



ADAPTATION FUND

AFB/PPRC.38/46
20-21 October 2026

Adaptation Fund Board
Project and Programme Review Committee
Thirty-eight Meeting
Bonn, Germany

Agenda Item 9 e)

PROPOSAL FOR LARGE INNOVATION PROJECT FOR THAILAND

Background

1. At its thirtieth meeting, having considered document AFB/B.30/5/Rev.1, the Adaptation Fund Board (the Board) decided:

(a) To adopt the medium-term strategy as amended by the Board, as contained in the Annex 1 of the document AFB/B.30/5/Rev.1 (the MTS); and

(b) To request the secretariat:

(i) To broadly disseminate the MTS and work with key stakeholders to build understanding and support;

(ii) To prepare, under the supervision of the MTS task force, a draft implementation plan for operationalizing the MTS, containing a draft budget and addressing key assumptions and risks, including but not limited to funding and political risks, for consideration by the Board at its thirty-first meeting; and

(iii) To draft, as part of the implementation plan, the updates/modifications to the operational policies and guidelines of the Adaptation Fund needed to facilitate implementation of the MTS, for consideration by the Board at its thirty-first meeting.

(Decision B.30/42)

2. Pursuant to decision B.30/42, subparagraph (b) (ii), the secretariat prepared a draft implementation plan for the MTS, including an assessment of assumptions and risks. The secretariat shared a version of the draft with the MTS task force for comments.

3. The draft implementation plan also contains suggestions for specific funding windows that might be opened under the MTS in complement of the Fund's existing funding windows for single-country and regional adaptation projects and readiness support projects. Following the approval of the implementation plan, the secretariat would present specific proposed details for each new funding window at subsequent meetings of the Board for its consideration, in accordance with the timeline contained in the implementation plan.

4. At its thirty-first meeting, the Board discussed the draft implementation plan for the MTS, and members of the Board proposed amendments to the document. The secretariat then presented a revised draft, in document AFB/B.31/5/Rev.1. Having considered that document, the Board decided:

(a) To approve the implementation plan for the medium-term strategy for the Fund for 2018–2022 contained in the Annex I to document AFB/B.31/5/Rev.1 (the plan);

(b) To request the secretariat:

[...]

- (iii) *To prepare, for each proposed new type of grant and funding window, a specific document containing objectives, review criteria, expected grant sizes, implementation modalities, review process and other relevant features and submit it to the Board for its consideration in accordance with the tentative timeline contained in Annex I to document AFB/B.31/5/Rev.1, with input from the Board's committees;*
- (iv) *Following consideration of the new types of support mentioned in subparagraph (b)(iii), to propose, as necessary, amendments to the Fund's operational policies and guidelines Fund to better facilitate the implementation of such new types of support; and*

[...]

(Decision B.31/32)

5. At the second session of its thirty-fifth meeting, the Board considered document AFB/PPRC.26.b/16, Program on Innovation: Large Grants for Innovation, and the Board decided:

- (a) *To approve the process for providing funding for innovation through large grants to Implementing Entities (IEs) as described in document AFB/PPRC.26.b/16; including the proposed objectives, review criteria, expected grant sizes, implementation modalities, review process and other relevant features as described in the document;*
- (b) *That the large grants for innovation would fall outside the country cap approved by the Board in decision B.13/23 or, in the case of regional or multi-regional proposals, the regional provision, whereas they would count against the Multilateral Implementing Entity cap as per decision B.12/9;*
- (c) *To request the secretariat to prepare the first Request for Proposals to IEs for a total amount of US \$30 million to be launched by the first quarter of calendar year of 2021; and*
- (d) *To request the secretariat to consider the need to develop specific objectives and indicators for the innovation aspects of the projects, beyond what is included in the regular project performance reporting process and make relevant recommendations to the Board at its thirty-seventh meeting.*

(Decision B.35.b/8)

6. At its thirty-sixth meeting, the Board considered the document AFB/PPRC.27/28, Programme on Innovation: Operationalization of Large Grants for Innovation, and the Board decided:

- (a) *To approve the Innovation Large Grant Project Proposal template, the Review Criteria template and the Instructions for Preparing a Proposal for Innovation Large Grants, as described in annexes II, III and IV to document AFB/PPRC.27/28;*
- (b) *To launch the request for proposals so that submissions of Innovation Large Grants proposals are invited to be considered as early as the thirty-seventh meeting of the Board.*

(Decision B.36/24)

7. Subsequently, the first call for project and programme proposals under the indicative set-aside amount of US\$ 30 million was issued to eligible Parties to submit large innovation project and programme proposals to the Fund through accredited NIEs, RIEs and MIEs.

8. At its thirty-ninth meeting in October 2022, the Board discussed and adopted the “Medium-term strategy of the Fund for the period 2023–2027” (Decision B.39/61). At the subsequent meeting, the Board adopted, via Decision B.40/72, the *Implementation Plan for Medium-Term Strategy of the Fund for the Period 2023-2027* (document AFB/B.40/.5/Rev.1). Together, these documents include plans for the continuation and expansion of the innovation pillar that was launched and developed during the MTS 2018 to 2022 period.

9. The following concept note proposal document titled “Microclimate–Energy Nexus Platform for Climate Adaptation in Remote Areas in Thailand” was submitted for Thailand by United Nations Industrial Development Organization (UNIDO), which is a Multilateral Implementing Entity of the Adaptation Fund.

10. This is the fourth submission of the concept-note project proposal, using the two-step submission process.

11. The current submission was received by the secretariat in time to be considered in the forty-seventh Board meeting. The secretariat carried out a review of the project proposal, assigned it the Project ID number AF00000511, and completed a review sheet.

12. In accordance with a request to the secretariat made by the Board in its 10th meeting, the secretariat shared this review sheet with UNIDO and offered it the opportunity of providing responses before the review sheet was sent to the PPRC.

13. The secretariat is submitting to the PPRC the summary and, pursuant to decision B.17/15, the final technical review of the project, both prepared by the secretariat, along with the final submission of the proposal in the following section. In accordance with decision B.25/15, the proposal is submitted with changes between the initial submission and the revised version highlighted or with track changes.



ADAPTATION FUND

ADAPTATION FUND BOARD SECRETARIAT
TECHNICAL REVIEW OF PROJECT PROPOSAL FOR
"MICROCLIMATE–ENERGY NEXUS PLATFORM FOR CLIMATE ADAPTATION IN REMOTE
AREAS IN THAILAND"

Project Title Microclimate–Energy Nexus Platform for Climate Adaptation in Remote Areas in Thailand

Project ID AF00000511

Category Innovation large project

Type Single country project

Stage Concept

Country Thailand

Implementing Entity UNIDO

Financing Requested USD 5,000,000.00

Reviewer Linda Ogallo

Co-reviewer(s)

IE Contact Person

Fatou Haidara, Ganna Onysko, Limi Kalapurackal, Mark Grigoryan, Natale Guarnaccia, Olga Gordiievskaya, Rasha Abdrabu

Secretariat's Overall Comment

The project “Microclimate–Energy Nexus Platform for Climate Adaptation in Remote Areas in Thailand” aims to strengthen Nakhon Ratchasima’s (and Thailand’s) resilience to droughts, floods, and heat stress by introducing innovative technologies and practices which will enhance local climate data systems, improve early warning and forecasting capabilities, and promote climate-informed planning and response across key sectors.

The proposal includes a request for a project formulation grant of 150,000 USD.

The initial technical review raised several issues such as the lack of an initial gender analysis, lack of clarity on consultation and inclusion of vulnerable and marginalised groups, cost effectiveness of the project, sustainability of the project, alignment with the funds results framework and compliance with the Environmental and Social Policy and Gender Policy of the Fund as is discussed in the number of Clarification Requests (CRs) and Corrective Action Requests (CARs) raised in the review.

(6 March 2026)

The second technical review cleared a number of the issues raised in the first review but several issues remain such as the lack of an initial gender analysis, lack of clarity on consultation and inclusion of vulnerable and marginalised groups, sustainability of the project, alignment with the funds results framework and compliance with the Environmental and Social Policy and Gender Policy of the Fund as is discussed in the number of Clarification Requests (CRs) and Corrective Action Requests (CARs) raised in the review.

The third technical review cleared a number of the issues raised in the second review but several issues remain such as lack of clarity on consultation and inclusion of vulnerable groups, sustainability of the project, alignment with the funds results framework and compliance with the Environmental and Social Policy of the Fund as is discussed in the number of Clarification Requests (CRs) and Corrective Action Requests (CARs) raised in the review. Please note that there are several inconsistencies in the proposal text that need to be rectified.

The fourth technical review finds the pending CRs/ CARs to be addressed.

Country Eligibility

Is/are the beneficiary country/countries a developing country/countries Party/Parties to the Kyoto Protocol?

Response: Yes

Secretariat: (6 March 2026)

Is the participating country / are all participating countries developing countries particularly vulnerable to the adverse effects of climate change?

Response: Yes

Secretariat: The province has experienced a clear rise in extreme events such as droughts, floods, windstorms and heatwaves over the past decade leading to impacts such as doubling of drought frequency, 2011 flood losses at USD 47 billion in the context of station density gaps against WMO standards. Future climate projects an increase in frequency of flood and drought.

(6 March 2026)

Project Eligibility

Has the designated government authority for the Adaptation Fund / Have the governments' designated authorities for the Adaptation Fund endorsed the project?

Response: Yes

Secretariat: As per the Endorsement letter dated 9 February 2026
(6 March 2026)

Does the project/programme support concrete adaptation actions to assist the country or countries in addressing adaptive capacity to the adverse effects of climate change and build in climate resilience? In case of regional project/programme, is there added value using the regional approach, compared to implementing similar activities in each country individually?

Response: Not Cleared

Secretariat: Yes, however further clarification is required.

The project proposes a coherent and climate-relevant intervention that goes beyond business-as-usual by deploying a dense microclimate sensor network integrated with solar infrastructure and AI-driven forecasting in Nakhon Ratchasima Province. The theory of change is clearly articulated using an "if-then-because" logic, climate hazards are well-quantified, and the three components, sensor deployment, platform development, and capacity building; are aligned with AF Strategic Objectives (particularly Outcome 8 on innovation, Outcome 1 on reduced exposure, and Outcome 2 on institutional capacity). The thematic focus on disaster risk reduction and early warning systems is appropriate and well-supported.

CR1: The proposal frames PV integration as serving "energy resilience for adaptation functions," yet several passages discuss benefits to solar developers, improved PV yield forecasting, and commercial sustainability as part of the exit strategy. Please clarify more precisely which PV-related activities and budget allocations serve exclusively adaptation purposes versus those that primarily benefit renewable energy deployment.

The theory of change references "substantial tangible outcomes," yet several key outcome indicators in the results framework remain undefined. In the development of the full proposal, quantified baselines and targets should be established for all indicators; particularly the number of sensors to be deployed, the forecast accuracy improvement expected, and the number of beneficiaries.

(6 March 2026)

Response: Not Cleared

Secretariat: CR1: Not Cleared.

The revised proposal now confirms in multiple sections, that PV assets are not financed, deployed, or optimised under the AF investment, and that any renewable-energy benefits are incidental co-benefits outside the results framework, with Component 1 costs itemized down to specific hardware lines. However, two passages remain inconsistent with this framing:

- Section C references a "secondary use" (pg 19) of the platform whereby private-sector companies could derive value from assessing sites for "large scale renewable energy deployment and property development potential," and ties this to the platform's "continued use and sustainability."
- Section D and Section L reference future PV expansion and a "business case and project exit strategy" to be elaborated at PFG stage.

Please confirm whether these commercial/PV-expansion-related activities are (a) excluded from AF financing and from the project's results framework, consistent with the language used elsewhere, or (b) intended to play a role in the project's sustainability model. If the latter, please clarify how this is reconciled with the stated principle that PV-related benefits are strictly incidental and outside the adaptation results framework, to avoid ambiguity about whether commercial PV value generation is a project objective.

(July 13, 2026)

Response: Not Cleared

IE:

Response: Not Cleared

Secretariat: CR1: Not Cleared.

The revised concept note confirms that all commercial and PV-expansion-related activities are excluded from AF financing and from the results framework, with AF resources ring-fenced to sensors, the data platform, MHEWS integration and community capacity building:

- the Section C "secondary use" passage on private-sector value from large-scale renewable energy deployment and property development potential has been removed and replaced with an explicit statement that the platform is not designed, financed or used to generate commercial value for private actors;
- Section D now treats renewable-energy benefits as incidental co-benefits outside the results framework;
- and the "business case and exit strategy" is redefined as institutional handover to DCCE/CCIC, recurrent-cost absorption by Thai public budget lines and replication under DCCE leadership.

However, two passages remain inconsistent with the confirmation given: Section C (pg 16), which describes PV asset operators as providing "co-financing of the EWS subscription stream," and Section M (pg 42), which refers to "leveraging willingness-to-pay only for asset-specific value-added services"; both of which imply a paid, PV-linked service tier contributing to sustainability, contradicting the commitment to free, non-discriminatory access to climate data and EWS and the statement that 90–100% of recurrent costs are absorbed by Thai public

budgets. As clearance is assessed against the concept note text rather than the response sheet, please delete or revise these two references so the document reflects the confirmation provided, after which this CR can be cleared.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CR1: Cleared. Pages 16 and 43.

The two inconsistent references have been removed. Page 16 confirms that no co-financing, subscription-based revenue, or private commercial arrangement is envisaged and that climate data and EWS services will be provided free of charge. Page 43 confirms that no user fees, subscription streams, or willingness-to-pay mechanisms form part of the sustainability model and that recurrent costs will be absorbed by Thai public budgets.

Does the project/programme help spread innovative adaptation practices, tools and technologies that have demonstrated success in one country to another country, countries or regions; and/or Does the project/programme pilot at larger scale innovative adaptation practices, tools or technologies generated that have demonstrated viability at a small scale?

Response: Not Cleared

Secretariat: Yes, however further clarification is required.

The proposal presents a reasonably clear innovation rationale. The proposal identifies that while individual components (sensors, AI, solar PV) exist independently, their integrated deployment at provincial scale for adaptation purposes has not been attempted in Thailand. The reference to Malaysia's experience with similar PV-integrated monitoring provides evidence of viability at smaller scale, and the South–South cooperation dimension adds credibility to the scaling logic.

CR2: The AF's innovation pillar emphasizes iterative deployment where "change, learning, and new information is embraced and can take innovation projects in different directions." The current proposal describes a relatively linear deployment sequence (install sensors then build platform then train users then scale). Please clarify:

1. How the project design incorporates structured iteration cycles, for example, how will early sensor data or community feedback during pilot phases actively reshape the AI models, platform design, or deployment strategy? What decision points are built in where the project could pivot based on what is learned?
2. Please provide more specific evidence of the viability of this approach achieved at smaller scale; including quantified improvements in forecast accuracy, community uptake rates, or operational sustainability achieved in Malaysia or comparable settings, to demonstrate that the innovation has a sufficient evidence base for scaling.
3. Please clarify what institutional, social, or process innovations are embedded in the design. Additionally, please identify any unconventional actors (private sector, civil society, academia) whose engagement differentiates this from a standard government-to-government technology deployment.

CR3: The proposal states that "core AI algorithms will remain proprietary to ensure system performance and future scalability." This raises a potential concern under the innovation pillar, which emphasizes diffusion of innovative adaptation solutions. Please clarify how the retention of proprietary algorithms is consistent with the AF's objective of spreading innovative practices to other countries and regions, and describe what arrangements will ensure that the innovation outputs can be replicated or adapted by other ASEAN countries without

dependency on a single proprietary provider.

The proposal does not adequately describe the existing state of development, testing, or deployment of the specific innovation being proposed, as required under the innovation criteria. During full proposal preparation, include a dedicated subsection documenting the evidence base, with specific performance data from comparable deployments, that demonstrates the innovation has progressed beyond concept stage.

(6 March 2026)

Response: Not Cleared

Secretariat: CR2: Not Cleared.

The proposal now describes the intended iteration architecture reasonably clearly, which addresses part of the original request. However, the request for quantified evidence of viability at smaller scale remains outstanding. The Malaysia, Indonesia, and Philippines comparators (Section C) are described only narratively, with no forecast-accuracy improvement, community uptake rate, or operational sustainability figures provided for any of them. Notably, the SEDA Malaysia consultation (Section J) raises sustainability concerns with the comparable Malaysian system (reliance on 3G connectivity, discontinued data collection from original FIT sites) rather than demonstrating success.

Please provide, to the extent available at this stage, quantified performance data from the Malaysian PV-monitoring deployment or other comparable initiatives (e.g., accuracy improvements over baseline forecasting, user adoption rates, operational uptime, cost per station in comparable deployments) to substantiate that this approach has an evidence base beyond concept stage. Where such data does not yet exist, please clarify what minimum evidence threshold will be used to make the go/no-go scaling decision referenced in Section B.

CR3: Not Cleared.

The revised proposal states in Section B that core AI algorithms will be non-proprietary, accessible to the Thai public sector under perpetual royalty-free terms for adapted Malaysian components, and released under open-source licences for newly developed components. However, Section M still states that "the algorithm is developed as part of the project intellectual property to remove the risk of any provider exits," (pg 42) without clarifying how this IP arrangement relates to the open-source/royalty-free commitments made in Section B. Please clarify whether the IP referenced in Section M is held specifically to enable and safeguard the public-good licensing described in Section B, or whether it implies a different, more restrictive ownership arrangement. Please ensure consistent language across the proposal on this point.

Please include, either in the full proposal or as an interim annex, a consolidated summary of the technology readiness level and performance evidence for (i) the sensor/PV co-location approach, (ii) the AI forecasting component, and (iii) the Malaysian system being adapted, so the concept can be assessed on whether the innovation has progressed meaningfully.

(July 13, 2026)

Response: Not Cleared

IE:

Response: Not Cleared

Secretariat: CR2: Cleared on page 14-15.

The revised Section C: Quantified evidence has been added. Indicative go/no-go thresholds are now stated: forecast-accuracy improvement over the TMD baseline, community EWS uptake sufficient to demonstrate behaviour change, ≥90% operational uptime, and ≥80% institutional absorption of recurrent costs, to be jointly endorsed by DCCE, TMD and the Provincial Working Group at PFG. The SEDA sustainability concerns are also

now translated into explicit design mitigations rather than left unaddressed.

CR3: Not Cleared.

The revised Section M satisfactorily clarifies that DCCE's IP holding through CCIC is a safeguard for public-good, open-source licensing rather than a restrictive ownership arrangement. However, the proposal remains internally inconsistent on the treatment of the Malaysian-derived components. Section B states that adapted Malaysian components will be accessible to the Thai public sector under perpetual royalty-free terms, with open-source licensing reserved for newly developed components. Section C states that the Malaysian application will be released under an open-source licence. Section M states that all algorithms developed or substantially adapted under AF financing are owned by DCCE and released under open-source licences. A perpetual royalty-free licence granted to a single public-sector user and open-source release under DCCE ownership are materially different arrangements with different consequences for replication, third-party reuse and the project's stated public-good architecture. Please adopt a single, consistent formulation across Sections B, C and M for the Malaysian-derived components, and clarify the basis on which the underlying proprietary application can be relicensed as proposed, including whether the necessary rights have been confirmed with the Malaysian technology partner.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CR3: Cleared. Pages 13, 15 and 41. The revised proposal now sufficiently distinguishes the Malaysian-derived components, which will be available under perpetual royalty-free terms with source-code escrow and derivative-work rights, from adaptations developed under AF financing, which will be released under an open-source licence.

For the next stage: During PFG/full proposal preparation, harmonize the remaining reference to “proprietary predictive models” on page 13 and provide written confirmation from the Malaysian technology owner of the proposed licensing terms. This is necessary to demonstrate that DCCE can legally operate, modify and replicate the system without vendor dependency and that AF-financed adaptations can be released as open source as proposed.

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

Response: Not Cleared

Secretariat: Yes, but further information is required.

The proposal identifies economic, social, and environmental benefits across the three dimensions as required. Economic benefits include reduced climate-related losses, improved resource allocation, and job creation in climate technology. The target group, farmers and agricultural workers in Nakhon Ratchasima, is clearly identified and justified with substantial evidence of climate vulnerability.

