There is a risk of localized waste generation or resource inefficiency during the installation of small-scale infrastructure (C2).<br>**Mitigation:** ESMP will include standard waste management protocols for minor installation debris. |
| *Public Health* | | **Magnitude: Medium.** There is a risk of drowning or injury in constructed or rehabilitated retention ponds (C2). **Mitigation:** Mandatory safety protocols including site fencing, safety signage, and community education protocols. |
| *Physical and Cultural Heritage* | | **Magnitude: Low.** There is a risk of inadvertently harming cultural heritage sites during ground works in Ulu Muda or Temuan lands. **Mitigation:** Assessment during design to map sites and establish exclusion zones; implementation of a 'Chance Finds' Procedure. |
| *Lands and Soil Conservation* | X | **Magnitude: Negligible/No Risk**. Project activities are inherently restorative, designed to enhance soil stability and peatland integrity. EbA interventions like peat rewetting and reforestation will use manual, low-impact techniques, avoiding heavy machinery, land clearing, or chemicals. As these activities strengthen natural assets rather than depleting them, they pose no risk to soil conservation, and no further assessment is required. |

## PART III: IMPLEMENTATION ARRANGEMENTS

## A. Programme alignment with the Results Framework of the Adaptation Fund

| Project Objective(s) | Project Objective Indicator(s) | Fund Outcome | Fund Outcome Indicator | Grant Amount (USD) |
|---|---|---|---|---|
| **Objective 1**:<br>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 Nature-Based Solutions (NbS) for enhanced water security, and targeted capacity building and gender-responsive livelihood empowerment. | 1a. 1,300+ hectares Total Hectares (ha) of vulnerable ecosystems (peatlands/watersheds) brought under improved NbS management by year 4. | 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 | 3,500,000 |
| | 1b. 200+ urban drainage and water management assets ecologically upgraded to withstand climate-induced flood and heat stress. | Outcome 4: Increased adaptive capacity within relevant development sectors | 4.1.2 No. of physical assets strengthened or constructed | 1,500,000 |
| | 1c. 6 national/sub-national institutions and 630 personnel demonstrate increased awareness and application of climate intelligence tools and NbS stewardship. | Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes | 3.1 No. of targeted population groups aware of predicted adverse impacts | 3,341,014 |
| **Total objective level grant amount** | | | | **8,341,014** |
| **Project Outcome(s)** | **Project Outcome Indicator(s)** | **Fund Output** | **Fund Output Indicator** | **Grant Amount (USD)** |
| **Outcome 1: Institutions applying climate intelligence in adaptive planning.** | 1.1: 2 major national intelligence tools (ICFIS and Vulnerability Atlas) fully operational and formally anchored by year 4<br><br>1.2: 3 Municipalities formally adopting the Scaling Framework **(**IPPSF) and Urban Resilience Toolkit by year 4. | Output 3.2: Strengthened capacity of national and subnational stakeholders and entities to capture and disseminate knowledge and learning. | 3.2.2 No. of tools and guidelines developed (thematic, sectoral, institutional) and shared with relevant stakeholders. | 1,750,000 |
| **Outcome 2: Ecosystems delivering restored hydrological and buffering functions.** | 2.1: 1,300+ hectares of critical peatland and watershed ecosystems under improved hydrological management through NbS AquaVault & EbA planting by year 5. | Output 5: Vulnerable ecosystem services and natural resource assets strengthened in response to climate change impacts. | 5.1: No. of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change | 3,500,000 |

| | | | | |
|---|---|---|---|---|
| | 2.2: 200+ urban drainage assets (ponds, berms, corridors) ecologically upgraded by year 4 to withstand climate-induced flood and heat stress thresholds | Output 4: Vulnerable development sector services and infrastructure assets strengthened in response to climate change impacts. | 4.1.2: No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change | 1,500,000 |
| **Outcome 3: Communities sustaining NbS assets through formalized stewardship and diversified income.** | 3.1: 630 personnel (230 staff and 400 Eco-Wardens) trained and demonstrate increased capacity to utilize climate intelligence tools by year 5.<br><br>3.2: 3 Women-Prioritized Community Nurseries operational as viable livelihood assets, providing native seedlings for NbS replication by year 3. | Output 3.2: Strengthened capacity of national and subnational stakeholders to capture and disseminate knowledge and learning. | 3.2.1 No. of local community organizations benefitting from and/or engaged in institutional strengthening. | 1,591,014 |
| **Total outcome level grant amount** | | | | **8,341,014** |