However, the proposal has notable gaps in gender analysis, quantification of beneficiary numbers, inclusive innovation design, and engagement of vulnerable sub-groups beyond farmers as a broad category. The treatment of benefits remains largely qualitative and aspirational rather than specific and measurable, and the inclusive innovation lens is underdeveloped.

CR4: The proposal does not provide estimated numbers of direct and indirect beneficiaries. If possible, provide

estimated beneficiary numbers disaggregated by gender and vulnerability status.

CR5: The proposal references gender in general terms, "active outreach to ensure equal opportunities for women in technical training" and recognition of "distinct roles in agricultural and household decision-making", but lacks a substantive gender analysis. Please clarify how the project will address gendered vulnerabilities.
(6 March 2026)

Response: Not Cleared

Secretariat: CR4: Not Cleared.

The revised concept in Section C estimates indirect beneficiaries at approximately 1,500,000–2,000,000 individuals (~65% of the provincial population), while Section D cites "up to 2.6 million people (the province's regional population as of 2021)." Please reconcile these two figures and confirm which estimate should be treated as authoritative for the concept note.

In the full proposal please provide, the estimated proportions or numbers for each named vulnerable sub-group, even as indicative ranges.

CR5: Cleared on page 19.

The revised concept states that 'A significant share of the project's capacity-building resources will be directed toward farmers, community-based organisations, women's groups, local technicians, village health volunteers, and other vulnerable community stakeholders. Capacity-building investments will prioritise strengthening local adaptive capacity, improving access to climate information, supporting community-level use of early warning services, and developing the skills required for long-term operation, maintenance, and utilisation of climate information systems.' (pg 19)

(July 14, 2026)

Response: Not Cleared

IE:

Response: Not Cleared

Secretariat: CR4: Not Cleared. The inconsistency remains in the third submission. Section C (p. 7) continues to describe the estimated 1.5–2.0 million indirect beneficiaries as "around 65% of the provincial population," while Section D (p. 17) identifies the provincial population as 2.18 million.

Based on 2.18 million, the beneficiary range represents approximately 69–92% of the provincial population, not 65%. Please remove the percentage descriptor and retain the absolute range, or revise the beneficiary estimate and percentage so they are arithmetically consistent. Also replace "correspondence to" with "corresponding to."

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CR4: Cleared. Pages 7 and 17. The inaccurate "65% of the provincial population" descriptor has been removed. Page 7 now retains only the estimated range of 1.5–2.0 million indirect beneficiaries, while page 17 separately identifies the provincial population as u

Does the project engage, empower and/or benefit the most vulnerable communities and social groups?

Response: Not Cleared

Secretariat: Unclear.

The proposal identifies climate-vulnerable farming communities in Nakhon Ratchasima as the primary beneficiaries and provides strong evidence of their vulnerability. The design includes multiple engagement channels and plans for stakeholder consultations with farmer cooperatives, provincial authorities, and academic institutions. The consultative process at national level is well-documented. However, the proposal has significant gaps in demonstrating genuine community empowerment and inclusive innovation scouting. The engagement model is predominantly top-down and expert-driven. There is limited evidence of scouting for existing local or grassroots innovations, and the design risks reinforcing a hierarchy where technical expertise is valued above community knowledge and lived experience.

CR6: Please clarify:

1. Which specific community-level actors, including farmer cooperatives, women's groups, indigenous knowledge holders, youth organizations, local health volunteers, disability advocacy groups, or informal sector workers, will be engaged during full proposal development, and describe the methodology that will ensure their input meaningfully shapes project design rather than merely validating pre-determined technical choices.
2. Please describe what steps have been or will be taken to identify and build upon existing community-level innovations and informal adaptation practices, and how these will be integrated into the project design alongside the proposed technology solutions.
3. Please describe concrete mechanisms through which farmers' traditional knowledge will be incorporated into the AI model calibration, risk mapping, and early warning design. Will local knowledge inform the definition of warning thresholds rather than these being set solely by technical parameters?

CR7: The proposal does not adequately address the risk that the innovation could widen existing inequalities. Several design features raise concerns: the reliance on mobile applications and SMS alerts assumes digital access and literacy, which may exclude elderly, low-income, or geographically remote populations; the proprietary nature of core AI algorithms concentrates knowledge and power with external technology providers rather than building local ownership of the analytical tools; and the capacity building model focuses on "trained technicians" and "government staff" with community members receiving more passive awareness-raising. Please clarify how the project will ensure that digitally excluded populations are not left further behind, that the innovation does not create new dependencies on external technology providers, and that power dynamics between institutional stakeholders and community members are actively addressed.

The full proposal should include a stakeholder engagement plan with clear roles, timelines, and budgets that distinguish between consultation (informing communities), participation (involving communities in implementation), and empowerment (sharing decision-making authority with communities).

(6 March 2026)

Response: Not Cleared

Secretariat: CR6: Cleared on pages 17-18.

The revised concept outlines including farmer cooperatives, women's groups, indigenous knowledge holders, youth organizations, local health volunteers, disability advocacy groups, or informal sector workers, will be engaged during the PFG. A "You Said/We Did" register and named governance arrangements for approving design changes provide a concrete accountability mechanism (pg 17). The concept further states that at the PFG stage information on 'how traditional knowledge will be collected, coded and translated into model-relevant

variables; who validates farmer observations against sensor and remote-sensing data; whether local indicators feed the AI system as inputs, calibration checks, interpretation layers or threshold modifiers' , including on validation and thresholds (pg 17-18).

CR7: Not Cleared.

The concept includes non-digital dissemination channels (radio, community meetings, temple-based sessions), a shift from proprietary to open-source/royalty-free AI algorithms to reduce vendor dependency, and formal governance seats for women's, youth, PWD, and CSO representatives to close a documented representation gap. However, some gaps remain:

(1)The mitigation relies partly on an assumption that mobile access will "likely" expand in remote areas, rather than on a defined reach target or coverage metric for non-digital channels. Please specify how non-digital-channel reach will be measured and what minimum coverage will be ensured for populations without mobile access.

(2)Technical/operational training (sensor operation, maintenance, troubleshooting) is directed at DCCE staff and provincial officials, while community-level training is framed around using SMS alerts and mobile applications. This mirrors the power-dynamic concern raised in CR7. Please clarify whether community members (not only government staff) will have access to technical skill-building (e.g., sensor maintenance, data interpretation) consistent with the leadership and governance roles described elsewhere in the proposal.

(3) Section M still refers to algorithms developed "as part of the project intellectual property to remove the risk of any provider exits," (pg 42) which has not been reconciled with the open-source/royalty-free commitment in Section B. Please confirm these are consistent and clarify the nature of the IP arrangement.

Response: Not Cleared

IE:

Response: Not Cleared

Secretariat: CR7: Not Cleared.

Sub-points (ii) and (iii) are cleared, subject to the proposed Section M wording being reflected in the concept note itself and Section C being amended in the same revision, since its current statement that the Malaysian application will be released under an open-source licence is inconsistent with the perpetual royalty-free arrangement now proposed for pre-existing components. Sub-point (i) remains outstanding: the response identifies six non-digital channels but does not state a coverage target. Please confirm the minimum percentage of the population in each pilot zone to be reached through at least one non-digital channel, and the corresponding figure for vulnerable households under the two-channel redundancy rule, and insert these figures into the concept note text at page 12, where the current sentence appears incomplete.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CR7: Cleared. Pages 11–12, 15 and 41. The concept note now:

Establishes six complementary outreach channels.

Commits to reaching at least 80% of the population in each pilot zone through one channel and 90% of vulnerable households through at least two channels.

Includes substantive technical training for community actors.

Reflects consistent licensing arrangements for Malaysian-derived and AF-financed components.

For the next stage: Incorporate the coverage targets into the results framework and M&E plan, including verification through sex-, age-, disability- and income-disaggregated household surveys.

Does the project advance gender equality and the empowerment of women and girls?

Response: Not Cleared

Secretariat: No.

The proposal acknowledges gender as a relevant consideration and includes some gender-sensitive language throughout.

However, the proposal falls substantially short on issues around fostering women as entrepreneurs and removing biases against women founders. There is no gender analysis, no discussion of gendered climate vulnerability in Nakhon Ratchasima, and no deliberate strategy to position women as innovators, entrepreneurs, or leaders within the project's innovation ecosystem.

CAR1: The AF Gender Policy requires an initial gender analysis at the earliest stage of project preparation to determine the different needs, capabilities, roles, and knowledge resources of women and men. No such analysis has been conducted or referenced. Kindly include an initial gender assessment.

CR8: The proposal contains no reference to women's entrepreneurship, women-led innovation, or women's economic empowerment through the project's activities. The climate technology and data analytics space in which this project operates is one where women are typically underrepresented. Please describe how the project will actively create pathways for women to participate not merely as beneficiaries or trainees but as entrepreneurs, innovators, and technical leaders within the innovation ecosystem being created.

During full proposal preparation, the proponent must conduct a gender assessment that examines the differentiated climate vulnerabilities, adaptive capacities, information access patterns, and livelihood roles of women and men in the target districts of Nakhon Ratchasima. Based on this assessment, a costed gender action plan must be developed that includes gender-specific activities (not only gender-mainstreamed participation), sex-disaggregated targets, and dedicated budget lines. The proposal currently contains no strategy for fostering women as entrepreneurs within the innovation ecosystem, which is an explicit requirement under the AF innovation gender criteria. The full proposal should support women's entrepreneurship and leadership in the climate information and technology space.

(6 March 2026)

Response: Not Cleared

Secretariat: CAR1: Not Cleared.

The concept commits to conduct a comprehensive gender assessment during the PFG phase, including a costed Gender Action Plan with sex-disaggregated targets and dedicated budget lines. This is appropriate for the depth of analysis required at full proposal stage.

The response sheet acknowledges that 'initial gender assessment based on secondary data and existing literature, which identifies key gendered constraints relevant to the project context' has been done. The current proposal contains gender-relevant data points distributed across several sections, but these have not been consolidated into a dedicated gender analysis.

Please include a dedicated subsection in the concept note presenting the findings of the initial gender assessment referenced in the response sheet. This initial assessment should demonstrate that available evidence has been reviewed and applied to shape the concept, consistent with the Gender Policy's requirement

that gender considerations inform design from the earliest stage rather than being addressed solely as a downstream deliverable.

CR8: Cleared on pages 14 & 19.

The project "will actively promote women-led innovation and entrepreneurship as a core component of its innovation model," with pathways for women to participate "as developers, service providers, and entrepreneurs" (pg 14). The concept also concludes a minimum 40% women's participation in technical training on sensor installation, maintenance and data analytics; a 30% share of service contracts reserved for women-led enterprises/cooperatives; and a dedicated small grant or incubation window for women-led businesses providing climate-related services (pg 19). The proposal further states that facilitation of market linkages for women entrepreneurs delivering climate advisory and EWS dissemination services; partnerships with universities to support women in STEM through internships and mentorship linked to the AI platform; and women "prioritised for leadership roles within community-level governance structures, managing the sensor networks and data use." (pg 19).

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CAR1: Cleared (pages 34–35).

The concept note now contains a dedicated subsection headed "Initial Gender Assessment" within Section J. The subsection sets out its evidentiary basis (secondary data, relevant literature, and information generated during project preparation) and its scope. It presents findings on the constraints identified, covering access to land, credit and productive resources, extension and technical training, timely early warning information, digital technologies and decision-making structures, together with time constraints from unpaid care work, literacy and digital access differentials, and underrepresentation in technical fields. It also identifies the design risk directly and notes opportunities arising from women's existing roles as users and disseminators of climate information.

Is the project/programme cost-effective? In the case of regional project/ programmes, does the regional approach support cost effectiveness? Does the project engage, empower and/or benefit the most vulnerable communities and social groups?

Response: Not Cleared

Secretariat: Yes, however some clarifications remain.

The proposal provides a reasonable initial cost-effectiveness argument. The total budget is presented as delivering high value relative to the avoided losses referenced. The logic of deploying low-cost sensors on existing PV infrastructure rather than building standalone meteorological stations is sound and well-articulated. The full cost of adaptation justification, demonstrating the gap between the baseline scenario and the target, is one of the stronger elements of the proposal.

However, the cost-effectiveness analysis lacks depth in several important areas. No alternative intervention options are systematically compared, the sustainability business case remains underdeveloped, and several cost assumptions are presented without sufficient justification or comparison.

CR9: The proposal does not present a systematic comparison of alternative approaches that could achieve similar adaptation outcomes.

1. Please provide initial thinking on why the proposed combination of PV-integrated sensors plus proprietary AI

platform was selected over other alternatives, with particular attention to the trade-offs in terms of cost per beneficiary, sustainability, scalability, and adaptation impact. This need not constitute a formal cost-benefit analysis but should demonstrate that reasonable alternatives were considered and that the chosen approach is justified.

2. Please provide a more detailed rationale for the budget distribution across components, particularly explaining what the platform development costs cover and why the capacity building allocation is proportionate to the project's stated ambitions for community empowerment and institutional integration.

CR10: The proposal cites a unit cost of approximately USD 2,500 per PVmet weather station "including supply and installation, excluding extensive cabling," and contrasts this with conventional hydromet stations that "can exceed USD 50,000 per site." While this comparison supports the cost-effectiveness argument, several questions remain. If 100+ sensors at USD 2,500 each would cost approximately USD 250,000-300,000, how does this reconcile with the USD 1,700,000 allocated to Component 1 (Sensor Deployment)? What additional costs beyond the sensor units account for the remaining ~USD 1.4 million? Additionally, the scalability argument would benefit from an indicative cost estimate for replicating this model. Please provide a more granular breakdown of the sensor deployment costs to substantiate the cost-effectiveness claim.

CR11: The proposal identifies sustainability through three pillars: community engagement, institutional integration, and regional scalability, but does not present a credible financial sustainability model for the post-project period. The proposal mentions "cost-sharing models that engage provincial governments, farmer cooperatives, and private businesses" and references PV developers as potential sustainability partners, but these remain vague and unquantified.

1. Please provide initial estimates of annual recurrent costs for maintaining the system post-project, identify which institutions or revenue streams are expected to cover these costs, and explain why the proposed sustainability model is realistic given the public-good nature of climate data and early warning services.

2. The reference to PV developers providing ongoing sustainability is particularly important to clarify, what is the actual value proposition for private solar developers to co-finance a public climate monitoring system?

CR12: The proposal states cost-effectiveness benefits from South-South cooperation with Malaysia, including "bulk procurement of hardware and software components," "shared algorithm development," and "joint training and capacity building." However, these claims are not quantified. The consultations with SEDA Malaysia described in Section J suggest a relatively modest collaboration, access to Malaysia's PV monitoring database for algorithm testing and potential adaptation of algorithms. This is valuable but does not clearly constitute "bulk procurement" or suggest the scale of joint investment that would yield significant per-unit cost reductions. Please clarify the actual scope and scale of cost savings expected from the Malaysia partnership, knowledge-sharing benefits, while valuable, do not directly reduce project costs.

During full proposal preparation, the proponent must include a dedicated subsection presenting alternative approaches that were considered and provide a comparative assessment explaining why the proposed approach offers superior cost-effectiveness in terms of adaptation outcomes per dollar invested. This comparison should address not only upfront capital costs but also long-term sustainability costs, institutional feasibility, and the breadth and equity of adaptation benefits delivered. Quantitative estimates should be provided where feasible.
(6 March 2026)

Response: Not Cleared

Secretariat: CR9: Cleared on page 43-46

The revised concept clears the clarification request, a table is introduced (pg 45-46) directly demonstrating that reasonable alternatives were considered rather than assuming the chosen approach by default. Section L

(pg 43-44) provides a breakdown of the gaps in the national climate data platform, and details what the grant funding will do to fill that gap, and reinforcing that 'the PV assets themselves are not financed'.

CR10: Cleared on page 45.

The revised concept shows that the USD 2,500 figure was not a complete station, and provides the full cost architecture (Table 5, pg 45) itemising the Platform development costs. The cost of scalability is states as 'approximately USD 8,300 per station all-in for Nakhon Ratchasima, and approximately USD 7,600 per station for replication in other Thai provinces' (pg 22).

CR11: Not Cleared.

The recurrent-cost model presented in Section M is helpful and quantifies post-project maintenance costs as being absorbed 90–100% by Thai public budget lines. However, this creates an inconsistency with two other statements in the proposal: (i) that sustainability will be supported through "cost-sharing models that engage provincial governments, farmer cooperatives, and private businesses," (pg 14) and (ii) that PV developers will be engaged during PFG to explore "potential co-investment and operational partnerships," (pg 41) particularly since the proposal also clarifies that installations are expected to occur exclusively at publicly-owned PV sites (pg 41). Please clarify: Given that the recurrent-cost model is already fully covered by public budget lines and installations are planned at public sites only, what specific role is private business or PV-developer co-financing expected to play in the sustainability model, and what would the actual value proposition be for a private solar operator to contribute to a publicly-owned, public-good climate monitoring system in which they have no site-level stake?

CR12: Cleared on page 22.

Section E in the revised concept reframes the Malaysia partnership: "the Malaysia partnership is expected to generate primarily non-monetary cost-effectiveness benefits through technology transfer, validation of algorithms using comparable datasets, avoidance of design errors, and accelerated learning," and states that "any direct procurement or training-related cost savings will be assessed and quantified during full proposal preparation and are not currently counted in the project's cost-effectiveness calculations."

Response: Not Cleared

IE:

Response: Not Cleared

Secretariat: CR11: Not Cleared.

The revised text at pages 12 and 35 satisfactorily clarifies that recurrent costs are absorbed by named Thai public budget lines, that private-sector contributions are not required for sustainability, and that engagement with farmer cooperatives, private businesses and private PV developers, is confined to potential future scaling to provinces where publicly owned solar installations may not be available. The value-proposition question raised in the original CR is therefore no longer applicable to this project.

However, two references to a private revenue stream survive and describe a second, inconsistent sustainability model. Page 16 states that Thai host sites will include operators of ground-mounted and rooftop solar PV assets providing "co-financing of the EWS subscription stream," which posits both private host sites and a subscription-based revenue model. Page 41 closes the recurrent-cost paragraph with a reference to "leveraging willingness-to-pay only for asset-specific value-added services," for which no mechanism, payer, service definition or revenue assumption appears anywhere in the proposal, and which sits directly after the statement that costs are 90–100% absorbed by public budget lines.

Please remove or reconcile both references so that a single sustainability model is described consistently throughout the proposal, and confirm that the subscription-stream reference at page 16 is compatible with the

commitment made elsewhere to free, non-discriminatory access to climate data and Early Warning Services for all users. Please see CR1 as its clarification should clear this as well.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CR11: Cleared. Pages 12, 16, 35 and 41–43.

The two inconsistent references to an “EWS subscription stream” and “willingness-to-pay” have been removed. The concept note now presents a single sustainability model: the current project will use publicly owned PV sites, provide climate data and EWS free of charge, and finance recurrent costs through Thai public budget lines without reliance on private-sector contributions. Potential private-sector engagement is limited to future replication outside the current project, as also reflected under CR1.

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

Response: Not Cleared

Secretariat: Yes, but some clarification is required.

The proposal demonstrates strong alignment with a comprehensive range of national and regional frameworks. Section F presents a well-structured table mapping project activities against seven key strategies: Thailand's National Adaptation Plan (2024), Climate Change Master Plan (2015–2050), Nationally Determined Contribution, FAO-UNDP SCALA Programme, ASEAN Climate Change Strategic Action Plan (2025–2030), National Strategy (2018–2037), and the Bio-Circular-Green Economy Model (2021–2027). The proposal also references the Sendai Framework for Disaster Risk Reduction. The alignment narratives are specific that the project directly supports, and linking AI-enabled forecasting to the Climate Change Master Plan's emphasis on science-based adaptation and innovation. The additional contextual references to Thailand's Multi-hazard Early Warning Systems, the WMO's HydroSOS initiative, and the Associated Programme on Flood Management demonstrate awareness of the broader institutional landscape.

However, there are notable gaps in the strategy mapping. The alignment descriptions remain largely declarative without demonstrating how the project operationalizes specific strategy targets, and neither Technology Needs Assessments nor Technology Action Plans are referenced.

CAR2: The proposal must reference Thailand's Technology Needs Assessment and Technology Action Plan and demonstrate consistency or explain the absence of alignment.

CR13: Please clarify on the following:

1. TNA and TAP: Whether Thailand's TNA and TAP have been reviewed for consistency, indicate whether microclimate monitoring, AI-based forecasting, or distributed sensor networks are identified as priority adaptation technologies in these instruments, and describe how the project's technology choices align with or complement the TNA's recommended technology priorities and the TAP's identified barriers and enabling actions. If the TNA does not cover these specific technologies, this should be noted as an additional justification for the project's innovation value.
2. SDG: The proposal does not reference Thailand's SDG framework or its national SDG roadmap. Please describe how the project contributes to Thailand's national SDG targets.
3. Poverty Reduction Strategy: Thailand's approach to poverty reduction is embedded in the National Strategy

(2018–2037) and the National Economic and Social Development Plan. The proposal references the National Strategy at a high level but does not connect the project to poverty reduction objectives. Please describe how the project's outcomes are expected to contribute to poverty reduction targets in Nakhon Ratchasima and at the national level.

CR14: Please identify which specific ACCSAP strategic priorities or action lines the project contributes to, and describe the concrete mechanisms through which lessons and technologies from this project will be shared with ASEAN member states beyond the bilateral collaboration with Malaysia. Additionally, given the reference to the ASEAN Climate Resilience Network and ASEAN Centre for Energy as dissemination channels, please clarify whether these bodies have been consulted during concept development and whether they have expressed support for the project's regional learning objectives.

During full proposal preparation, the proponent should review both instruments and include a specific discussion of how the project's technology choices relate to Thailand's identified technology priorities for adaptation. The full proposal must also include explicit alignment with Thailand's national SDG strategy and relevant SDG targets. This should go beyond listing relevant SDG numbers and instead describe how specific project outputs and outcomes contribute to measurable progress on Thailand's national SDG indicators. Given the project's cross-sectoral scope the SDG alignment narrative should demonstrate the project's contribution to the integrated and indivisible nature of the 2030 Agenda rather than treating SDGs as an afterthought. The full proposal must include a substantive discussion of alignment with Nakhon Ratchasima's provincial development plan and any relevant sub-national climate, disaster risk reduction, agricultural, or water management strategies. (6 March 2026)

Response: Cleared

Secretariat: CAR2: Cleared on page 24.

Table 3 now includes dedicated rows for Thailand's Technology Needs Assessment and Technology Action Plan. The proposal further states that "a detailed TNA crosswalk will be undertaken... during full proposal preparation"; "a detailed mapping between project activities and specific TAP implementation actions will be undertaken during full proposal development".

CR13: Cleared pages 24-25.

On TNA and TAP, the TNA entry explicitly states that microclimate sensor networks, AI-enabled forecasting, and PV-hosted climate monitoring "are not currently identified as standalone priority technologies within the concept-stage assessment"(pg 24), while asserting the project supports the TNA's "underlying objectives" of strengthening climate information systems and evidence-based adaptation planning. The TAP entry similarly links the project to institutional strengthening, inter-agency coordination, and capacity-building. On SDGs, Section F includes a dedicated paragraph mapping the project to SDG 13, 2, 6, 7, 9, 5, 10, and 11 with a one-line rationale per goal. On the Poverty Reduction Strategy; The Table 3 entry on the National Strategy (2018–2037) / National Economic and Social Development Plan now explicitly connects project outcomes to poverty reduction pathways, and commits to incorporating poverty-disaggregated baselines and beneficiary targets into the results framework during full proposal preparation.

CR14: Cleared on page 34.

The proposal now identifies a credible institutional pathway for regional dissemination (the Ministry of Energy as Thailand's interface with the ASEAN Centre for Energy, and MoNRE/DCCE as Thailand's interface with the ASEAN Working Group on Climate Change and the ASEAN Climate Resilience Network) which addresses the request to identify concrete dissemination mechanisms beyond the bilateral Malaysia collaboration (pg 34). However, the proposal discloses that outreach to these ASEAN bodies has not yet taken place and is planned for the full proposal preparation phase. The only consultation confirmed to date is that Thailand's Ministry of Energy "has expressed openness to coordination with UNIDO on the project".

During full proposal preparation please include: Whether direct outreach to the ASEAN Climate Resilience Network and the ASEAN Centre for Energy has occurred, and if so, summarize their response or level of interest in the project's regional learning objectives.

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

Response: Not Cleared

Secretariat: Yes, but some clarification is required.

The proposal demonstrates good awareness of the relevant Thai regulatory landscape. Section G identifies the Enhancement and Conservation of the National Environmental Quality Act (1992, updated 2018), the Building Control Act (1979), Thai Industrial Standards (TIS), Digital Government Development Agency and Ministry of Digital Economy and Society regulations, Thailand's Personal Data Protection Act (PDPA, 2019), and Energy Regulatory Commission guidelines. The inclusion of technical maintenance provisions, manufacturer-certified maintenance schedules, periodic inspections, calibration protocols, adds credibility to the compliance narrative. However, the treatment of technical standards remains largely declarative, listing applicable laws and asserting compliance without explaining the specific steps, authorization processes, or clearance requirements involved. Several relevant regulatory domains are not addressed, and the relationship between the identified standards and the project's specific activities is not sufficiently detailed.

CR15: The project will use GSM and LoRaWAN networks to transmit sensor data across the province, but the proposal does not reference Thailand's telecommunications regulator (NBTC) or any associated licensing requirements. Do the proposed GSM and LoRaWAN deployments require any spectrum licenses, equipment certifications, or registrations under Thai telecommunications law, and if so, what steps will be taken to secure these authorizations?

CR16: Please provide clarification on the following technical standards:

1. Please clarify what TMD technical standards and data quality requirements apply to the proposed sensor network, whether it meets TMD's requirements for integration into national weather and climate datasets, what calibration protocols and reference standards will be followed, and whether TMD has formally endorsed the proposed equipment specifications as suitable for feeding into national early warning systems.
2. Please identify the specific Thai regulations governing e-waste and hazardous waste disposal that apply to the project's equipment, describe the end-of-life management plan for sensors, batteries, and solar components including collection, transport, and disposal or recycling arrangements, and clarify whether certified hazardous waste handlers will be contracted for this purpose.
3. Please identify the specific OHS standards applicable to sensor and solar installation activities, describe the safety training and certification requirements for local technicians who will install and maintain equipment at height and work with electrical systems, and confirm that all contractors will comply with Thai labor law requirements regarding insurance, protective equipment, and working conditions.

During full proposal preparation, the proponent should develop a compliance matrix that maps each project activity (sensor installation, solar integration, communications deployment, platform development, data collection and sharing) against the specific permits, licenses, certifications, or clearances required under Thai law, the responsible issuing authority, the application process and estimated timeline, and the current status of compliance. Given that the project's core value proposition depends on integrating sensor data into national meteorological and early warning systems, the full proposal should include formal confirmation from TMD that the proposed sensor specifications, data formats, calibration standards, and transmission protocols are compatible with and acceptable for integration into TMD's national systems and MHEWS. If the PVMET-75

sensors, designed primarily for solar PV performance monitoring, require supplementary meteorological instruments to meet TMD's observation standards, this must be identified and costed in the full proposal budget. (6 March 2026)

Response: Not Cleared

Secretariat: CR15: Cleared pages 16-17.

Part II, Section C now includes a dedicated paragraph confirming that data transmission uses "standards-based, type-approved telecommunications technologies that comply with the National Broadcasting and Telecommunications Commission (NBTC) framework," and explicitly states the system "does not require dedicated frequency-spectrum licences under the NBTC"; cellular communications operate under existing licences held by Thai mobile carriers (AIS, True, dtac), while LoRaWAN operates on Thailand's licence-exempt 920–925 MHz ISM band.

CR16: Not Cleared.

1. The concept provides a detailed TMD compliance framework (WMO CIMO Guide, WIGOS metadata standard, NIMT/TMD calibration traceability) built around an "IEC 61724-1 Class A weather-station head" measuring rainfall, air temperature, humidity, wind speed/direction, pressure, and solar radiation (Section G; Table 4, USD 4,000/station). This differs from the PVMET-75 unit described in Section A, which is a solar-monitoring instrument measuring ambient/panel temperature and irradiance only.

Please clarify whether the project has moved from the PVMET-75 to a more comprehensive IEC 61724-1 Class A station as the primary sensor specification, or whether both instruments are being deployed together (i.e., PVMET-75 for PV-performance parameters plus a separate meteorological sensor suite for TMD-required parameters). If the latter, please confirm this combined configuration is reflected in the Table 4 cost breakdown.

2. The clarification is cleared on page 14. Section G names the specific framework (Basel Convention plus applicable Thai regulations), commits to an E-Waste and Hazardous Waste Management Plan developed at PFG and incorporated into the ESMF. It further confirms now that only DIW-licensed hazardous waste transporters and treatment facilities will be contracted, including e-waste and battery recyclers certified under ISO 14001 and, where applicable, R2 standards, selected through competitive procurement with contractual clauses on Basel Convention compliance and no export to non-OECD facilities without prior informed consent.

3. The revised concept further describes a credible OHS risk-management process (page 17) but does not name the specific Thai legal instrument(s) governing occupational safety for the activities involved (e.g., electrical work, work at height, rooftop installation). Please identify the applicable Thai OHS legislation and any relevant ministerial regulations or technical codes (e.g., governing work at height, electrical safety, or heat exposure) that will govern installation and maintenance activities, consistent with the level of specificity already provided for environmental and building-code compliance in Section G.

Response: Not Cleared

IE:

Response: Not Cleared

Secretariat: CR16: Not Cleared.

Sub-points 2 and 3 are cleared. Sub-point 1 remains outstanding. The PVMET-75 reference has been removed and the specification is now expressed as an IEC 61724-1 Class A weather-station head, but the parameter sets described remain inconsistent: Section C (page 11) lists ambient temperature, PV panel temperature and irradiance only, while Section G (page 23) lists rainfall, air temperature, relative humidity, wind speed and direction, atmospheric pressure, solar radiation and, where relevant, soil moisture and water level. IEC 61724-1

is a PV performance-monitoring standard and does not itself specify the meteorological parameters listed in Section G. Please confirm whether a single station measuring the full Section G parameter set is to be deployed, or whether a PV-monitoring instrument and a separate meteorological sensor suite are to be co-located, and confirm that the configuration selected is what is priced in the USD 4,000 station-head line in Table 4. Please also complete the sentence at page 24, which currently reads "will be measured with sensor accuracy classes meeting" without specifying the applicable accuracy reference.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CR16: Cleared. Pages 11, 24 and 38. The concept note now clarifies that the IEC 61724-1 Class A PV-monitoring station will be co-located with a complementary meteorological sensor suite capturing the full parameter set. It also identifies the applicable WMO accuracy requirements and confirms the indicative USD 4,000 station-head cost.

For the next stage: During PFG/full proposal preparation, provide the final equipment specifications and clarify whether the USD 4,000 station-head cost includes the complete complementary meteorological sensor suite or whether any elements are budgeted separately.

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

Response: Not Cleared

Secretariat: No, but further clarification is required.

The proposal presents a thorough duplication analysis. Section H identifies twelve potentially overlapping projects and programs, ranging from nationally funded initiatives (Royal Rainmaking Project, National Hydroinformatics Centre, NSTDA-DOAE Weather Data Integration) to internationally funded programs (GCF-UNDP water resilience, UKRI ENRICH, SEI early warning initiatives, IKI Urban-Act) and two existing Adaptation Fund regional projects (Mekong EbA South and Greater Mekong Subregion groundwater). Each entry includes the funder, a description, and a complementarity statement. The proposal also acknowledges two UNIDO projects currently at concept phase in Thailand (Chiang Rai tourism and Southeast Asia fisheries) and commits to ensuring no overlap.

However, the concept has very little on what has been learned from these initiatives, how coordination will function during implementation, or whether genuine overlaps in geographic coverage or institutional mandate exist. Several potentially relevant projects and funding streams are missing from the analysis, and the treatment does not adequately describe frameworks for ongoing coordination.

CAR3: Please confirm whether the following have been reviewed for overlap and complementarity, and if relevant, include them in the full proposal's duplication analysis:

1. The World Meteorological Organization's Systematic Observations Financing Facility (SOFF), which specifically funds expansion of weather observation networks in developing countries and could be directly relevant to the project's sensor deployment objectives.
2. Japan International Cooperation Agency (JICA) programs in Thailand's disaster risk reduction and climate adaptation sectors, given JICA's substantial portfolio in Thai infrastructure and disaster management.
3. The Asian Development Bank's climate resilience and disaster risk management portfolio in Thailand, particularly any investments in digital infrastructure, climate information systems, or provincial-level adaptation

planning.

4. World Bank or bilateral donor investments in Thailand's hydromet modernization.

5. The Climate Risk and Early Warning Systems (CREWS) initiative, which specifically supports multi-hazard early warning systems in vulnerable countries and could be operating in Thailand or the ASEAN region.

6. Thailand's domestic budget allocations for meteorological infrastructure expansion, particularly any TMD modernization programs or DCCE investments in provincial climate monitoring that could overlap with or complement the project's sensor deployment.

CAR4: The duplication table identifies the SEI smart weather station pilot in Nakhon Ratchasima as a directly relevant precursor, noting it "installed pilot weather stations with farmer groups to support climate-smart agriculture" in the same province. The complementarity statement simply characterizes it as "small-scale and experimental" and positions the proposed project as scaling up. This treatment is insufficient given the direct geographic and thematic overlap. Please provide substantially more detail on this initiative including outcomes, challenges and lessons from SEI's pilot. Are any of SEI's pilot stations still operational, and if so, will they be integrated into the proposed sensor network? If this pilot demonstrated important limitations, these should explicitly inform the current project's design choices rather than being dismissed as simply "small-scale."

CR17: The HII's National Hydroinformatics and Climate Data Centre is described as "the national hub integrating hydrological and meteorological data from multiple agencies." The proposal states it will create "new, high-resolution microclimate data" to feed into the NHC's analytical capabilities. However, the NHC already aggregates data from multiple sources and has established data standards, protocols, and governance structures. Please clarify what specific agreements or discussions have taken place with HII regarding data integration, whether the NHC has been consulted on the proposed platform architecture to ensure compatibility rather than creating a parallel system, and whether HII has expressed any concerns about a separate cloud-based platform being developed outside its existing infrastructure.

CR18: Kindly strengthen the coordination information with the following projects:

1. Please clarify whether ENRICH has produced data, models, or community engagement structures in Nakhon Ratchasima that this project can build upon, whether there is a risk of duplicating ENRICH's research stations or community engagement in the same sub-districts, and what formal coordination mechanism will ensure the two initiatives are complementary rather than redundant.

2. Please clarify whether the GCF-UNDP project operates or has operated in Nakhon Ratchasima specifically, whether there are overlapping government counterparts or institutional structures, and what concrete coordination mechanism will prevent duplication of capacity building activities targeting the same government staff or community groups. If the GCF-UNDP project has already built institutional and community capacity in relevant areas, this project should build on those investments rather than starting from scratch.

CAR5: The duplication analysis identifies complementarity with twelve existing initiatives but does not describe any framework or mechanism for ongoing coordination during implementation. Given the number of active projects in Thailand's climate adaptation, early warning, and hydromet sectors, a passive approach of stating complementarity at design stage is insufficient. Please describe what coordination mechanisms will be established. Additionally, will the project's monitoring framework include indicators to track coordination effectiveness and early identification of emerging overlaps?

During full proposal preparation, the proponent must include a substantive discussion; particularly for the most directly relevant precursors of specific lessons learned, challenges encountered, and design decisions in the current project that reflect those lessons. The full proposal must also include a comprehensive assessment of the national and international landscape for meteorological infrastructure investment in Thailand, including any active or planned investments by WMO (particularly SOFF), the World Bank, ADB, JICA, or bilateral donors in

hydromet modernization, observation network expansion, or early warning system enhancement. Given that the project's core activity is deploying weather observation infrastructure, the risk of duplication with hydromet modernization programs is particularly high and must be thoroughly assessed. If Thailand is receiving or seeking support from SOFF or other dedicated hydromet financing mechanisms, the full proposal must explain how the AF investment complements rather than duplicates those investments, and whether coordination agreements with the relevant financing bodies have been established.

(6 March 2026)

Response: Not Cleared

Secretariat: CAR3: Not cleared on page 37.

The revised concept commits to evaluating duplication of the project with existing initiatives 'full proposal development, the project team will also conduct a detailed review of further ongoing and planned investments by SOFF, JICA, ADB, the World Bank and other development partners in hydrometeorological observation systems, climate information services, disaster risk reduction and adaptation planning. Preliminary assessment suggests that these initiatives are largely complementary rather than duplicative, as the proposed project focuses on adaptation-oriented microclimate monitoring, AI-enabled decision support, community-centred early warning services and integration into the Climate Change Information Center (CCIC).¹ However, there is no indication in the concept that screening for any planned or budgeted expansion of TMD's existing ~100-station network, or for DCCE's own provincial climate monitoring investments was done. Given that domestic modernisation efforts would be the most likely source of direct duplication, please confirm whether TMD or DCCE have any funded plans to expand observation infrastructure in Nakhon Ratchasima or nationally, and if so, describe how the AF-financed network will be sequenced or coordinated with them.

CAR4: Not cleared.

The response sheet indicates that the response was addressed towards the "Early Warning and Drought Resilience Initiatives" row (funder: Stockholm Environment Institute, describing work along the Thailand–Myanmar border).

CAR4 specifically concerns the separate "Smart Weather Station Pilot (Nakhon Ratchasima)" row (funder: SEI/ONWR/RMUTI), which installed pilot weather stations with farmer groups in the same province targeting the same population as the proposed project. This row remains unchanged for "The SEI pilot is small-scale and experimental. This project aims to scale up sensor deployment across multiple provinces, integrate AI prediction models, and build a national data and training platform for long-term application."

Please provide substantially more detail on this initiative including outcomes, challenges and lessons from SEI's pilot. Are any of SEI's pilot stations still operational, and if so, will they be integrated into the proposed sensor network? If this pilot demonstrated important limitations, these should explicitly inform the current project's design choices rather than being dismissed as simply "small-scale."

CR17: Not Cleared.

The proposal now clarifies that DCCE and HII are structurally interlinked through reciprocal committee membership and that HII will be invited to join the Project Steering Committee during full proposal development. This is a helpful clarification of the institutional relationship. However, the original request also asked specifically whether HII/NHC has been consulted on the proposed platform architecture to confirm compatibility, and whether HII has raised any concerns about a separate cloud-based platform being built outside its existing infrastructure. Neither point is directly confirmed.

Please clarify:

1. Whether technical-level discussions with HII have covered the proposed CCIC platform's data architecture and interoperability standards specifically (as opposed to general institutional collaboration); and

2. Whether HII has expressed any view, on a new cloud-based platform being developed outside the NHC's existing infrastructure, (given that an "Informal discussions on collaboration with HII..have already taken place."

CR18: Cleared on page 36.

The proposal confirms no geographic overlap (GCF/UNDP operates in Phitsanulok, Sukhothai, Uttaradit under the Yom/Nan basins; this project targets Nakhon Ratchasima under the Mun/Chi basin system) and no thematic overlap (grey-green infrastructure and on-farm adaptation vs. data/EWS/CCIC infrastructure). Coordination is named specifically: via DCCE as national focal point and direct UNDP engagement during full proposal development, with a stated intent for the CCIC platform to eventually also serve Greater Chao Phraya basin stakeholders.

CAR5: Cleared on pages 36-37.

Section H describes a structured coordination framework: multi-stakeholder coordination committees at national and provincial levels, regular data/progress sharing via dashboards and technical workshops, designated coordination focal points within the project team, and joint planning/review sessions during pilot phases. It also adds specific M&E indicators to track coordination effectiveness; number/frequency of coordination meetings, instances of joint data use or shared AI model enhancements, and early identification/mitigation of overlapping activities.

Response: Not Cleared

IE:

Response: Not Cleared

Secretariat: CAR3: Cleared on page 30.