# Annex 1: UNDP Offline SESP Tool (Abridged version for Adaptation Fund)

### Project Information

| Information | |
|---|---|
| Title | Strengthening Resilience and Adaptive Capacity by Piloting Nature Based Solutions for Water Management in Malaysia |
| Number | Quantum project ID, 10377 |
| Location | Malaysia |
| Project stage | Concept |
| Date | December 2025 |

### Social and Environmental Risk Rating of the Project

| Overall Social and Environmental risk categorization | | |
|---|---|---|
| S&E Risk rating | | Comments |
| Low Risk | ☐ | |
| Moderate Risk | X | |
| Substantial Risk | ☐ | |
| High Risk | ☐ | |

### Social and Environmental Risk Management Instruments

| Assessment or management measures required to address the identified S&E risks and impacts | | |
|---|---|---|
| Further assessment or management measures | Check if applicable | Comments: indicate scope of measures (e.g. outputs/activities to be addressed) as well as timing (e.g. completed, planned in design, or planned in implementation prior to initiation of certain activities) |
| ESMF (Environmental and Social Management Framework) | ✓ | ESMF may be prepared during Project Formulation Grant (PFG) stage if/where the nature, location and scale of activities is insufficiently detailed for ESMP preparation (see below). |
| Targeted assessment(s) | ✓ | To be confirmed during PFG stage but ESMF/ESMP may specify further targeted assessments to be carried out during implementation if/where needed e.g. Cultural Heritage, OHS risks. |
| ESIA (Environmental and Social Impact Assessment) | X | To be confirmed during PFG stage but activities unlikely to require ESIA. |
| SESA (Strategic Environmental and Social Assessment) | X | N/A. Not required for project of this nature (no upstream policy, project, plan development) |
| ESMP (Environmental and Social Management Plan) | ✓ | ESMP may be prepared during PFG stage if/where nature, location and scale of activities are sufficiently detailed and where there is adequate time for consultation. |
| Targeted management plans | ✓ | Indigenous Peoples Plan(s) (IPPs) to be developed during PFG stage where project activities affect IPs<br>Gender Action Plan (GAP) to be developed during PFG stage<br>To be confirmed during PFG stage but ESMF/ESMP may specify further targeted management plans e.g. OHS Management Plan, Cultural Heritage Management Plan etc. |
| Other instruments (please specify) | ✓ | Stakeholder Engagement Plan (SEP) including Grievance Redress Mechanism (GRM) to be developed during PFG stage |

### Additional Measures to Integrate the Programming Principles to Strengthen Social and Environmental Sustainability

| Measures to further mainstream the UNDP Programing Principles into the project |
|---|
| **Mainstreaming the human rights-based approach** |
| Participatory project formulation process engaging a wide range of stakeholders, emphasizing consultation and co-design with indigenous peoples, local communities, women and youth, as well as relevant government agencies, academia and civil society. The project design itself will be socially-inclusive and seek to strengthen accessibility of project benefits and services to marginalised and vulnerable groups. Specific assessments and measures shall be included to ensure that for components/activities affecting indigenous peoples, Free, Prior and Informed Consent (FPIC) is initiated during the project formulation phase and secured prior to the implementation of activities. The project includes activities aiming to enhance the capacity of government agencies to realise human rights under international law and to implement human rights-related standards in national law (particularly vis-à-vis indigenous peoples and other marginalised groups that are especially vulnerable to climate change). |
| **Improving gender equality and women's empowerment** |
| Comprehensive Gender Analysis to be conducted during project design with formulation of a Gender Action Plan (GAP) with strict participation targets and budget tracking to ensure gender equality and women's empowerment. The GAP will be implemented as part of the project and include a project-specific gender baseline using DOSM, sub-national data, and indicators to track intra-household impacts (e.g., time saved in water collection, women's participation in decision-making). Further, the GAP will integrate mandatory procedures and mitigation measures for the Prevention of Sexual Exploitation and Abuse (PSEA) and Gender-Based Violence (GBV), in strict adherence to the UNDP Gender Policy and PSEA requirements |
| **Mainstreaming sustainability and resilience** |
| The project's interventions as a whole aim to reduce vulnerabilities and strengthens resilience of communities to anticipated impacts of climate change and associated disaster risks in line with Malaysia's stated national climate adaptation commitments and policies. The detailed design of project components and activities will consider relevant climate projections and hazard modeling, considers environment-development linkages and promotes Nature-based Solutions (NbS) as a key strategic adaptation response. |