The gap identified has been filled at page 30. A dedicated paragraph now confirms that the project team screened domestic modernisation activity by TMD and DCCE specifically, in addition to external partners, and reports the outcome of that screening: TMD manages the WMO-compliant national station network and has national-level expansion plans, but none specific to Nakhon Ratchasima, expansion being constrained by the substantial financial resources WMO-standard stations require; DCCE serves as the coordinating agency promoting implementation at local level. The paragraph states the coordination logic that follows; that TMD and DCCE activities do not overlap with the project on network expansion, and that the project functions as a demonstration in Nakhon Ratchasima with replication in other provinces in line with provincial climate adaptation plans. It also records that this was confirmed in the coordination meeting with DCCE and TMD, which is annexed (Annex E).

CAR4: Cleared (pages 27–28).

The correct row has now been revised. The "Smart Weather Station Pilot (Nakhon Ratchasima)" entry has been substantially expanded and is no longer characterized as simply small-scale. It now identifies the implementing partners (SEI Asia with ONWR and RMUTI), records that UNIDO has completed a preliminary desk review and initiated direct outreach, and addresses each element the CAR asked for.

Outcomes are described automatic weather stations installed alongside farmer field schools in selected sub-districts, generating localised rainfall, temperature and soil-moisture data for planting, water management and crop selection decisions, and demonstrating that farmer engagement in weather-data interpretation is feasible when tied to concrete agricultural decisions. Three limitations are named: limited spatial coverage insufficient for province-wide EWS or MHEWS integration; short-term research-grant financing with no post-project host institution for operation, maintenance, calibration or data hosting; and limited institutional integration, with data used for research outputs rather than fed into TMD, DCCE or CCIC systems.

CR17: Not Cleared.

The revised text at page 30 confirms existing data exchange between HII and DCCE, commits to progressive API-based connectivity and open interoperability standards, and states that the AF-financed platform will complement rather than replace HII's infrastructure. However, neither original question is answered in the concept note. The references to HII providing technical input on platform architecture, data standards and interoperability are prospective, indicating that the architectural discussion has not yet occurred, and HII does not appear among the stakeholders listed as consulted in Section J. Whether HII has expressed any view on a separate cloud-based platform being developed outside the NHC is not addressed. The sentence inviting HII to join the Project Steering Committee also appears twice in succession.

The response sheet states that technical-level discussions with HII have been initiated and are ongoing on the CCIC platform's data architecture and interoperability standards specifically, that HII has not raised concerns about the platform being developed alongside the NHC, and that this is documented at Minute 10 (29 July 2026). That content would clear the clarification request, but it does not appear in the concept note text. Please incorporate these confirmations into the concept note itself.

HII should be included among the stakeholders listed as consulted in Section J, and the duplicated Project Steering Committee sentence removed. Where HII's position is reported on the basis of the DCCE/TMD coordination meeting recorded at Minute 10, please also indicate whether HII participated in that meeting or whether its position is conveyed through DCCE.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CR17: Cleared. Page 30.

The concept note now confirms that technical discussions have occurred between DCCE and HII, that HII has not raised concerns about the CCIC platform being developed alongside the NHC, and that the AF-financed platform will complement rather than replace HII's infrastructure. It also clarifies that formal coordination will be established during the PFG stage, and the duplicated sentence has been removed.

For the next stage: Consult HII directly and confirm its role, data-sharing arrangements and participation in project governance. The reference to "Minute 10" should also be corrected or the corresponding record added to Annex A, which currently contains only Minutes 1–9.

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

Response: Not Cleared

Secretariat: Yes, but some clarification is required.

The proposal dedicates Section I to learning and knowledge management. The breadth of planned knowledge products and the identification of specific regional dissemination channels demonstrate thoughtful planning. However, the knowledge management framework as described operates primarily at the level of single-loop learning, tracking implementation progress, documenting what happened, and sharing outputs. The proposal does not articulate how evidence will be used to iteratively adapt the intervention during implementation, and does not demonstrate how marginalized groups and community beneficiaries will participate as knowledge owners rather than knowledge recipients.

CR19: Please describe:

1. How the project will incorporate structured reflection processes that question whether the innovation approach itself is working as intended. What mechanisms exist for stakeholders to challenge the project's fundamental assumptions, such as the assumption that technology-driven climate data will translate into changed behavior and improved adaptation outcomes?
2. The specific decision points, feedback mechanisms, and governance processes through which learning will translate into concrete changes to project design during implementation.
3. How the project will systematically document not only what works but also what does not work and why, including technology failures, community adoption barriers, institutional resistance, data quality challenges, or unforeseen contextual factors.
4. How the project will ensure that community-generated knowledge (including farmers' observations, traditional weather indicators, local risk perceptions, and experiential learning about what adaptation practices work in their specific context) is systematically captured, valued, and integrated into the project's knowledge base alongside technical and scientific data.
5. What proportion of the project budget is specifically allocated to knowledge management and learning activities.

During full proposal preparation, the proponent should develop and include a dedicated adaptive management and innovation learning framework that goes beyond conventional M&E. This framework should include structured reflection and decision points at defined intervals (not only mid-term review) where the project team, together with community stakeholders, formally assesses whether the innovation approach is achieving its intended effects and whether fundamental design changes are warranted. It should establish clear protocols for documenting both successful and unsuccessful innovation outcomes with analysis of contributing conditions.

(6 March 2026)

Response: Not Cleared

Secretariat: CR19: Not Cleared.

The revised concept clarifies some requests however others remain:

1. The proposal commits to assessing whether "underlying assumptions, technologies, and service delivery approaches are achieving their intended adaptation outcomes," but does not specifically name or address the foundational assumption flagged in CR19 that access to technology-generated climate data will translate into changed behaviour and improved adaptation outcomes. In the response sheet every mechanism listed measures whether the tool is functioning; usability, data quality, platform functionality, stakeholder uptake of the platform, complaints via the GRM. None of them is designed to test whether the underlying causal chain holds. Please describe a specific mechanism (e.g., a defined check-in point, an indicator, or a stakeholder forum) that tests the underlying behavior-change assumption itself, with a defined trigger for revisiting the theory of change if it is not holding.
2. The proposal references "predefined review points" and community feedback loops, but the only formal, dated review points in the project calendar remain the mid-term review (2030) and terminal evaluation (2032). The governance and feedback elements cited in the response sheet are each individually present in the concept note (Sections J, I, M, Part III.A), but the concept note does not itself state how DCCE/PSC oversight and UNIDO/IE approval function together as the decision-making layer that translates learning into design change, kindly add this connecting statement directly to the concept note (e.g., in Section I).
3. This is cleared. Section I states the learning framework "will explicitly document both successes and challenges, including technology performance issues, data quality limitations, community adoption barriers, institutional constraints, and unforeseen contextual factors, ensuring that lessons from what does not work are captured alongside good practices." (pg 33)
4. This is cleared. Section I's community knowledge integration framework commits to participatory mapping,

local knowledge registries, and community-led monitoring, and explicitly states that "community-generated knowledge including farmer observations, traditional weather indicators, local risk perceptions, and experiential adaptation practices will be systematically documented through participatory processes and integrated into the project's knowledge base, model calibration processes, and learning products alongside scientific and technical data." (pg 33)

5. Knowledge management activities are currently folded into Output 3.4 within the overall Component 3 budget (USD 587,260) without a distinct allocation. The response sheet defers the allocation to the PFG. Please provide at least an indicative percentage or dollar range for knowledge management activities within Component 3, to demonstrate that this function is resourced proportionate to its role in the adaptive management framework.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CR19: Cleared on page 32.

Sub-points 1, 3, 4 and 5 are cleared. On sub-point 2, Section I now sets out dated review points beyond the mid-term and terminal evaluations, including inception, monthly technical meetings, quarterly meetings, a six-month data review, end-of-first-rainy-season and end-of-first-drought/heat-season reviews, and an Annual Theory of Change review, alongside the newly introduced Behaviour-Change and Adaptation-Outcome Test and its annual Independent Assumption Review Panel.

The connecting statement on how DCCE/PSC oversight and UNIDO/IE approval function together as the decision-making layer translating learning into design change has not been added, and should be provided at full proposal stage as part of the monitoring and evaluation arrangements under Part III.D, specifying which body reviews learning-cycle and BCAOT findings, which body approves resulting changes to system design, forecast models, communication channels, training approaches or implementation strategies, and at what points in the project cycle those decisions are taken.

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

Response: Not Cleared

Secretariat: Unclear.

The proposal documents a meaningful initial consultative process at the national and regional levels. Section J identifies consultations conducted in August and September 2025 with DCCE, TMD, TGO, and SEDA Malaysia. The results of these consultations are visibly reflected in the project design.

CAR6: Section K states that the project "combines multiple perspectives on innovation by engaging climate-vulnerable communities" and that local communities "inform sensor placement, data needs, and the types of advisories most useful for daily decision-making." However, Section J confirms that no community consultations have taken place to date. Please reconcile these two sections. Section K should accurately reflect the current state of stakeholder engagement rather than presenting planned activities as accomplished.

CR20: The consultative process (Section J) does not describe any gender-specific engagement strategies. Please clarify:

1. Whether any of the national-level consultations included discussion of gender-differentiated climate vulnerabilities, information needs, or technology access patterns. Were organizations with a gender remit present in the consultation delegations?
2. If consultations included civil society organizations operating in Nakhon Ratchasima or in Thailand's climate adaptation sector.
3. Whether PV developers operating in Nakhon Ratchasima have been engaged. Proposal references several private-sector stakeholders who are important to the project's design and sustainability but consultations only include one private-sector adjacent actor.

CR21: Please clarify whether any ethnic minority communities or culturally distinct groups exist in the proposed target sub-districts of Nakhon Ratchasima, whether their specific vulnerabilities, information needs, or language requirements have been considered.

(6 March 2026)

Response: Not Cleared

Secretariat: CAR6: Not Cleared.

Section K's states: "Local communities and businesses, drought- and flood-affected districts, and district-level disaster response units will inform sensor placement, data needs, and the types of advisories most useful for daily decision-making" (pg 37). However, the reconciliation is incomplete. The section's opening sentence still reads: "The project combines multiple perspectives on innovation by engaging climate-vulnerable communities..." framed as already happening. A few sentences later, it also states community lived experience "helps shape the platform's practical outputs" implying community input has already shaped design, which Section J does not support (Section J confirms community/CSO engagement specific to this project remains planned for the PFG phase, distinct from the 2023–2024 Provincial Working Group's general prior consultations). Kindly revise the concept to be consistent about if consultation has taken place.

CR20: Cleared on pg 35.

Section J confirms preliminary national-level consultations did include discussion of gender-differentiated climate vulnerability (access to information, decision-making roles, differential exposure), while explicitly acknowledging that gender-focused organisations " (pg 35) were not formally represented in all initial consultations. Consultations did not include civil society organizations operating in Nakhon Ratchasima or in Thailand's climate adaptation sector or PV developers operating in Nakhon Ratchasima but all these would be done during the PFG.

CR21: Not Cleared.

The concept identifies the Khorat Thai (Thai Doeng) group, concentrated in Chok Chai, and confirms standard Thai as a shared language across groups. However, the concept does not address if they or any other culturally distinct group's have specific vulnerabilities or information needs have been considered in project design. Please clarify whether the Khorat Thai or other locally distinct communities have any differentiated climate exposure, livelihood patterns, or preferred information channels relevant to sensor siting, advisory content, or outreach design, or confirm that no differentiated needs have been identified to date and that this will be assessed as part of the PFG-stage community consultations.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CAR6: Cleared on page 37.

Section K has been reworked and the inconsistency the CAR identified is resolved. The opening sentence now reads that the project "combines multiple perspectives on innovation by drawing on community perspectives documented through the 2023–2024 provincial climate-planning process, together with project-specific consultations conducted with national and provincial institutions and technical experts"; which attributes the community input to its actual source rather than implying direct project consultation. The forward-looking elements are correspondingly in future tense: communities, affected districts and district-level disaster response units "will inform" sensor placement, data needs and advisory types.

The lived-experience sentence has been corrected in the same way. It now states that experience of rising temperatures, erratic rainfall and crop losses, "as documented through the 2023–2024 provincial consultation process, has informed the project's preliminary design," followed immediately by the qualifier that "direct project-specific consultations during the PFG phase will validate these findings and further shape the platform's practical outputs."

CR21: Cleared on page 36.

Section J now closes with the confirmation requested. The passage retains the description of Nakhon Ratchasima as a culturally diverse province and identifies the Khorat Thai (Thai Doeng) as the main local group, concentrated in areas such as Chok Chai, with a dialect blending Central Thai and Isan, and confirms that all groups communicate in standard Thai. It then states expressly that "no differentiated needs have been identified to date and that this will be assessed as part of the PFG-stage community consultations."

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

Response: Not Cleared

Secretariat: Yes, however some clarification is needed.

The proposal presents a strong argument in the full cost of adaptation justification (Section L). The baseline scenario is clearly quantified. The adaptation scenario is equally specific. The comparison with Taiwan's station density effectively illustrates the structural data gap. The project is fully self-contained at USD 5 million with no co-financing required, and the proposal explicitly states that "all activities from sensor deployment to platform development and capacity-building are calibrated to this budget." The incremental adaptation reasoning is logically sound.

However, the full cost of adaptation justification is weakened by an inadequately resolved tension between adaptation activities and energy sector development activities, several components that could be characterized as business-as-usual development without stronger adaptation framing, and insufficient demonstration that all budget allocations serve adaptation purposes exclusively. The PV and energy resilience narrative, while carefully worded, introduces ambiguity.

CAR7: The full cost of adaptation principle requires that all funded activities serve adaptation objectives.

- Please provide a clear delineation of which PV-related activities are strictly necessary for adaptation outcomes (ensuring uninterrupted sensor operation and data transmission during climate shocks) versus those that primarily serve energy sector commercial interests (improving solar yield forecasting, supporting PV developer site selection, enabling increased PV installations).
- The statement that "grant funding is required to provide the initial impetus for solar developers to participate" is particularly concerning, please clarify whether funds are being used to incentivize private sector participation in what is essentially a commercial activity, and if so, how this is consistent with the full cost of adaptation principle.

(6 March 2026)

Response: Not Cleared

Secretariat: CAR7: Not cleared.

The revised proposal substantially strengthens the delineation between AF-funded adaptation infrastructure and PV host infrastructure. The revision to Section L replacing the reference to funding as an "initial impetus for solar developers" with funding to enable public-sector host institutions (Tessaban, SAO, PAO) to participate as physical host sites, directly resolves the specific concern that AF funds might be used to incentivize private commercial solar participation. However, this delineation is not yet fully reconciled with three remaining passages that still associate the project's PV/energy dimension with commercial value and sustainability:

1. Section C's description of a "secondary use" of the platform for private-sector assessment of renewable-energy deployment and property-development sites, explicitly linked to the platform's "continued use and sustainability";
2. Section D's statement that enhanced forecasts "could be expected to allow for increased PV installations"; and
3. Section A's reference to "further elaborating the business case and project exit strategy" during PFG.

Please either (a) remove these references, or (b) explicitly relabel them as incidental co-benefits that fall outside the AF results framework and are not relied upon for the project's sustainability model, consistent with the ring-fencing language used elsewhere in the proposal. As currently worded, these passages risk implying that commercial PV/energy value generation plays a role in project rationale or sustainability, which would be inconsistent with the full cost of adaptation principle underpinning CAR7.

Response: Not Cleared

IE:

Response: Not Cleared

Secretariat: CAR7: Not Cleared.

The three passages identified are satisfactorily resolved at pages 3, 15 and 19, each now expressly relabelled as incidental co-benefits outside the AF results framework and excluded from the sustainability model. However, the reference at page 16 to private PV asset operators providing "co-financing of the EWS subscription stream" retains a commercial revenue element within the project rationale and is inconsistent with the free, non-discriminatory access commitment at page 15. This falls within the remedy already requested at CR11 and CR1 should be corrected in the same revision; no separate response is required beyond confirming that the passage has been reconciled with the ring-fenced public-good model.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CAR7: Cleared. Pages 3, 15–16 and 19. The reference to private PV operators providing co-financing for an EWS subscription stream has been removed. The concept note now consistently confirms that PV- and renewable-energy-related benefits are incidental co-benefits outside the AF results framework, that the platform provides free and non-discriminatory access, and that the sustainability model does not rely on commercial revenue, consistent with the clearance of CR1 and CR11.

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

Response: Not Cleared

Secretariat: No.

The proposal makes a commendable effort to demonstrate alignment with the AF Strategic Results Framework. Section III.F provides a detailed alignment table mapping project objectives and outcomes against AF outcomes and output indicators.

CAR8: Kindly revise the table as follows:

- Upper section of the table: i) Please enter the "Project Objective" identified in the results framework in the "Project Objective(s)" column; ii) enter the Project Objectives Indicators in the "Project Objectives indicator(s)" column; iii) for each Project Objective indicator, select only the most appropriate Fund Outcome and enter it in the "Fund Outcome" column; iv) for each Fund Outcome listed, select only the most relevant Fund Outcome Indicator and enter it in the "Fund Outcome Indicator" column; v) enter the grant amount for each Fund Outcome selected in the "Grant Amount (USD)" column, ensuring that the total equals the project activity cost;
- Lower section of the table: i) list the project outcomes identified in the project results framework (see relevant CAR) in the "Project Outcome(s)" column, along with their respective outcome-level indicators in the "Project Outcome Indicator(s)" column; ii) for each Project Outcome indicator, select only the most relevant corresponding Fund Output and enter it in the "Fund Output" column; iii) choose only the most relevant Fund Output Indicator for each Fund Output selected and enter it in the "Fund Output Indicator" column; and iv) input the grant amount for each Fund Output selected in the "Grant Amount (USD)" column, ensuring that the total equals the project activity cost.

Lastly, for consistency, please ensure that all Fund Outcomes associated with the listed Fund outputs in the lower section of the table are reflected in the upper section of the table.

Please see relevant Fund outcome & Output Indicator /Core Impact indicator <https://www.adaptation-fund.org/wp-content/uploads/2025/11/Alignment-with-Adaptation-Fund-Results-Framework-Template-and-guidance-Nov-2025.docx> (Funds result framework).

(6 March 2026)

Response: Not Cleared

Secretariat: CAR8: Not Cleared.

The table in Section F has not been revised in line with the specific structural requirements set out in CAR8.

Several issues remain:

1. The instruction to select only the single most relevant Fund Outcome (and single most relevant Fund Outcome Indicator) per Project Objective Indicator, and only the single most relevant Fund Output (and single most relevant Fund Output Indicator) per Project Outcome Indicator, has not been applied:
 - In the upper section, Objective 2 lists three Fund Outcomes (1, 3, 7) with four indicators in a single row; Objective 3 lists two Fund Outcomes (2, 4) with three indicators in a single row.
 - In the lower section, every row pairs a single Fund Output with two indicators and two separate grant amounts, and one row lists two distinct Fund Outputs (2.1 and 2.2) together.

Please revise so that each row reflects one Project Objective/Outcome Indicator mapped to exactly one Fund Outcome/Output and one Fund Outcome/Output Indicator, with its own discrete grant allocation.

2. The upper section totals USD 5,000,000 (full financing request) while the lower section totals USD 4,387,260 (Components 1–3 only). Please note that the sum of all objective indicators should be the sum of all project components. This should not include IE fees and EE cost, kindly revise.

3. CAR8 requires that all Fund Outcomes referenced in the upper section be reflected via corresponding Fund Outputs in the lower section. Outcome 8 currently has no corresponding Fund Output represented in the lower

section. Please add the relevant Output(s) under Outcome 8 to the lower section, or clarify how this allocation maps to the Fund's output-level framework.

Please refer again to the AF Results Framework template and guidance (<https://www.adaptation-fund.org/wp-content/uploads/2025/11/Alignment-with-Adaptation-Fund-Results-Framework-Template-and-guidance-Nov-2025.docx>) when revising the table.

Response: Not Cleared

IE:

Response: Not Cleared

Secretariat: CAR8: Not Cleared.

Kindly use the most updated template linked below:

1. The revised template in the Upper Table links the fund outcomes to project outcomes and not objectives.
2. Kindly ensure that each project outcome in the Upper Table links to a corresponding project output in the Lower table. Please also ensure that the budget is separated by fund outcome/output indicator (in revised version fund outcome 6 has no indicator to corresponding output).

Please see relevant Fund outcome & Output Indicator /Core Impact indicator <https://www.adaptation-fund.org/document/strategic-results-framework-guidance-2026/>

<https://www.adaptation-fund.org/document/alignment-with-adaptation-fund-results-framework-template-and-guidance-dec-2025/>

The following issues remain:

- The upper table still maps project objectives rather than project outcomes. The updated template requires “Project Outcomes” and “Project Outcome Indicators.” The project outcomes shown in the lower table should therefore be represented and mapped in the upper table.
- The table still uses outdated Fund results and indicator terminology. Examples include the former wording for Outcomes 1 and 8 and the old indicator numbering such as 1.2, 2.1.1, 2.1.2, 3.2.1, 4.1.1 and 7.2. These should be replaced with the exact outcomes, outputs and indicators in the July 2026 SRF.

- Several Fund outputs and indicators are incorrectly paired or combined:

Fund Output 1.1 is paired with an Output 1.2 indicator.

“Output 4” and “Output 7” use outdated designations.

The Outcome 3.1 row combines Outputs 2.1 and 4.

The Outcome 3.3 row combines Outputs 3.2 and 2.1 and combines indicators from different output areas.

- Each row should contain one project outcome or output indicator mapped to one relevant Fund outcome or output and its corresponding Fund indicator.

- Fund Outcome 6 remains incomplete. The upper table identifies Outcome 6 but provides no Fund outcome indicator, while the lower table contains no corresponding Output 6.1 and Indicator 6.1. Either complete this alignment using the revised SRF or remove Outcome 6 if livelihood change is not an intended and measurable project result.

- The project’s innovation alignment is incomplete. As a Large Innovation Project, the table should include the relevant revised Outcome 8 indicator—8A and/or 8B—and a corresponding Output 8.1 or 8.2 indicator. No

revised Outcome 8 output currently appears in the lower table.

- The outcome- and output-level totals now both equal the components total of USD 4,487,260, which is correct. This amount should be retained and distributed discretely across the revised mappings, excluding the USD 121,035 execution cost and USD 391,705 IE fee.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CAR8: Cleared. Pages 46–49. The revised tables use the updated structure and terminology, include the innovation outcome, and both the outcome- and output-level allocations correctly total USD 4,487,260. Together with the execution cost of USD 121,035 and IE fee of USD 391,705, the total financing requested is correctly USD 5,000,000.

For the next stage: Refine the remaining Fund outcome/output mappings, separate Project Outputs 3.3 and 3.4, and avoid double-counting the same innovation across multiple rows.

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

Response: Not Cleared

Secretariat: No.

The proposal addresses sustainability through three pillars described in Section M. The concept of Nakhon Ratchasima as a "demonstration site" whose lessons inform expansion is well-articulated, and the emphasis on "low-cost, modular technology and open-data architecture" as enabling replication at moderate cost is appropriate. The institutional sustainability argument is logically sound in principle. The proposal also identifies the PV developer business case as a potential self-financing pathway, suggesting awareness that long-term viability requires economic sustainability beyond donor funding.

However, the sustainability framework remains largely aspirational and lacks the specificity needed to demonstrate credible post-project viability. Recurrent costs are not estimated, the institutional handover pathway is not defined, the PV developer self-financing model is unsubstantiated, critical dependencies on private sector and government budget commitments are unconfirmed, and the scaling evidence base strategy is underdeveloped. The proposal describes what sustainability would look like but does not convincingly demonstrate how it will be achieved across the economic, financial, institutional, social, and technical dimensions.

CAR9: Without indicative estimates of recurrent costs, it is impossible to assess whether the proposed sustainability mechanisms are proportionate to the financial burden. The proposal references "cost-sharing models that engage provincial governments, farmer cooperatives, and private businesses" but does not indicate the expected magnitude of annual costs or the willingness and capacity of these actors to absorb them. Please clarify if any preliminary costing of post-project operational expenditure been conducted, and have discussions with provincial government budget authorities confirmed that recurrent costs could realistically be absorbed into provincial or national budget lines?

CR22: The proposal presents the commercial value of climate data to PV developers as a key sustainability pathway. However, this model raises several unresolved questions.

- Have PV developers operating in Nakhon Ratchasima been consulted about their willingness to co-finance or maintain weather monitoring infrastructure?
- What is the actual commercial value of microclimate data to a typical PV developer, is it sufficient to justify the ongoing costs of sensor maintenance and data transmission?
- If PV developers own or co-manage sensors, how will this affect the public-good nature of the data; could commercial interests restrict data access or redirect monitoring priorities away from adaptation toward energy optimization?
- At concept stage, even preliminary evidence that this self-financing model has worked elsewhere would strengthen the sustainability argument. Has this model been demonstrated in Malaysia's experience with SEDA, or in any other comparable context?

CAR10: The proposal states that "collaboration with line ministries, provincial offices, and the local governor will ensure that the sensor network and platform are managed in accordance with existing regulatory frameworks and that responsibilities for maintenance, data sharing, and policy integration are clearly defined." However, no institutional handover plan is described. Key questions remain unresolved. Please state which specific institution will assume ownership of the sensor network after project completion.

CAR11: The proposal proposes a 4-year implementation period deploying specific hardware and software (proprietary AI algorithms, cloud platform). Technology evolves rapidly, and hardware deployed in 2027 may face obsolescence, compatibility issues, or supply chain discontinuation well before the end of its useful life. The proposal does not address technology lifecycle management.

- What is the expected operational lifespan of the PVMET-75 sensors and associated hardware? Are replacement parts and technical support likely to remain available from the manufacturer for 10–15 years beyond installation?
- If the proprietary AI algorithm provider ceases operations or changes its business model, what contingency ensures continued platform functionality?
- Is the cloud hosting arrangement structured to allow migration to alternative providers if needed?

These technology sustainability risks are particularly important for a project proposing to build long-term infrastructure in remote areas where technical support may be limited.

CAR12: The scaling strategy lacks specificity particularly given the proposals the proposal's reliance on proprietary AI algorithms.

- The difference between stating that a project is "designed with replication in mind" and having a credible pathway to actual replication is significant. How can the model be freely replicated if core analytical components are proprietary?
- What institutional mechanism will drive scaling after the project ends?

CAR13: Section M does not address environmental sustainability which is important given that batteries, solar panels, and electronic sensors all have limited operational lifespans and generate hazardous waste when replaced. How will environmentally sustainable replacement and recycling be ensured in the absence of project funding, particularly given that e-waste management in rural Thailand may be less developed than in urban areas?

(6 March 2026)

Response: Not Cleared

Secretariat: CAR9: Cleared.

Section M provides a quantified estimate: USD 145,000–170,000/year for the full 205-station network, broken into calibration travel (in-kind, absorbed by the Provincial Governor's office), platform maintenance (USD

550/station × 205 = USD 112,750), and training/coordination/contingency (USD 30,000–55,000), with 90–100% stated to be absorbed by Thai public budget lines (CCIC/DCCE). Section J's "preliminary consultations... with the provincial environment office and the provincial energy office" confirm siting feasibility, not budget absorption. The actual institutional cost commitment is explicitly deferred: "this will be formalised through written commitments from MDES/TMD and MoNRE/DCCE-CCIC annexed to the full proposal at the PFG stage." In the full proposal stage please ensure the commitment that post project costs will be absorbed into provincial or national budget lines.

CR22: Not cleared.

Given the recurrent-cost model in Section M is now ~90–100% public-budget-funded, the PV-developer financing pathway no longer appears relevant. However this cannot be fully cleared with the inconsistencies on PV developers raised in CAR7. Please either substantiate the PV-developer/private-business financing pathway with consultation evidence and a value proposition, or remove this reference so the sustainability narrative is internally consistent with the public-budget-based recurrent cost model presented in Section M (refer to CAR7).

CAR10: Cleared on page 43.

Section M names CCIC under DCCE as the long-term institutional owner, with an intended joint management arrangement with TMD, and an explicit fallback: "If TMD declines to assume formal responsibility at full proposal stage, CCIC under DCCE will assume sole responsibility to continue managing and maintaining the equipment, hosting the data platform and sustaining the recurrent operations beyond project closure." Formalisation via written commitments is deferred to PFG, which is reasonable given this is a concept note.

CAR11: Not Cleared.

The shift to open-source/royalty-free algorithms addresses the algorithm-provider contingency risk, and the indicative 3–10 year sensor lifespan is indicated in the concept, though it draws on general industry standards rather than manufacturer-specific data. Two items remain unanswered:

1. Please confirm whether replacement parts and technical support are expected to remain available from the sensor/hardware manufacturer(s) over a 10–15 year horizon, consistent with the project's long-term infrastructure ambitions.
2. Please clarify whether the cloud hosting arrangement is structured to allow migration to alternative providers if needed, to avoid platform-level vendor lock-in distinct from the algorithm-level safeguards already described.

CAR12: Cleared on pages 14 & 42.

The algorithms is framed as open-source/royalty-free (Section B, pg 14). The institutional mechanism for scaling is also now specific, Section M names a multi-ministry replication architecture (MoNRE/DCCE for CCIC, MDES/TMD for observation-network integration, Ministry of Energy for PV co-location and funding streams, Ministry of Interior for Provincial Governors/PAOs/SAOs/Tessaban), explicitly stated to be "anchored in standing Thai public-sector mandates and budget lines" (pg 42) rather than contingent on continued AF financing.

CAR13: Cleared on pg 42.

Section M states no new solar panels will be installed, and that batteries are the only additional hardware, with a specific end-of-life pathway: "spent batteries will be sent to certified industrial and hazardous-waste disposal facilities in accordance with Thai regulatory standards under the Ministry of Industry."

Response: Not Cleared

IE:

Response: Not Cleared

Secretariat: CR22: Not Cleared.

The revised text confirms that recurrent costs are absorbed by Thai public budget lines and that private-sector contributions are not required for sustainability, and confines private PV-developer engagement to potential future scaling beyond Nakhon Ratchasima. However, the reference at page 16 to private PV asset operators providing "co-financing of the EWS subscription stream" remains, together with the reference at page 41 to leveraging willingness-to-pay for asset-specific value-added services. Neither is substantiated nor reconciled with the public-budget model. Please see CAR7 and CR11; no separate response is required beyond confirming that both passages have been removed or reconciled.

CAR11: Not Cleared.

The revised concept confirms the indicative 3–10 year sensor lifespan and the algorithm-level open-source safeguards, but neither outstanding item has been addressed. Please confirm (i) whether replacement parts and manufacturer technical support are expected to remain available over a 10–15 year horizon, and how procurement specifications will secure this, noting that the stated 3–10 year sensor life implies at least one replacement cycle within the period over which recurrent costs are to be absorbed by Thai public budget lines; and (ii) whether the cloud hosting arrangement is structured to permit migration to alternative providers, for example through data portability requirements, open formats and exit provisions in the hosting contract, so as to avoid platform-level vendor lock-in distinct from the algorithm-level safeguards already described. Please incorporate both responses below into the concept note text. Note that the reference to perpetual royalty-free licensing for pre-existing components must be applied consistently with the revised Section M wording and with Section C, per CR3.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CR22: Cleared. Pages 16 and 43. The references to subscription-based co-financing and willingness-to-pay have been removed, consistent with CAR7 and CR11.

CAR11: Cleared. Page 41. Section M now addresses parts availability, warranties, manufacturer support, replacement cycles and multi-vendor compatibility over the expected operational period. It also includes data portability, open formats, source-code escrow, exit provisions and transition support to enable migration between cloud providers and avoid vendor lock-in. Detailed contractual specifications can be finalized during the next stage.

Does the project / programme provide an overview of environmental and social impacts / risks identified, in compliance with the Environmental and Social Policy and Gender Policy of the Fund?

Response: Not Cleared

Secretariat: No.

The proposal states that a detailed Environmental and Social Management Plan is not required but commits to precautionary measures for e-waste management, occupational health and safety, gender and inclusion, and stakeholder engagement. However, the ESP screening has substantiation of risk assessments, the consistency of categorization logic, the treatment of several potentially significant risks, and the near-complete absence of gender-specific analysis. The checklist reads as a compliance exercise rather than a genuine risk assessment,

with generic mitigation language that does not demonstrate engagement with the specific conditions in Nakhon Ratchasima. The Category C classification, is not fully substantiated given several unresolved risk dimensions.

CAR14: In the table in section N in page 35 on the compliance with the Environmental and Social Policy and Gender Policy of the Fund

1. Kindly leave a check mark in the second column 'No further assessment required for compliance' only if no risk is identified, therefore no further assessment and leave blank if an assessment is to be conducted.
2. In the third column on 'Potential impacts and risks – further assessment and management required for compliance' For each risk categorized as low, medium, or high, please provide a brief justification (1-2 sentences) explaining the risk and its potential impacts, followed by a description of the proposed mitigation measures.

Please refer to https://www.adaptation-fund.org/wp-content/uploads/2016/07/ESP-Guidance_Revised-in-June-2016_Guidance-document-for-Implementing-Entities-on-compliance-with-the-Adaptation-Fund-Environmental-and-Social-Policy.pdf

CAR15: The proposal classifies the project as Category C under UNIDO's ESSPP. However, the project should be classified based on the AF ESP criteria that may not align precisely with UNIDO's framework. Please review the project classification based on the following risks identified in the proposal: data privacy, labor safety, e-waste, potential ecosystem disturbance, and limitations on women's participation. Please revise according to the AF guide in https://www.adaptation-fund.org/wp-content/uploads/2016/07/ESP-Guidance_Revised-in-June-2016_Guidance-document-for-Implementing-Entities-on-compliance-with-the-Adaptation-Fund-Environmental-and-Social-Policy.pdf

CAR16: The proposal does not explicitly identify any Unidentified Sub-Projects (USPs). However, the project design includes USPs, specifically, the sensor deployment strategy states that "detailed site assessments will guide the selection of locations" and that "high-risk sub-districts will be identified" during the preparatory phase, meaning the exact locations and communities affected will be determined during implementation rather than at appraisal. If specific deployment sites and affected communities are not known at the time of project approval, the AF ESP requires adequate provisions to ensure these subsequently identified activities comply with safeguards. Please see USP guide https://www.adaptation-fund.org/wp-content/uploads/2019/04/AFB.B.32-33.7_Compliance-with-ESP_Update-of-PPR_and_Guidance-for-USPs_revised-1.pdf (6 March 2026)

Response: Not Cleared

Secretariat: CAR14: Not cleared.

The table 6 structure has not been revised in line with CAR14. Two issues remain:

1. The second column continues to state "Further assessment required" or "No Further assessment required" as text for every row, rather than being left blank where no risk is identified and a check mark where no further assessment is required.
2. In addition, the third column continues to contradict the second column where it states "No Further assessment required" (Indigenous Peoples, Involuntary Resettlement, Protection of Natural Habitats, Conservation of Biological Diversity, Public Health, Physical and Cultural Heritage, Lands and Soil Conservation). Risks have been identified, but "no further assessment" designation is selected, meaning the project will not take any measures to monitor the identified risk. Please revise the table so that only categories with an identified risk carry a populated risk/mitigation entry in the third column, consistent with the second column's designation.

CAR15: Not Cleared

The revision from Category C to Category B is a substantive and welcome change that better reflects the risk dimensions identified (data privacy, labor safety, e-waste, ecosystem disturbance, gender/participation limitations). However, this reclassification is presented and justified entirely under UNIDO's ESSPP framework (pg 27). Kindly revise the justification against the Adaptation Fund's own ESP category criteria, which may not align precisely with UNIDO's internal framework. Please revise justification to align with AF criteria and not UNIDO's.

CAR16: Cleared on page 11 & 27.

Section A states the project "will apply an Unidentified Sub-Projects (USP) approach in accordance with the Adaptation Fund Environmental and Social Policy," with a defined USP screening and management framework covering: standardized screening procedures, exclusion criteria for high-risk activities/locations, site-specific risk assessment and mitigation, documentation/approval processes prior to deployment, and monitoring/reporting mechanisms. The concept further states 'the project will establish a formal USP management procedure to govern activities where exact locations and beneficiaries are not known at approval stage' (pg 27). Section G reinforces this with a direct reference to AF USP guidance and confirms only low/moderate-risk activities consistent with Category B requirements will be approved.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CAR14: Cleared on pages. 42–43. Table 6 has been corrected: the contradictory text has been removed from Column 2, which is now left blank where further screening or management may be required, while Column 3 identifies the potential risks and corresponding measures. This conservative approach is acceptable because the exact sensor deployment sites have not yet been identified. Section G confirms that all sites will undergo site-specific environmental and social screening under the project's USP management procedure, with an Environmental and Social Management Framework to be developed during the PFG phase. The approach is consistent with the project's Category B classification and allows principles for which no impacts are currently anticipated, including Indigenous Peoples and Involuntary Resettlement, to be confirmed through subsequent site-specific screening.

CAR15: Cleared on page 26.

The justification has been relocated to the Adaptation Fund's own framework. The concept note now states that environmental and social risks "have been assessed as limited, site-specific and readily mitigable, and the project has been classified as Category B (moderate risk) under Adaptation Fund's updated Environmental and Social Policy (ESP)." The UNIDO ESSPP framing that previously carried the classification has been removed from that passage, and the reference to UNIDO at page 26 is now confined to its role as Implementing Entity conducting the environmental and social screening during project preparation, which is the correct division.

Resource Availability

Is the requested project funding within the parameters for large grants set by the Board?

Response: Not Cleared

Secretariat: Yes, however some clarification is needed.

CAR17: Component 3 (Capacity Building and Stakeholder Engagement) is budgeted at \$587,260 in the component table, but the corresponding output-level allocations in the results framework sum to only \$487,260. Kindly reconcile.

(March 6, 2026)

Response: Not Cleared

Secretariat: CAR17: Not cleared

The reconciliation has been resolved; the output-level allocations under Component 3 now sum to USD 587,260, matching the Component 3 budget in Table 1.

However, this correction has introduced a new discrepancy in the Results Framework. Summing all output-level grant amounts currently listed in Section F totals USD 4,487,260, whereas the table's stated "Total output level grant amount" reads USD 4,387,260 (pg 50) a difference of USD 100,000, consistent with the amount by which the Component 3 allocation was revised upward. Please update the stated total to reconcile with the sum of the individual output-level figures.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CAR17: Cleared, page 48

The discrepancy has been corrected in the revised version. The stated "Total output level grant amount" now reads USD 4,487,260, matching the sum of the individual output-level figures.

Is the Implementing Entity Management Fee at or below 8.5 per cent of the total project budget before the fee? Are the Project/Programme Execution Costs at or below 9.5 per cent of the total project/programme budget (including the fee)? For regional projects/programmes, are the administrative costs (Implementing Entity Management Fee and Project/ Programme Execution Costs) at or below 10 per cent of the project/programme for implementing entity (IE) fees and at or below 10 per cent of the project/programme cost for the execution costs?

Response: Not Cleared

Secretariat: No.

IE Management Fee - 7.8%, EE- 2.4%.

CAR18: The proposal states in Part III Section A that UNIDO serves as the Implementing Entity and that DCCE is the primary Executing Entity. However, it also states that "UNIDO will undertake limited execution functions only where specifically justified, focusing on specialized technical support, capacity development, and knowledge dissemination." Furthermore, the component table assigns execution responsibility directly to UNIDO for the two largest components, Component 1 Sensor Deployment (\$1,700,000) is marked "(UNIDO)" and Component 2 Platform Development (\$2,200,000) is marked "(UNIDO)" while only Component 3 Capacity Building (\$587,260) is marked "(DCCE)." This would cap the EE fee at 1.5%.

(March 6, 2026)

CAR19:

1. Please address the following on the PFG: The stakeholder consultation description states it will involve "local communities and indigenous populations," yet the concept note's ESP checklist stated no indigenous peoples

impacts were anticipated this inconsistency should be reconciled.

2. The IE support costs of \$11,751 represent 7.8% of the total PFG, while this is within acceptable limits, the description ("admin and technical support for project development, monitoring and supervision") overlaps with the monitoring mission already budgeted at \$12,506 under Output 2. What distinct functions do the IE support costs cover beyond the monitoring mission?

3. The concept note identified several studies to be conducted during the PFG phase, (including the PV developer business case, the exit strategy, and the detailed technology feasibility assessment) yet the PFG budget does not include explicit line items for business case development, sustainability and exit strategy formulation

Response: Not Cleared

Secretariat: CAR18: Cleared in Annex D.

Annex D, a formal letter from MNRE (28 April 2026, co-validated by DCCE), confirms and justifies UNIDO's execution role under Components 1 and 2 on technical grounds, confirms DCCE retains the central coordinating role, and confirms UNIDO's execution costs remain within the limits of activities it directly executes.