| Strengthening accountability to stakeholders |
|---|
| Stakeholder mapping and analysis will be conducted during project formulation and a Stakeholder Engagement Plan (SEP) prepared providing strategic approaches towards supporting the meaningful participation and inclusion of all stakeholders, in particular marginalized individuals and groups in project implementation and monitoring. The SEP shall also include means for local communities and affected populations to raise concerns and/or grievances including a Grievance Redress Mechanism (GRM) for local communities when activities may adversely impact them. Project stakeholders shall also have access to UNDP's Accountability Mechanism. |

| UNDP SES Principles & Standards | S&E Risk Events | Causes | Impacts | Risk Signifi-cance (Impact/ Likelihood) | Treatment Measures |
|---|---|---|---|---|---|
| Human Rights Principle | Risk associated with the limited capacities of duty bearers to meet human rights obligations (P1.2) | General/all outputs | Affected stakeholders may be excluded from decision-making or benefits or rights to access basic services/resources may be affected | I: 3<br>L: 2 | Capacity needs assessment to be conducted during project preparation<br>Capacity-building activities included in project design, including on relevant human rights and Social & Environmental safeguards. |
| Gender Equality & Women's Empowerment Principle | Risk of discrimination against women (P2.10) | General/all outputs | Ongoing or worsening of gender inequalities and injustices | I: 3<br>L: 3 | Gender assessment to be conducted during project preparation and Gender Action Plan (GAP) prepared<br>Mainstreaming gender equality and women's empowerment in project activities and indicators |
| Accountability Principle | Risks of potential exclusion of affected stakeholders (P3.13)<br>Risks of stakeholder grievances (P3.14) | General/all outputs | Exclusion of affected stakeholders could affect project results and sustainability, enhance inequity or even have adverse impacts on livelihoods, leading to potential grievances | I: 3<br>L: 3 | Stakeholder mapping and analysis to be conducted during project preparation and Stakeholder Engagement Plan (SEP) prepared<br>SEP to outline participatory and socially-inclusive approaches to ensure comprehensive stakeholder engagement during implementation<br>SEP to include design of a Grievance Redress Mechanism (GRM) for the project with stakeholders also able to access UNDP's Accountability Mechanism |
| Sustainability and Resilience Principle | Generic sustainability and resilience risks associated with activities with unknown design parameters (P4.16) | General/all components | Unknown but general nature and scale of activities indicates only low/moderate impacts | I: 3<br>L: 3 | Activities to be developed in greater detail during project preparation. Sustainability risks considered in relation to project-level Standards (as below) |
| 1. Biodiversity Cons. & Sust. Nat. Resource Mgmt. | Risks to habitats and/or ecosystems and their services (S1.1)<br>Risks to critical habitats (S1.2)<br>Forestry/plantation-related risks to biodiversity (S1.8) | Peatland restoration , Upland forest restoration and Urban NbS activities | Biodiversity loss, ecosystem degradation and loss of ecosystem service values | I: 3<br>L: 2 | Environmental & Social Assessment (ESA) during project preparation to identify critical habitats and consult experts on detailed design of restoration activities.<br>ESMP/ESMF to include standard requirements for restoration activities re; use of native species, buffers, stand design, fire breaks etc. |
| 2. Climate Change and Disaster Risks | Hazard/disaster-related risks (S2.1)<br>Risks due to sensitivity to climate change or disasters (S2.2)<br>Maladaptation risks (S2.3) | Malaysia and sites are exposed to climate related risks and hazards. Peatland restoration, Upland forest restoration and Urban NbS activities and outcomes may be susceptible to climate/hazards | Project activities aim to have a positive impact on enhancing climate resilience but adverse impacts if they fail are not expected to be significantly additional to the baseline. | I: 2<br>L: 4 | Detailed technical designs to consider climate projections e.g. in selection of hardy or climate resilient tree species |
| 3. Community Health, Safety and | Construction-related risks (S3.1)<br>Emissions, noise, traffic, hazards and | Retention pond construction activities | Potential drowning risks associated with ponds | I: 4<br>L: 2 | Safety measures for ponds to be included in detailed designs and ESMF/ESMP |