CAR19: Not Cleared

The budget note for IE Support Costs now clarifies that "the monitoring function has been removed" and that these costs instead cover administrative, procurement, financial, and technical support services, distinct from the monitoring mission budgeted under Output 2. However, the "Output of the PFG Activities" column for this same budget line has not been updated to match, it still reads "IE admin and technical support for the project development, monitoring and supervision." Kindly revise.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CAR19: Cleared

The "Output of the PFG Activities" column has been revised for the IE Support Costs line. It now reads "IE admin and technical support for the project development and supervision," with "Compliance assurance" added beneath. The word "monitoring" has been removed, so the column is consistent with the budget note for the same row, which states that the monitoring function has been removed and that the PFG IE Fee covers administrative, procurement, financial and technical support services.

Response: Not Cleared

Secretariat: CAR20 (New): PFG application, page 2. The Output 2 budget lines—USD 14,743, USD 8,000 and USD 12,506—total USD 35,249, rather than the stated USD 34,250. This results in an overall total of USD 150,999. Please correct the relevant line item(s) so that Output 2 totals USD 34,250 and the overall PFG request remains USD 150,000.

Response: Not Cleared

IE:

Response: Cleared

Secretariat: CAR29 (New): Cleared (PFG form).

Eligibility of IE

Is the project submitted through an Implementing Entity accredited by the Board?

Response: Not Cleared

Secretariat: Accreditation Expiration Date: 30 November 2025
(March 6, 2026)

Response: Cleared

Secretariat: Accreditation Expiration Date: 30 October 2027

Funding Proposal Template

Application Template for Fully-Developed Proposal and Project Concept Proposal¹



ADAPTATION FUND

PROGRAMME ON INNOVATION: LARGE GRANTS PROJECTS

REQUEST FOR PROJECT FUNDING FROM THE ADAPTATION FUND

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project must be fully prepared when the request is submitted.

Complete documentation should be sent to:

The Adaptation Fund Board Secretariat
1818 H Street NW
MSN N7-700
Washington, D.C., 20433
U.S.A
Fax: +1 (202) 522-3240/5
Email: afbsec@adaptation-fund.org

¹ Single Country and Regional Concept proposals should complete Part I and Part II of the Project Proposal Template.



ADAPTATION FUND

SINGLE COUNTRY/ REGIONAL INNOVATION PROJECT/PROGRAMME PROPOSAL

PART I: PROJECT/PROGRAMME INFORMATION

Title of Project/Programme: Microclimate–Energy Nexus Platform for Climate Adaptation in Remote Areas in Thailand

Countries: Thailand

Thematic Focal Area²: Disaster risk reduction and early warning systems

Type of Implementing Entity: Multilateral Implementing Entity

Implementing Entity: United Nations Industrial Development Organization (UNIDO)

Executing Entities: Department of Climate Change and Environment (DCCE), Ministry of Natural Resources and Environment, with United Nations Industrial Development Organization (UNIDO)

Amount of Financing Requested: USD 5,000,000

² Thematic areas are: Food security; Disaster risk reduction and early warning systems; Transboundary water management; Innovation in adaptation finance.

Project/Programme Background and Context:

Short Summary of the Project

Thailand faces increasing climate risks, including heat stress, droughts, and extreme rainfall events. Vulnerable communities in remote areas often lack access to timely and localised weather information, limiting their ability to prepare for and respond to climate impacts.

The Thai Meteorological Department (TMD) operates approximately 100 weather stations nationwide, which is insufficient for high-resolution forecasting and early warning systems. Additionally, Thailand's national risk maps are based on low-resolution and outdated data from 2020, limiting their utility for local adaptation planning.

This project proposes the deployment of microclimate sensors integrated with public-sector solar infrastructure in remote and vulnerable areas of Nakhon Ratchasima province. This initiative deploys a distributed network of climate sensors as the primary AF-financed adaptation infrastructure, co-located on existing public-sector solar PV assets (Tessaban, SAO and PAO installations already financed under the Provincial Governor budget and the Ministry of Energy fund) that serve only as physical host infrastructure. By leveraging this existing solar baseline as a mounting platform rather than constructing dedicated towers the project ensures uninterrupted monitoring and data transmission during climate shocks, safeguards the continuity of adaptation functions such as Early Warning Systems integrated with Thailand's MHEWS, and reduces the vulnerability of community-level adaptation services to climate-induced disruptions. The PV assets themselves are not financed, deployed or optimised under the AF investment; any benefits accruing to renewable-energy operation are treated as incidental co-benefits outside the project's results framework, while AF financing is ring-fenced strictly to the climate adaptation infrastructure (sensors, data platform, MHEWS integration, community capacity building) consistent with the AF's adaptation mandate and public-good principles. These sensors will feed into a cloud-based national climate data platform that will be institutionally anchored under the Climate Change Information Center (CCIC) of the Department of Climate Change and Environment (DCCE) Thailand's Designated Authority for the Adaptation Fund and the Ministry of Natural Resources and Environment (MoNRE) entity mandated to host national climate data as a public good. The platform supports AI-driven forecasting, risk mapping and climate resilience planning, with standards-based interoperability with MHEWS, the Thai Meteorological Department (TMD) national observation network and sectoral ministerial dashboards, ensuring that climate data and Early Warning Services are distributed free of charge to all users communities, ministries, sectoral agencies, provincial and local governments, academia, civil society and the public. The platform will be hosted in Thailand and developed with technical support from Malaysian experts under a South–South cooperation modality, adapting and innovating a proven Malaysian solar-monitoring application into a Thai climate adaptation data platform under DCCE/CCIC stewardship.

The AF investment is limited to climate adaptation infrastructure, including sensors, data systems, forecasting, MHEWS integration and community capacity-building. Existing public-sector solar PV assets are used only as host infrastructure for sensor co-location and are not financed, expanded or optimised by the project. Any renewable energy, PV yield, property development or commercial co-benefits are incidental externalities that are not measured by project indicators and do not drive any project decision. The "business case and project exit strategy" referenced during the PFG stage focuses exclusively on the institutional handover to DCCE/CCIC, the recurrent-cost absorption model by Thai public budget lines, and the replication pathway under DCCE leadership.

Climate hazards and future climate trends

Thailand is among the 16 countries globally identified as being in the “extreme risk” category for climate change impacts over the next three decades, according to [UNDP](#) and the country's updated Nationally Determined Contribution ([NDC](#)). The country faces a future of more intense droughts and floods driven by a strengthened hydrological cycle and increased surface drying. These extremes are projected to directly undermine the agricultural sector, which remains the backbone of rural livelihoods and a significant driver of exports. Vulnerable households are expected to be most severely affected as precipitation becomes increasingly erratic, with more frequent intense rainfall events and prolonged dry periods. In recognition of these risks, Thailand's [National Adaptation Plan](#) (2024) places climate-informed water management and climate-resilient infrastructure as central priorities for building resilience.

Several recent droughts have already highlighted the fragility of Thailand's economy. As the [UK Centre for Ecology and Hydrology](#) notes, water shortages have disrupted food supplies, energy generation, and economic productivity. Agriculture, which employs roughly one-third of the labour force, is especially exposed.

Yet despite progress in drought monitoring, gaps remain in linking hydrometeorological data to real-world agricultural impacts. The lack of consistent datasets and stakeholder-informed impacts assessments limits the ability of farmers and water managers to translate forecasts into action. Closing this gap will be essential to improving preparedness, resilience, and livelihood security.

Long-term data confirm these trends. Research by the [Thailand Development Research Institute Foundation](#) shows that between 1951 and 2005, the frequency of severe droughts more than doubled, with a sharp increase in the mid-1970s due to surface warming. At the same time, the frequency of wet spells decreased by 2.5% per year, while the combined frequency of droughts and wet spells rose by 2% annually. Such volatility points to a future of increasingly frequent and damaging extremes. The catastrophic 2011 floods serve as a stark reminder of these risks: with damages estimated by the World Bank at USD 47 billion (equivalent to 13% of Thailand's GDP) the disaster revealed both the destructive power of extreme rainfall and the country's institutional weaknesses in water management. While large-scale floodways and reservoirs have often been favoured as solutions, experts caution that fragmented and centralised governance has hampered efficient and adaptive responses.

Further, monsoon storms frequently trigger flash floods that devastate local communities, and the country remains among the ten most flood-prone countries in the world. In the Sai-Ruak River Basin, heavy seasonal rainfall causes rapid river overflow, sending torrents of water, rocks, and debris downstream. These flash floods often result in landslides, destruction of homes and infrastructure, and loss of livelihoods. The 2021 floods in Mae Sai District, for instance, caused widespread damage to markets and residential areas, resulting in losses estimated at around half a million U.S. dollars. Studies by the [Stockholm Environment Institute](#) (SEI) and Mae Fah Luang University have shown that existing early warning systems in the region, designed to alert communities before flooding, have struggled to provide adequate lead time. In several recent events, warning sirens sounded only after river levels had risen sharply, leaving little opportunity for evacuation or asset protection. Many municipalities, including Mae Sai, face difficulties in forecasting floods accurately because they lack real-time data and hydrological modelling tools. National agencies such as the Thai Meteorological Department and the Department of Water Resources provide rainfall and river monitoring data, but these are often too broad or delayed to support rapid, community-level decision-making. Furthermore, upstream data gaps in transboundary areas limit the accuracy of predictions for downstream settlements in Thailand.

The human impact of these climate extremes is equally severe. In provinces like Nakhon Sawan, where the Yom and Nan rivers converge, floods and droughts have shaped daily life for generations. When water is scarce, crops fail, incomes collapse, and many farmers are forced to migrate to urban areas such as Phitsanulok or Sukhothai to seek temporary work, often in construction. These seasonal migrations strain household economies and fracture families, demonstrating how climate hazards ripple far beyond physical damage to reshape social and economic dynamics. Further,

The scale of losses from storms, droughts, and floods underscores the urgency of action. According to Thailand's [National Adaptation Plan](#), storms damaged nearly 1,179 km² of agricultural land in 2022, drought affected 2,848 km² in 2020, and floods inundated more than 9,120 km² in 2021, destroying an additional 3,341 km² of farmland. Between 2011 and 2019 alone, economic damages amounted to USD 17.5 million from storms, USD 119.4 million from drought, and USD 23.7 million from floods. These events not only jeopardise food security but also undermine livelihoods, housing, and critical infrastructure.

Additionally, resilience of the energy system to climate shocks is an issue that requires further analysis and should be addressed / included in planning of the future energy system.

Together, these findings from national and international institutions point to a clear conclusion: Thailand is facing a future of intensifying climate extremes that threaten its agricultural base, economic stability, and community well-being.

A critical barrier to effective adaptation across Thailand is the lack of localised, high-resolution, and real-time climate and hydrometeorological data, according to the Thai Meteorological Department (TMD). Existing systems are too sparse and fragmented to capture the microclimatic variations that drive floods, droughts, and heat extremes at the community level. Without improved data infrastructure, predictive analytics, and integrated modelling, national and local institutions will remain constrained in their ability to provide timely early warnings, plan resilient infrastructure, and protect vulnerable populations. Addressing this foundational data gap is therefore central to strengthening Thailand's climate resilience and achieving the priorities outlined in its National Adaptation Plan.

Project Area

Nakhon Ratchasima Province, also known as Khorat, is a critical hub for Thailand's economy and food security. The province has a strong dependence on agriculture and is recognised as a major processing centre for rice, tapioca, and sugar production from the Isan region, which contributes nearly half of Thailand's total exports of these commodities. Beyond agriculture, Nakhon Ratchasima also plays an industrial role, housing significant manufacturing facilities such as Seagate Technology's hard disk production site. However, this economic importance is increasingly threatened by climate risks.³

Overall Climate Vulnerability and Hazard Trends

Nakhon Ratchasima is facing accelerating climate-related risks that affect both people and the economy. The province has experienced a clear rise in extreme events such as droughts, floods, windstorms and heatwaves over the past decade. In 2019, a severe drought affected 473,975 households, directly limiting water availability for domestic and agricultural use. In 2020, the province recorded 135 flood events, impacting 105,356 households and damaging lives, property and livelihoods. Between 2012 and 2021, both flood and drought events increased in frequency and severity. Windstorms are another growing hazard, with 339 reported events in 2020 alone, posing risks to settlements and infrastructure. Climate projections indicate a continued upward trend in maximum and minimum temperatures and a decline in rainfall, leading to prolonged dry spells, heavier storms and greater variability. The province has one of Thailand's highest historical heat hazard scores at 0.49, which is projected to increase to 0.55 in 2016–2035, 0.61 in 2046–2065 and 0.65 by 2081–2099 according to the [Centre for Climate Change and Environment](#).

Water Resources and Groundwater Risks

Water availability and quality are major concerns for both households and agriculture. Current annual water storage stands at 4.07 cubic meters per person, which is considered adequate for now; however, rising temperatures and anticipated demand growth are expected to strain supplies. Groundwater salinity is already a pressing problem, with several areas reporting contamination levels that render water unfit for consumption and key risks to this sector include disruptions to domestic water supplies and declining groundwater quality due to contamination and salinity. Flash floods have also been contributing to water system instability and damage to water infrastructure. Without intervention, these trends will undermine both public health and economic stability.

Agriculture and Food Security

Agriculture in Nakhon Ratchasima is both highly productive and highly vulnerable. Yet shifting climatic patterns and recurrent disasters have eroded productivity. In 2018, drought damaged approximately 900,936 rai (144,150 hectares) of farmland. The most affected districts Non Sung, Thepharak, Pak Thong Chai, Mueang Nakhon Ratchasima, Sikhio, Sung Noen, Prathai and Sida - are also the ones classified as high-risk for droughts. Although the area of affected land has declined since 2018, agricultural yields continue to drop due to rising temperatures, unpredictable rainfall and plant diseases. Current water storage for agriculture is only 235.33 cubic meters per rai, placing the province within the water scarcity range (0–250 m³/rai).

Economic Importance and Sectoral Impacts

The economic importance of Nakhon Ratchasima extends far beyond agriculture into other areas which are increasingly threatened by climate shocks, which disrupt supply chains, damage infrastructure and reduce productivity. Tourism has also suffered climate-related declines. Between 2013 and 2022, the province experienced a drop in visitors and overnight stays, resulting in lower tourism revenue. Heatwaves and more frequent flooding have been identified as major contributors to this downward trend. In the human settlements and security sector, climate hazards threaten livelihoods, homes and public assets, disrupting local economies and slowing development.

Public Health Impacts

Climate change is also directly affecting health outcomes in Nakhon Ratchasima. The province has faced recurring outbreaks of food-borne and water-borne diseases driven by higher temperatures and water contamination. Although the public health system has implemented Multi-hazard Early Warning Systems that have reduced some outbreaks, risks remain high. Vector-borne diseases linked to changing temperatures and humidity patterns are also a concern. Heat-related illnesses are on the rise: reported heatstroke cases

³ All relevant statistics and information in this section are provided by the Thailand Greenhouse Gas Management Organisation (TGO)

increased from six in 2022 to nine in 2023 and are expected to grow as climate conditions worsen. The principal risk identified in the public health sector is the loss of life and property due to health-related climate impacts.

Ecosystems, Conservation and Wildlife Conflict

While Nakhon Ratchasima has made progress in forest restoration and conservation through protected areas, reclamation projects and ecotourism initiatives, climate change is disrupting ecological balance. Rising temperatures and flash floods are degrading habitats and food sources for wildlife. As a result, elephants, wild boars and other animals are increasingly leaving forests in search of food during the dry season. Incidents have been reported particularly in Khon Buri, Soeng Sang, Pak Chong and Wang Nam Khiao districts, with wildlife entering agricultural lands between January and March each year. In 2018, there were seven recorded wildlife intrusion incidents affecting 36 households. The key climate risk in the natural resource management sector is the loss of ecosystem diversity and increased human-wildlife conflict.

Urban Settlements, Infrastructure and Livelihood Security

Rising temperatures, windstorms, floods and droughts are increasingly affecting human settlements and local economies. The frequency and severity of these hazards threaten housing, small businesses and public and private assets. Climate-related damage impacts livelihoods, displaces residents and places pressure on local authorities to rebuild and respond. The disruption of critical infrastructure, including roads, electricity and water systems, could further limit resilience and recovery.

Emissions Profile and Mitigation Potential

Nakhon Ratchasima is also a major emitter of greenhouse gases (GHG). In 2019, it released 7.95 million tonnes of CO₂ equivalent, ranking seventh among Thai provinces, while only 1.95 million tCO₂eq was absorbed. Without intervention, emissions could exceed 9 million tCO₂eq by 2030. However, mitigation actions have the potential to reduce this by more than 2.26 million tCO₂eq according to the [Centre for Climate Change and Environment](#). This dual challenge of high emissions alongside high vulnerability highlights the need for integrated adaptation and mitigation solutions.

And as such Nakhon Ratchasima sits at the intersection of high climate risk, economic importance and sector-wide vulnerability. It is central to Thailand's agricultural exports, manufacturing supply chains, rural livelihoods and ecosystem services. The province faces mounting threats across water resources, food security, public health, infrastructure and biodiversity, with clear evidence that current coping measures are insufficient. Rising temperatures, declining rainfall and increasing disaster intensity will only deepen existing challenges. Targeted intervention in this province will deliver outsized benefits by protecting national food systems, safeguarding critical infrastructure, enhancing public health resilience and securing livelihoods across rural and urban areas. For these reasons, Nakhon Ratchasima is a priority location for this project.

Target Groups

Farmers and agricultural workers represent one of the most climate-vulnerable populations in Thailand, and this is particularly evident in Nakhon Ratchasima Province, a region deeply reliant on agriculture for livelihoods and income⁴. The province is a leading producer of rice, cassava, maize, and sugarcane, all of which are highly sensitive to temperature fluctuations, rainfall variability, and water scarcity. Climate change directly threatens the productivity and stability of these farming systems, placing smallholder farmers at increasing risk of income loss and food insecurity.

National climate data from the Thai Meteorological Department shows that the mean temperature in Thailand increased by an average of 0.09°C per year from 2011 to 2021, with annual means reaching 28.0°C in 2020 and 27.5°C in 2021. The number of days when the heat index exceeded 35°C has risen dramatically from just 1.9 days in 1950 to nearly 50 days in 2020, signalling a steady intensification of heat stress conditions. For farmers, these rising temperatures accelerate crop water loss, reduce yields, and increase risks of heat-related stress on both crops and livestock.⁵

At the same time, rainfall patterns have become highly erratic. Over the past seven years (2015–2021), Thailand has experienced significant oscillations in total precipitation, including the lowest rainfall in four decades recorded in 2019 (1,343 mm). Such irregular rainfall undermines the reliability of planting cycles, reduces soil moisture, and increases dependence on irrigation. This variability is compounded by climate

⁴ See publication <https://www.sciencedirect.com/science/article/pii/S2949911924000443>

⁵ All relevant statistics and information in this section are from the [Climate Change Action Plan for the Agricultural Sector](#)

phenomena such as El Niño–Southern Oscillation (ENSO), which has seen sea surface temperatures steadily rising above normal since the early 1980s further amplifying drought and flood risks.

The consequences of these climatic shifts are already evident in Thailand’s agricultural economy. Studies by Attavanich (2017) estimate that the cumulative economic damage from climate change impacts on agriculture between 2011/2012 and 2050 could range from USD 17.5 billion to USD 83.8 billion, depending on the emission scenario. At the household level, Attavanich et al. (2019) project that farm productivity could decline by 10% under moderate (RCP4.5) and 11.5% under high-emission (RCP8.5) scenarios, affecting nearly all farm households nationwide.

The growing financial burden on the state underscores the scale of vulnerability. Between 2008 and 2021, the Thai government provided an average of 8.18 billion THB per year in agricultural disaster relief, with the largest payments recorded in 2010 and 2011 due to widespread flooding and drought. Floods account for the majority of agricultural damage, followed by intermittent rain and drought events, which primarily affect crops but also impact fisheries and livestock.

For farming communities in Nakhon Ratchasima, these climate impacts translate into increasingly unstable livelihoods. Unpredictable rainfall disrupts planting decisions, heat waves reduce yields, and repeated floods or droughts degrade soil quality. Smallholder farmers, who rely heavily on seasonal rainfall and lack access to real-time climate information, are often unable to prepare for or respond effectively to such conditions. This limited adaptive capacity makes them especially vulnerable to both immediate shocks and long-term climate trends.

Within this group, women farmers and female-headed households face compounded vulnerabilities due to gendered constraints in access to land, credit, extension services, and climate information. Evidence indicates that women are less likely to receive timely early warning information and technical training, despite playing central roles in agricultural production and household risk management⁶. The project will therefore adopt a gender-responsive targeting approach, ensuring that women and other marginalised groups are explicitly prioritised in outreach, training, and access to climate services.

By targeting farmers and agricultural workers, this project addresses the population most at risk from climate change while directly supporting those who form the foundation of Thailand’s food production system. According to recent labour force data for Nakhon Ratchasima Province (Quarter 3, 2025), approximately 189,314 individuals—representing nearly 40% of the working-age population—are engaged in agriculture, forestry, and fisheries, confirming the sector’s central role in local livelihoods and climate vulnerability. Women account for approximately 41% of this workforce, highlighting the importance of gender-responsive targeting.

Based on this population baseline and the phased geographic focus of the project, it is estimated that approximately 80,000–120,000 individuals covered Mueang Nakhon Ratchasima, Pak Chong, Chok Chai within Nakhon Ratchasima Province in high-risk sub-districts will directly benefit from project interventions, including farmers, agricultural workers, and community stakeholders engaged in climate-sensitive livelihoods. Of these, at least 40–45% are expected to be women, consistent with sectoral labour composition. Vulnerable groups include female-headed households, elderly farmers, informal workers, and persons with disabilities.

Indirect beneficiaries are estimated at approximately 1,500,000–2,000,000 individuals across the province, including households benefiting from improved early warning systems, local authorities using enhanced climate data, and communities benefiting from reduced climate-related risks. These estimates will be further refined during the project preparation phase.

The detailed will be developed during the PFG phase through structured field studies and community surveys, in coordination with DCCE, the Provincial Working Group on Climate Change, the Office of the Governor of Nakhon Ratchasima and the relevant District Chief Officers. The disaggregated beneficiary baseline will be annexed to the full proposal and embedded in the project Results Framework and Gender Action Plan.

Short introduction of the proposed project interventions

Nakhon Ratchasima Province faces growing climate risks driven by increasing temperature extremes, erratic rainfall patterns, and recurrent droughts and floods. These hazards undermine agricultural productivity, water

⁶ Food and Agriculture Organization (FAO). (2011). The state of food and agriculture 2010–2011: Women in agriculture: Closing the gender gap for development. <https://www.fao.org/3/i2050e/i2050e.pdf>

security, and public health, particularly in rural and peri-urban communities where livelihoods depend heavily on climate-sensitive sectors. Despite national efforts to strengthen climate adaptation, local resilience remains limited by insufficient microclimate data, weak early warning systems, and gaps in institutional capacity to translate climate information into timely and practical action. To bridge these gaps, the project will deploy compact weather sensors integrated with resilient power solutions (e.g., solar PV with battery backup) and redundant communications. These measures ensure that localised climate intelligence remains operational even during climate-induced grid failures, directly reducing vulnerability to energy resilience and enhancing adaptive capacity at the community level.

If Nakhon Ratchasima uses innovative technologies and practices to develop a decentralised, data-driven climate monitoring and forecasting system—deploying distributed weather sensors and ensuring energy-resilient continuity—that localises climate intelligence, and strengthens the capacity of local institutions and communities to interpret, apply, and iteratively refine this information through participatory learning, **Then** the province will be better able to anticipate and manage climate risks, empowering communities and institutions to (i) enhance adaptive capacity (e.g., through better on-farm decisions, water allocation, and preparedness), (ii) reduce exposure (e.g., via risk-aware land use and siting, infrastructure planning in hazard-prone areas), and (iii) reduce vulnerability (e.g., anticipatory action for droughts, floods, heat stress; continuity of essential services and local MHEWS)—ultimately generating evidence on scalable, locally led climate-information solutions

Because decisions in agriculture, water management, disaster preparedness, and local planning will be informed by accurate, real-time climate data, enhanced adaptive capacity, and a continuous learning process that supports replication in other vulnerable provinces.

The climate information generated will support practical adaptation decisions, including drought preparedness, irrigation scheduling, water allocation, heat-risk management, crop planning, anticipatory action and local adaptation planning.

Project/Programme Objectives:

The overarching objective of the project is: To strengthen Nakhon Ratchasima's (and Thailand's) resilience to droughts, floods, and heat stress by introducing innovative technologies and practices which will enhance local climate data systems, improve early warning and forecasting capabilities, and promote climate-informed planning and response across key sectors.

Specific Objectives:

1. **Enhanced Climate Data and Forecasting:** Use innovative tools and technologies to improve the collection, analysis, and dissemination of localised microclimate data to enable more spatially detailed and timely forecasting of droughts, floods, and heat events.
2. **Reduced Climate-Related Disruptions:** Minimise the adverse impacts of climate variability on agriculture, water supply, and local economies, particularly among vulnerable and low-income communities, through improved preparedness and adaptive management.
3. **Strengthened Institutional and Community Capacity:** Build national and local capacity for interpreting climate data and integrating climate information into decision-making processes for sustainable resource management and disaster risk reduction.

Project / Programme Components and Financing:

Table 1: Project / Programme Components and Financing

Project/ Programme Components	Expected Outcomes	Expected Outputs	Amount (US\$)
1. Sensor Deployment ⁷ (UNIDO)	Outcome 1.1: Improved accuracy of localised weather and climate risk monitoring. Outcome 1.2: Stronger early warning systems for	Output 1.1: Network of microclimate sensors and solar-powered weather stations installed in priority high-risk zones. Output 1.2: Operational data transmission system linked to national meteorological and disaster management platforms.	1,700,000 ⁸

⁷ Install microclimate sensors and solar-powered weather stations in remote areas, prioritising high-risk zones identified by DCCE and aligned with NAP sectoral priorities. The distributed sensor network is designed to address spatial gaps in existing observation coverage and capture localised climate variability that cannot be detected through the current national network.

⁸ Compared with conventional meteorological infrastructure, the distributed sensor approach provides a cost-effective way to generate high-resolution climate information for early warning and adaptation planning in vulnerable communities.

	floods, droughts, and heatwaves. Outcome 1.3: Enhanced decision-making for agriculture, water management, and disaster preparedness.	Output 1.3: Baseline data collection on temperature, rainfall, and humidity across remote regions.	
2. Platform Development ⁹ (UNIDO)	Outcome 2.1: Real-time climate intelligence available for national and local planning. Outcome 2.2: Faster and more coordinated response to climate-related shocks. Outcome 2.3: Institutionalised climate data governance and digital infrastructure. Outcome 2.4: AI-assisted forecasting models developed and calibrated using localised data	Output 2.1: Cloud-based national climate data platform with AI-enabled forecasting tools integrated with Thailand's existing Multi-hazard Early Warning Systems to enhance accuracy and timeliness of local alerts. Output 2.2: Integrated dashboards accessible to ministries and sectoral agencies that display real-time provincial and national forecasts, drawing on data shared with the MHEWS platform. Output 2.3: APIs enabling data interoperability with existing government systems, including DCCE's MHEWS and related disaster management platforms, ensuring seamless exchange of forecasts and alerts. Output 2.4: A network of microclimate weather sensors installed and operational across key zones, feeding high-resolution data into both the provincial platform and MHEWS to improve localized early warning capabilities.	2,200,000
3. Capacity Building & Stakeholder Engagement ¹⁰ (DCCE)	Outcome 3.1: Increased technical capacity for climate-informed planning at all levels. Outcome 3.2: Community ownership of monitoring systems leading to sustained use. Outcome 3.3: Stronger institutional collaboration around NAP implementation.	Output 3.1: Training modules and manuals for sensor maintenance and data interpretation. Output 3.2: Workshops delivered to government units and community focal points, with targeted quotas (minimum 40–50%) for women's participation and tailored training formats addressing gender-specific barriers (e.g., time constraints, literacy, digital access). Output 3.3: Established feedback and coordination mechanism between national and local actors. Output 3.4: Knowledge management covering knowledge product development, replication toolkit production, community materials, ASEAN outreach and the open-data portal. Under Output 3.4: indicatively USD 95,000–100,000 (≈ 17% of Component 3, ≈ 1.9% of total project). Final allocation to be confirmed at PFG stage.	587,260
4. Project components total			4,487,260
5. Project/Programme Execution Cost			121,035
6. Total Project/Programme Cost			4,608,295
7. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)			391,705
Amount of Financing Requested			5,000,000

Projected Calendar:

Project duration: 4 years (48 months)

⁹ Build a cloud-based data platform with AI forecasting tools, integrating with national systems and enabling real-time data access for water, health, and food security sectors.

¹⁰ Train local communities, DCCE staff, and relevant agencies on the use, maintenance, and climate-informed planning of data aligned with NAP goals.

Table 2: Project Calendar

Milestones	Expected Dates
Start of Project/Programme Implementation	January 2028
Mid-term Review (if planned)	June 2030
Project/Programme Closing	December 2031
Terminal Evaluation	February 2032

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Describe the project/programme components, particularly focusing on the concrete adaptation activities, how these activities would contribute to climate resilience, and how they would build added value through the regional approach, compared to implementing similar activities in each country individually. For the case of a programme, show how the combination of individual projects would contribute to the overall increase in resilience.

The proposed initiative will commence with a comprehensive preparatory phase designed to ensure local relevance and alignment with national adaptation priorities. Through engagements with the Department of Climate Change and Environment (DCCE), high-risk sub-districts in Nakhon Ratchasima will be identified, with a focus on those most vulnerable to drought, flooding, and agricultural stress. Detailed site assessments will guide the selection of locations for sensor deployment, such as farmlands, reservoirs, schools, and community centres where sites suitable for solar integration will be prioritised.

In parallel, a structured ‘innovation scouting’ process will be conducted to identify and document existing community-level adaptation practices, including informal weather prediction methods, water-sharing arrangements, crop diversification strategies, and local early warning practices. These grassroots innovations will be systematically assessed and integrated into project design, ensuring that the proposed technological solutions build upon, rather than replace, existing adaptive practices.

Given that final site selection will occur during implementation, the project will apply an Unidentified Sub-Projects (USP) approach in accordance with the Adaptation Fund Environmental and Social Policy. A USP screening and management framework will be established to ensure that all subsequently identified sites and activities comply with environmental, social, and gender safeguards. This framework will include:

- (i) standardized environmental and social screening procedures;
- (ii) exclusion criteria for high-risk activities or locations;
- (iii) site-specific risk assessment and mitigation measures;
- (iv) documentation and approval processes prior to deployment; and
- (v) monitoring and reporting mechanisms to ensure compliance throughout implementation.

At this stage, stakeholder consultations will be held with provincial authorities, local municipalities, farmer cooperatives, and academic institutions to strengthen ownership and ensure alignment with Thailand’s National Adaptation Plan (NAP) sectoral priorities in water, health, and food security. All necessary permits will be secured, and formal collaboration agreements will be established with community leaders to support long-term cooperation.

These consultations will be expanded into a structured co-design process involving diverse community-level actors, including farmer cooperatives, women’s groups, youth organisations, local health volunteers, informal sector workers, and representatives of vulnerable populations (e.g., older persons and persons with disabilities). Participatory methodologies—such as community mapping, seasonal calendars, problem-ranking exercises, and co-design workshops—will be used to ensure that community inputs actively shape system design, including sensor placement, data priorities, and service delivery mechanisms, rather than merely validating pre-defined technical solutions.

Following this groundwork, the project will advance to the deployment of climate monitoring infrastructure using PV installations. The use of PV installations is chosen for a few reasons:

- PV systems are and can be more widespread geographically than current monitoring systems and easily accessible for maintenance / adjustments of equipment
- Sensors for climate monitoring help in the forecasting for energy production from PVs

- Improved PV systems and other distributed energy systems can help with energy resilience against climate shocks.

Professional-grade weather stations meeting the IEC 61724-1 Class A international standard for PV performance monitoring will be co-located with a complementary meteorological sensor suite at each site. Together, the co-located instruments capture the full parameter set required for adaptation and MHEWS integration, namely: rainfall, air temperature and relative humidity, wind speed and direction, atmospheric pressure, global (and plane-of-array) solar radiation, PV panel temperature and, where relevant, soil moisture and water level. These units are Sunspec compliant and rely on Modbus (RS-485) communication. Each station is powered through a 24V DC system (10–30V range), with built-in surge and overcurrent protection. Where applicable, rooftop installations will be prioritised, including on existing solar structures or low-lying built environments, while ensuring that placement avoids thermal interference and shading. In most cases, installation and routine upkeep will be carried out by designated local technicians trained under the project. Each device will undergo calibration and testing against reference instruments to ensure data accuracy and reliability. Once operational, data will be transmitted via RS-485 to site-dependent dataloggers and linked to either a cloud server or a secure Network Attached Storage (NAS) system. Connectivity will be adapted to local conditions using GSM and/or LoRaWAN networks to ensure steady transmission in both urban and remote settings. This step will create the foundation for high-quality, real-time environmental monitoring in the province.

In parallel, the project will develop and operationalise a cloud-based data platform that aggregates the incoming sensor feeds. The platform will be configured to interface with existing national systems, including those managed by the Thai Meteorological Department and DCCE. The AI component will function as part of the platform's analytical engine, using incoming sensor readings to train predictive models that generate actionable insights such as short-term weather shifts, seasonal drought or flood projections, and application-specific outputs for agriculture, water planning, and insurance risk assessment.

Local knowledge will be systematically incorporated into AI model calibration and early warning design through: (i) participatory identification of locally relevant climate indicators (e.g., soil moisture conditions, crop stress signals, animal behaviour); (ii) community validation of model outputs and seasonal forecasts; and (iii) co-definition of warning thresholds to reflect local risk perceptions and livelihood sensitivities.

User-friendly dashboards and mobile applications will provide accessible data visualisations for technical agencies and local stakeholders. A pilot phase with DCCE staff, local institutions, and community representatives will be used to test usability and refine system functions before the platform is formally launched.

The systematic collection of high-resolution climate and weather data will primarily strengthen MHEWS and adaptive decision-making for vulnerable communities and institutions. These granular datasets can also support energy resilience by improving solar PV system planning and operational continuity during climate shocks. Reliable, localised data enhances PV operators' ability to anticipate adverse weather conditions and maintain critical energy services, which is essential for sustaining early warning platforms and community-level communications during extreme events.

PV assets themselves are not financed, deployed or optimised under the AF investment. Existing public sector solar PV assets (Tessaban, SAO, PAO installations already financed under the Provincial Governor budget and the Ministry of Energy fund) serve only as physical host infrastructure for sensor co-location, which lowers the total cost of adaptation delivery compared to constructing dedicated towers. Any incidental improvements in solar yield forecasting, PV site selection or renewable energy operation that may arise from the availability of public-good climate data are treated as incidental co-benefits outside the AF results framework, not measured by project indicators and not driving any project decision. This framing ensures that PV-related activities are strictly aligned with adaptation outcomes: continuity of essential services, resilience of the Early Warning System integrated with MHEWS, and reduced vulnerability to climate-induced disruptions of adaptation infrastructure.

Capacity building will be a central pillar of the initiative, distributing technical skills across every governance level so that community members are positioned as active technical partners, not passive information recipients. The programme trains Community Data Champions, Village Health Volunteers, Village Natural Resource and Environment Volunteers, farmer cooperatives, women's groups and youth networks, together with dedicated women's participation in technical training ensuring community members gain real technical skills rather than only application user awareness. Training is delivered by ERTC under DCCE and covers five core modules: (1) basic sensor usage; (2) reading the CCIC dashboard; (3) basic troubleshooting (checking connectivity, reporting issues); (4) understanding AI forecasts; and (5) translating climate data into

community action. In parallel, central institutional training is delivered to DCCE staff, TMD and provincial officials on sensor operation, calibration to NIMT/TMD standards, platform administration and MHEWS integration. Sex-, age- and disability-disaggregated participation targets including at least 40% women in technical training and 30% of service contracts reserved for women-led enterprises will be finalised in the Gender Action Plan at PFG stage. Training materials will be developed in Thai and tailored for different audiences to ensure inclusivity.

To complement these efforts, a structured community outreach and engagement programme will be implemented, using explicit non-digital coverage targets to ensure that populations without smartphones or mobile data are not left behind. 6 complementary non-digital channels will be deployed: (1) village public-address loudspeakers; (2) local community FM radio; (3) Village Health Volunteers door-to-door cascade; (4) printed public notices at temples, health stations, sub-district offices, markets and schools; (5) basic SMS alerts that work on any mobile phone without a data plan; and (6) monthly community meetings at sub-district level. The project commits to reaching at least 80% of the population in each pilot zone through at least one non-digital channel, and at least 90% of vulnerable households (elderly, persons with disabilities, women-headed and low-income households) through at least two non-digital channels for redundancy. Coverage will be verified through baseline, mid-term and terminal household surveys, disaggregated by sex, age, disability and income.

Coverage will be measured through baseline, mid-term and terminal household surveys, disaggregated by sex, age, disability and income. Feedback mechanisms — including hotlines, the Grievance Redress Mechanism and community validation sessions will ensure that community experiences inform iterative improvements to the system.

The project will conclude with a focus on monitoring, evaluation, and sustainability. Regular performance reviews will be undertaken to assess data quality, platform functionality, and the extent of stakeholder uptake. To ensure long-term continuity, local maintenance teams will be established, comprising trained technicians and provincial staff capable of managing equipment and data systems independently. Sustainability is anchored on absorption of recurrent costs by Thai public budget lines (TMD, DCCE/CCIC/ERTC, the Provincial Governor and PAO/SAO/Tessaban), which cover the estimated USD 145,000–170,000 annual recurrent cost of the 205-station network. Private-sector contributions are not required for sustainability; where relevant, non-monetary in-kind support may be provided by public-sector host institutions (Tessaban, SAO, PAO) that host sensors on their existing solar PV assets. The experience and lessons generated from the Nakhon Ratchasima pilot will serve as a model for scaling up across other vulnerable provinces.

All PV-related activities under this project are strictly limited to using existing public-sector solar PV assets as physical host infrastructure for sensor co-location, and are designed exclusively to serve adaptation objectives namely, the continuity and reliability of climate observation, Early Warning Services and MHEWS-integrated data flows. The AF investment does not finance, deploy, expand, operate or optimise PV systems, any incidental contributions to renewable energy operation, solar yield improvement or commercial benefits are treated as co-benefit of the project's result framework. Further technology feasibility assessments will also be conducted during the PFG phase.

B. Describe how the project /programme would promote new and innovative solutions to climate change adaptation, such as new approaches, technologies and mechanisms.

This project advances climate adaptation through the combined use of large-scale microclimate data collection and AI-driven forecasting, an approach not yet deployed in Thailand at this scale or level of integration. In addition to technological innovation, the project adopts a co-production approach to innovation, integrating scientific and local knowledge systems. This includes the incorporation of farmer observations, seasonal indicators, and traditional forecasting practices into model development, ensuring that innovation is contextually grounded and socially embedded.

First, while sensors and weather stations are well-established technologies, the innovation lies in how they will be deployed, powered and integrated—coupling microclimate monitoring with energy resilience. The project will install a dense network of microclimate sensors across an entire province and connect them to existing or new solar-powered infrastructure as decentralised PV-backed systems. This infrastructure ensures uninterrupted data flow and advisory services during extreme events—a critical adaptation function often overlooked in conventional early warning architectures. Furthermore, it enables continuous, low-cost data collection in remote and underserved areas where national meteorological coverage is currently limited. This is already being carried out in other countries (such as Malaysia) but not in Thailand.

Second, the project will introduce AI-based forecasting models trained on ultra-local datasets. These models go beyond traditional hydrometeorological systems by improving resolution, predictive capacity, and sectoral relevance. This approach will generate tailored insights for agriculture, water management, disaster preparedness, public health, and local planning, areas where current national systems operate at a coarser spatial and temporal scale.