| | | | | | |
|---|---|---|---|---|---|
| Security | effluent risks (S3.2)<br>Risks of water/vector-borne diseases (S3.4)3.1) | | | | Stakeholder engagement and awareness-raising with local communities and relevant government agencies on safety risks associated with ponds |
| 4. Cultural Heritage | | | | I:<br>L: | ESA during project preparation to confirm the absence of this risk |
| 5. Displacement and Resettlement | Economic displacement risks (S5.2) | Peatland restoration (C1), Upland forest restoration (C2) activities could lead to restricted access to lands/resources or transport routes customarily used by local communities and have adverse economic or livelihood impacts | Economic losses or livelihood impacts (inconvenience, loss of access to lands/resources used for subsistence purposes) | I: 3<br>L: 2 | Participatory consultations and surveys with communities during project preparation to understand localized land tenure issues, natural resource dependency and impacts/risks of proposed activities to livelihoods<br>Siting of restoration activities to avoid areas where there could be risks of economic displacement. |
| 6. Indigenous Peoples | Risks associated with activities taking place where indigenous peoples are present (S6.1)<br>Risks associated with activities taking place on lands, territories claimed by indigenous peoples (S6.2)<br>Risk that activities will take place without meaningful, effective informed participation of indigenous peoples (S6.4)<br>Risk of economic displacement of indigenous peoples (S6.6) | Peatland restoration (C1), Upland forest restoration (C2) activities are implemented at sites with known IP populations. Project activities are expected to affect these communities. | Activities that affect IP customary access and land tenure rights can be sensitive and lead to negative outcomes for the project and impacts on the IP communities | I: 3<br>L: 3 | ESA to identify affected IP groups and assess the likely impact of proposed activities on their livelihoods<br>Participatory consultations and surveys with IP communities during project preparation to understand localized land tenure issues, natural resource dependency and impacts/risks of proposed activities to traditional livelihoods<br>Confirmation of broad support for proposed activities by IP communities during project preparation<br>Indigenous Peoples Plan(s) to be prepared to ensure adequate Free, Prior and Informed Consent (FPIC), inclusion of IPs and/or their representatives in project decision-making, avoid/manage any possible adverse impacts on IP communities, ensure appropriate livelihood benefits, equitable benefit-distribution |
| 7. Labour and Working Conditions | Occupational health and safety (OHS) risks (S7.6) | There are low/moderate OHS risks associated with peatland restoration (C1), upland forest restoration (C2), and urban NbS (C4) activities as well as at tree nurseries (C3.1) | Likely relatively minor injuries or impacts on health of workers or hired labour for project activities. | I: 3<br>L: 3 | ESA to assess potential labour/OHS impacts/risks of proposed activities.<br>ESMP/ESMF to outline standard protocols (e.g. Environmental and Social Codes of Practice) based on existing laws/guidelines for specific activities such as tree-planting, small scale construction, tree nurseries etc. |
| 8. Pollution Prevention and Resource Efficiency | | | | I:<br>L: | ESA during project preparation to confirm the absence of this risk |

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

### A. Record of endorsement on behalf of the government[2]

*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**<br>Deputy Secretary General (Environmental Sustainability)<br>Ministry of Natural Resources and Environmental Sustainability<br>Malaysia | Date*: 5 January 2026* |

### 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*<br><br>*Nancy Bennet*<br>*Executive Coordinator,*<br>*Vertical Fund Programme Support, Oversight and Compliance Hub*<br>*Bureau for Policy and Programme Support*<br>*United Nations Development Programme* | |
| Date: *13 March 2026* | Tel. and email:<br>nancy.bennet@undp.org |
| Project Contact Person: Aishath Azza, Regional Technical Specialist | |
| Tel. and Email: aishath.azza@undp.org | |

**KEMENTERIAN SUMBER ASLI DAN KELESTARIAN ALAM**
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**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;

(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

**Revised PFG Submission Form**[1] **(additions in red)**

**Project Formulation Grant (PFG)**

**Submission Date**:

**Adaptation Fund Project ID**:
**Country**: Malaysia
**Title of Project/Programme**: Strengthening Resilience and Adaptive Capacity by Piloting Nature Based Solutions for Water Management in Malaysia
**Type of IE (NIE/RIE/MIE)**: MIE
**Implementing Entity**: UNDP
**Executing Entity/ies**: Forest Research Institute Malaysia (FRIM)

## A. Project Preparation Timeframe

| | |
|---|---|
| **Start date of PFG** | May 2026 |
| **Completion date of PFG** | Dec 2026 |

## B. Proposed Project Preparation Activities ($)

| List of Proposed Project Preparation Activities | Output of the PFG Activities | US$ Amount | Budget note[2] |
|---|---|---|---|
| 1. International Consultants. | **Project Proposal**<br>**Project SESP plan**<br>**Gender Assessment**<br>**Review of construction and engineering activities** | 91,500 | Consultancy contracts for:<br>● Lead technical drafter of Full Proposal include facilitation of onsite workshop(s).<br>● Expert to support Social and Environmental Screening Procedure (SESP) development<br>● Expert to develop gender assessment<br>● Experts to review and provide advice on |

[1] As presented in AFB/PPRC.33/40 Annex 1.
[2] The proposal should include a detailed budget with budget notes indicating the break- down of costs at the activity level. It should also include a budget on the Implementing Entity management fee use.

| | | | |
|---|---|---|---|
| | | | construction and engineering components. |
| 2. Travel to sites for workshops and other field visits | **Travel** | 13,725 | Travel to sites for workshops and other field visits |
| 3. Printing and other material to support consultation workshops. | **Workshop materials** | 2,745 | Printing and other material to support consultation workshops. |
| 4. Miscellaneous costs (sundry expenses) | | 1,830 | Miscellaneous costs (sundry expenses) |
| 5. Consultation and workshops with stakeholders at project sites to enable and ensure participatory approach to project development. | **Workshops** | 27450 | Consultation workshops at project sites |
| **Implementing Entity's Management Fee (Maximum of 8.5%)** | | 12,750 | |
| **Total Project Formulation Grant** | | 150,000 | |

1. Expert consultants:
    a. Consultant to assist in technical drafting of Full Proposal include onsite workshop

An international expert will support the technical development of the full project proposal and related documents, including a visit to Malaysia to conduct site assessments and participate in project workshops with local communities and relevant stakeholders.

This expertise is required to ensure the project is designed to have the greatest impact and is aligned with the objectives of the Adaptation Fund.

b. Expert to support SESP development

International expert to perform activities to assess risks and undertake (SESP) screening process.

An international expert is proposed to bring world class expertise and oversight of SESP development. Interventions on this project are potentially high risk, so extensive planning and mitigation strategies are required.

c. Expert to develop gender assessment

This project has significant gendered impact. This assessment will ensure we have assessed the key gender issues and ensure project programming has a significant gender impact.

d. Experts to review and provide advice on construction and engineering components.

Project components involve civil works and engineering interventions. Expertise will be procured to provide technical review of the project proposal and recommendations for project implementation.

2. Travel to sites for workshops and other field visits

Project sites are in Kedah and Selangor. A travel budget is allocated for FRIM, UNDP and relevant experts to travel to project sites for consultation and site assessments.

3. Printing and other material to support consultation workshops.

Small printing budget for materials to support workshops.

4. Miscellaneous costs for currency exchange and sundry expenses

Small miscellaneous to account for currency exchange and other small expenses.

5. Consultation and workshops with stakeholders at project sight to enable and ensure participatory approach to project development.

For consultation and workshops to ensure a participatory approach to project planning and local buy in for implementation. Budget will support venue hire and event management services.

**C. Implementing Entity**

This request has been prepared in accordance with the Adaptation Fund Board's procedures and meets the Adaptation Fund's criteria for project identification and formulation

| Implementing Entity Coordinator, IE Name | Signature | Date (Month, day, year) | Project Contact Person | Telephone | Email Address |
|---|---|---|---|---|---|
| Nancy Bennet | DocuSigned by: Nancy Bennet 4EEADA5A5FE9433... | 5 January 2026 | Aishath Azza | | Aishath.azza@undp.org |