The project design incorporates structured iteration cycles during the pilot phase. Early sensor data and user feedback from communities and sector stakeholders will be systematically integrated into model refinement, interface design, and deployment strategies. This includes predefined review points at which model performance, usability, and relevance will be assessed, enabling adjustments to data inputs, algorithm calibration, and service delivery mechanisms. These adaptive checkpoints ensure that the system can pivot based on operational learning, improving accuracy, usability, and impact over time.

Such parties include solar contractors, solar project developers and local governments. Platforms have to be designed to be user friendly graphic user interfaces, have its source code readily available and have the necessary videos and documentation to allow for easy integration by multiple hardware makers as well. Lessons from engagements with hardware and software teams will improve the planning and scope of the platform which will be critical for multi-country adoption. The design and architecture of the platform with its technology stack has to be well defined for localized storage instead of a cloud server architecture. Early data will provide the necessary testing and quality assurance base cases.

Third, the project differs from existing adaptation or hydrometeorological initiatives in Thailand in two key ways:

- Scale and localisation of data: Rather than piloting small numbers of stations or relying on satellite data, the project focuses on province-wide sensor deployment to build a granular dataset specific to high-risk areas.
- AI-enabled decision support: Unlike earlier projects focused on capacity building or general early warning, this initiative integrates proprietary predictive models designed to generate actionable outputs for local communities and subnational authorities.

Systematically collecting high-resolution weather data and integrating sensor data with national systems creates a cost-effective, scalable model that strengthens climate resilience. The forecasting platform will use a hybrid model approach: core AI algorithms will be non-proprietary in their public-good use, fully accessible to the Thai public sector under perpetual royalty-free terms (for adapted Malaysian components) and released under open-source licences for newly developed components to ensure system performance and future scalability, while the data dashboards and user interfaces can incorporate open-source components where appropriate to enable wider government uptake. In several Asian countries, subnational monitoring networks have demonstrated improvements in localised forecasting and agricultural advisories. However, none have combined large-scale sensor deployment with AI-enabled prediction models as proposed here.

By linking field-level data, sectoral applications, and AI analytics, this project introduces a replicable and forward-looking model for climate risk management in Thailand and the ASEAN region. The project connects with the weather and Multi-hazard Early Warning Systems (MHEWS) platforms of relevant agencies such as the Thai Meteorological Department ([TMD](#)), Hydro – Informatics Institute ([HII](#)), and Department of Disaster Prevention and Mitigation ([DDPM](#)).

To address gender gaps in the climate technology sector, the project will actively promote women-led innovation and entrepreneurship as a core component of its innovation model. This includes establishing pathways for women to participate as developers, service providers, and entrepreneurs within the climate information ecosystem. Targeted measures will include: (i) dedicated training programmes for women in digital climate services, sensor maintenance, and data analytics; (ii) mentorship and incubation support for women-led enterprises developing climate-related solutions; and (iii) facilitation of market linkages for women entrepreneurs to deliver climate advisory services, early warning dissemination, and data-driven agricultural support.

During the Full Proposal (FP) stage, the project will be designed to operate as a living, evidence-driven adaptation platform through four interlocking innovation mechanisms: (i) co-design with target communities that links community feedback directly to system design choices rather than treating consultation as one-off outreach; (ii) local-knowledge-to-AI-calibration loops through which community observations inform the AI forecasting models hosted under DCCE's CCIC; (iii) structured iteration cycles with predefined review points

for evidence-based course-correction; and (iv) an innovation scouting process that integrates emerging South–South adaptation technologies, exemplified by the Malaysia–Thailand technology transfer.

During the PFG phase, evidence from comparable pilots in Malaysia and other relevant contexts will be validated in the Thai context to define go/no-go criteria for scaling, including forecast accuracy, user uptake, gender-inclusive access, institutional absorption and sustainability.

C. Describe how the project/programme aims to roll out successful innovative adaptation practices, tools, and technologies and/or describe how the project aims to scale up viable innovative adaptation practices, tools, and technologies.

The project builds on similar experiences in relevant geographies such as the following:

- **Malaysia (Kelantan River Basin & Selangor):** Intense monitoring of monsoon rainfall, intensity, and duration is used to feed radar-based quantitative precipitation estimation (QPE) and hydrodynamic models. In Selangor, IoT sensors and microclimate stations (measuring rainfall, humidity, temperature, and water levels) have improved flash flood prediction in urban environments.
- **Indonesia (Jakarta & Java):** The use of in-situ IoT (Internet of Things) water level sensors and local weather stations has proven critical for tracking fast-rising flash floods. A micro-scale study in the Cilincing sub-district of Jakarta demonstrated that using local, real-time data from "orange and blue troop" patrols (who monitor waterway levels and waste) significantly improves flood response.
- **Philippines (Marikina River, San-Mateo):** A KolCA-funded initiative has established a test bed for an AI-based flood prediction model, which uses localized upstream water level gauges and rain stations to enhance flood warnings.

The evidence base for microclimate-driven AI forecasting is well documented in the peer-reviewed literature and in industry deployment. Peer-reviewed studies confirm that urban microclimate variability alone can drive 2–14% differences in building cooling energy demand and up to 11°C in local temperature differences within a single city¹. NREL research demonstrates that machine-learning site-specific weather forecasting, validated in the Denver metro area, achieves a 1-hour-ahead temperature forecast with mean absolute error below 0.72°C and a 48% improvement over the persistence method². Peer-reviewed research in Nature Scientific Reports confirms the value of microclimate data for precision agriculture, including irrigation optimisation, windbreak placement and pest/disease prevention³. At industry scale, Microsoft's DeepMC framework demonstrates that micro-climate AI prediction achieves over 90% accuracy at IoT sensor locations deployed globally⁴, confirming that the approach is scalable and viable at production level. The Malaysia, Indonesia and Philippines pilots additionally demonstrate operational deployment of IoT/microclimate sensor networks in tropical monsoon contexts. UNIDO also acknowledges the sustainability concerns raised by SEDA Malaysia (3G-connectivity reliance and discontinued data collection from original FIT sites) and has translated these into design mitigations: use of GSM/4G/5G/LoRaWAN redundant connectivity, sensor co-location on public-sector PV assets anchored institutionally on DCCE/CCIC, and public-budget absorption of recurrent costs.

During the PFG phase, this evidence base will be consolidated into a Technology Readiness and Evidence Annex, and Thai-context baselines for forecast accuracy, community uptake, operational uptime and institutional absorption will be established through baseline surveys. Indicative minimum evidence thresholds for the go/no-go scaling decision include: forecast-accuracy improvement over the TMD baseline consistent with the NREL benchmark (48% improvement over persistence method) or the Microsoft DeepMC benchmark (>90% accuracy at sensor location); community EWS uptake sufficient to demonstrate behaviour change; operational uptime of at least 90%; and institutional absorption of at least 80% of recurrent costs by Thai public budget lines. Final thresholds will be jointly endorsed by DCCE, TMD and the Provincial Working Group on Climate Change during PFG.

A consolidated Technology Readiness Level (TRL) and performance-evidence snapshot is provided below (to be substantiated in the Technology Readiness and Evidence Annex at PFG stage):

- (i) Sensor / PV co-location approach — TRL 8–9 (actual system proven in operational environments). IEC 61724-1 Class A sensors are a commercially mature technology deployed globally by multiple vendors in solar PV monitoring and meteorological observation. Peer-reviewed research confirms the value of microclimate sensor data for precision agriculture⁵. The innovation lies in co-locating sensors on public-sector PV assets for adaptation purposes at provincial scale.
- (ii) AI-enabled forecasting component — TRL 7–8 (system prototype demonstrated / actual system proven in analogous environments). NREL peer-reviewed research demonstrates that ML-based site-specific weather forecasting achieves 0.72°C mean absolute error and a 48% improvement over the persistence method⁶.

Microsoft DeepMC (industry deployment) confirms over 90% accuracy at IoT sensor locations deployed globally⁷, and peer-reviewed studies confirm ANN-based urban microclimate modelling with only a few months of data⁸. Integration with dense microclimate sensor networks and MHEWS at provincial scale in Thailand will be validated during implementation.

(iii) Malaysian solar-monitoring application being adapted — TRL 7–8 in Malaysian context (deployed operationally, with sustainability limitations acknowledged in the SEDA consultation and turned into design lessons). The application will be adapted to the Thai climate adaptation context, hosted under DCCE/CCIC, and licensed to the Thai public sector under perpetual, royalty-free terms with source-code escrow and full derivative-work rights (ensuring no vendor lock-in and no provider exit risk). Adaptations and derivative works developed under AF financing will be released under an open-source licence (e.g., Apache 2.0 or equivalent), transforming the tool from a proprietary solar-monitoring application into a public-good climate adaptation data platform.

The consolidated Technology Readiness and Evidence Annex prepared during PFG will substantiate each TRL score with full citations, document performance data from comparable deployments, establish Thai baselines, and define minimum evidence thresholds for the go/no-go scaling decision¹¹¹²¹³¹⁴¹⁵¹⁶¹⁷¹⁸.

The project scales innovative adaptation technologies by deploying solar-powered microclimate sensors and integrating them with an AI-enabled data platform to generate real-time, hyperlocal climate intelligence for vulnerable communities. Initial rollout will prioritise high-risk agricultural and disaster-prone areas identified, where localised data is currently unavailable. The system's modular design allows rapid replication across provinces, while the platform can be integrated into existing national adaptation and disaster management systems to serve multiple sectors, including water, food security, and public health. Data collected from microclimate sensors will strengthen early warning capabilities. The high-frequency weather data will feed into national Multi-hazard Early Warning Systems (MHEWS), enhancing the accuracy and timeliness of climate hazard forecasts.

Beyond the technology itself, the project embeds several institutional and process innovations. These include the decentralisation of climate data generation through community-level sensor networks; the integration of AI-driven analytics into public early warning systems; and the establishment of iterative feedback loops between data providers, end users, and decision-makers to continuously refine outputs and services. The project also introduces new coordination mechanisms between national agencies, provincial authorities, and local stakeholders to enable cross-sectoral use of climate intelligence.

The design further incorporates a multi-actor implementation model that goes beyond a standard government-to-government approach. This includes engagement with private sector technology providers and data service companies for sensor deployment and platform development; collaboration with academic and research institutions to support model development and validation; and partnerships with civil society organisations and community groups to support local deployment, maintenance, and uptake of climate services. This diversified ecosystem of actors is critical to ensuring both technical robustness and long-term sustainability.

Microclimate data significantly improves flood predictions by providing localized, high-resolution information that traditional, large-scale meteorological models miss. By integrating data on solar irradiance, temperature and potentially local rainfall intensity, flood forecasting systems can achieve greater accuracy, especially for flash floods and urban environments. For example, having access to 5 sets of data in each industrial park in a city would enable availability of a higher resolution of precipitation data allows for better identification of flash flood risks that are often missed by broader, regional forecasts. This is especially useful when the industrial sites are adjacent to rivers. Detailed analysis of data and insertion into larger climate models allow for the potential risk of urban drainage capacity overflows.

¹¹ ScienceDirect (Energy and Buildings, 2024) — ANN model for urban microclimate prediction, Montreal; and Hong et al. showing up to 11°C temperature differences within San Francisco during the 2017 heatwave. <https://www.sciencedirect.com/science/article/pii/S0378778824003992>

¹² NREL — Site-specific weather forecasting using machine learning for grid-interactive efficient buildings, Denver metro area. <https://docs.nrel.gov/docs/fy20osti/77768.pdf>

¹³ Nature Scientific Reports (2023) — Microclimate in precision agriculture. <https://www.nature.com/articles/s41598-023-48028-1>

¹⁴ Microsoft Research — DeepMC: Micro-climate predictions enabling hyper-local decisions for agriculture and renewables. <https://www.microsoft.com/en-us/research/blog/micro-climate-predictions-enabling-hyper-local-decisions-for-agriculture-and-renewables/>

¹⁵ Nature Scientific Reports (2023). <https://www.nature.com/articles/s41598-023-48028-1>

¹⁶ NREL — Site-specific weather forecasting using machine learning. <https://docs.nrel.gov/docs/fy20osti/77768.pdf>

¹⁷ Microsoft Research — DeepMC micro-climate predictions. <https://www.microsoft.com/en-us/research/blog/micro-climate-predictions-enabling-hyper-local-decisions-for-agriculture-and-renewables/>

¹⁸ ScienceDirect (Energy and Buildings, 2024). <https://www.sciencedirect.com/science/article/pii/S0378778824003992>

The AF-financed platform is designed and operated exclusively as a public-good adaptation service under DCCE's Climate Change Information Center (CCIC), providing free, non-discriminatory access to climate data and Early Warning Services for communities, ministries, sectoral agencies, provincial and local governments, academia, civil society and the public. The platform is not designed, financed or used to generate commercial value for private-sector actors. Any incidental positive externalities that may accrue to third parties from the availability of public-good climate data are outside the AF results framework, are not measured by project indicators, and do not drive any project decision. Long-term platform sustainability is anchored on DCCE/CCIC's institutional mandate and on Thai public-budget absorption, not on commercial value generation.

Specific institutional steps to ensure successful rollout include:

- A ministerial-level MOU between the Ministry of Natural Resources and Environment (MonRE) and the Ministry of Interior has already been signed to implement the National Adaptation Plan (NAP). The NAP defines a core mandate across six sectors; the Governor of Nakhon Ratchasima (under the Ministry of Interior) is included in this mandate.
- Data and the platform will be hosted at the Climate Change Information Center (CCIC) of DCCE, which is scheduled to be launched publicly by the end of 2026. The centre will consolidate system data and validate and integrate technology from Malaysia.
- Once the centre is established, the project will be presented to local governments as specified in the MOU so they can attend briefings, learn about the initiative, receive technology transfer, and provide feedback to improve the centre's dashboard.
- Under Component 3, a TOT (train-the-trainer) approach is planned, initially implemented through Subdistrict Administrative Organizations (Or-Bor-Tor). The department's Participation Promotion Division will be invited to support capacity-building activities. Communities / local relevant groups (eg farming extension services, emergency preparedness officers, etc. will be trained and informed of merging data collection efforts.

The project plans to engage a Malaysian technology vendor as a South–South technology transfer model, covering both hardware and software transfer. Thai host sites are limited to publicly owned solar PV assets (Tessaban, SAO, PAO installations financed through the Provincial Governor budget and the Ministry of Energy fund) that serve exclusively as physical mounting locations for sensor co-location; no co-financing, subscription-based revenue or private commercial arrangement is envisaged, and all core climate data and EWS services are distributed free of charge as a public good under DCCE/CCIC stewardship.

The data handled by the Climate Change Information Center (CCIC) are transmitted and received primarily via standard internet, cellular GSM/4G/5G mobile networks (using SIM-based modems) and, where applicable, LoRaWAN low-power wide-area networks operating on Thailand's unlicensed 920–925 MHz band, all of which use standards-based, type-approved telecommunications technologies that comply with the National Broadcasting and Telecommunications Commission (NBTC) framework. The system does not engage in radio broadcasting, does not generate proprietary radio communications services and does not require dedicated frequency-spectrum licences under the NBTC; cellular communications operate under the existing licences held by Thai mobile carriers (AIS, True, dtac), and LoRaWAN operates on Thailand's licence-exempt ISM band. The establishment and operation of the CCIC comply with the relevant ministerial regulations defining the roles and responsibilities of the Department of Climate Change and Environment (DCCE) within the Ministry of Natural Resources and Environment, and with all applicable Thai telecommunications, data protection and cybersecurity requirements. Therefore, they do not conflict with the regulatory framework on radio frequencies, and concerns regarding radio frequency use are not applicable to the center's operations.

As part of this approach, collaboration with local farmers will be carried out to ensure proper alignment of information sharing both from and to local populations. This will include a thorough understanding of current adaptation practices and how information is shared (both through formal and informal channels). This will be further explored during full project preparation.

Capacity-building for local technicians, community stakeholders, and provincial authorities ensures long-term adoption, operations, and data use. By demonstrating successful sensor clusters and AI forecasting models

in priority zones, the project creates a scalable model that can be expanded geographically and institutionally, transforming climate data access and decision-making at both community and national levels.

Note that while technology types have been identified at this stage, the specific technology selection will be based on feasibility studies during PFG and technology will be procured using an open and competitive process. The aim will be to allow for equity (geographical, gender, and economic class) in access to adaptation benefits. The project will incorporate inclusive communication channels, including radio announcements, to ensure widespread and equitable dissemination of climate and early warning information. Additionally, simplified dashboards to show the data and its predictions will be accessible on mobile devices – which are already widespread in the local populations. The continued expected proliferation of digital payments will likely result in even more of the populations in remote areas to have access to a mobile phone.

During the PFG phase, the project is explicitly designed to engage, empower and benefit the most vulnerable groups in Nakhon Ratchasima — women, smallholder farmers, low-income households, youth, persons with disabilities, village health volunteers and climate-exposed rural and peri-urban residents — through a two-stage participatory architecture, fully operationalised at the Project Formulation Grant (PFG) phase.

Stage 1 Engagement architecture (PFG-defined): specific districts and target communities; number and format of consultations and co-design workshops; methodologies for documenting, analysing and integrating community feedback; governance arrangements for approving design changes; and feedback mechanisms (GRM, "You Said / We Did" register, annual community validation sessions). Engagement covers farmer cooperatives, women's groups, youth organisations, disability advocacy organisations, CSOs and others.

Stage 2 Iterative co-design integrating local and traditional knowledge (PFG-assessed): how traditional knowledge will be collected, coded and translated into model-relevant variables; who validates farmer observations against sensor and remote-sensing data; whether local indicators feed the AI system as inputs, calibration checks, interpretation layers or threshold modifiers; how disagreements between technical outputs and local knowledge are resolved; how risk maps visually represent local knowledge; how often warning thresholds are reviewed; whether differentiated thresholds apply by crop, livelihood, district, gender or season; and how M&E captures the influence of local knowledge on the system.

Concrete benefits to vulnerable groups: improved MHEWS-disseminated Early Warning Services through gender-responsive channels; tailored agricultural and livelihood advisories; community capacity building of CSOs, water-user groups and women's groups as EWS multipliers; gender-responsive empowerment under the Gender Action Plan; traceable co-design influence over project decisions; and closure of the gender and CSO representation gap of the 2023–2024 Provincial Working Group through formal seating of women's, youth, PWD and CSO representatives.

All elements above will be operationalised and annexed at PFG stage — including the Stakeholder Engagement Plan, Gender Action Plan, Traditional Knowledge Integration Protocol, Adaptive Management Protocol, GRM SOP, and a disaggregated beneficiary baseline in compliance with the AF Environmental and Social Policy and Gender Policy.

D. Describe how the project/programme would provide economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations. Describe how the project/programme would avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy of the Adaptation Fund.

The proposed pilot in Nakhon Ratchasima Province will generate tangible economic, social, and environmental benefits by strengthening the foundation of Thailand's climate resilience through improved data collection and integration. The project is expected to benefit (either directly or indirectly) between 80,000 and 120,000 people in priority high-risk districts through improved access to localised early warning information, resilient energy-enabled services, and strengthened local response capacity. Of these, at least 40% are expected to be women, and a significant proportion will include vulnerable groups such as low-income households, smallholder farmers, and climate-exposed rural communities. Additionally, the project could benefit up to 2.18 million people (the province's regional population as of 2021) through strengthened Multi-hazard Early Warning Systems (MHEWS), improved climate-informed planning, and enhanced resilience of critical services and infrastructure.

Vulnerable populations, including rural households, women, and low-income groups, stand to benefit indirectly from better-informed policies, MHEWS, and infrastructure design that account for climate risks. A detailed disaggregation of beneficiaries by vulnerability status (including income level, gender, and climate exposure) will be conducted during the Project Formulation Grant (PFG) phase through field assessments and stakeholder consultations.

Economic benefits

By establishing a localised network of microclimate weather sensors, the project will enhance the quality, accuracy, and timeliness of climate data available to national and provincial agencies. This improved information will support evidence-based planning and more efficient resource allocation, particularly for agriculture, water management, and disaster response. In the longer term, better data will reduce the economic costs of climate-related damage by enabling proactive investment, early intervention, and optimised use of public funds for climate adaptation. The integration of localised data into existing government systems will also support private-sector and academic research, fostering innovation and job creation in the emerging climate technology sector.

Social benefits

At the social level, the project will contribute to greater institutional and community preparedness for climate extremes. By closing data gaps that currently limit local authorities' ability to anticipate floods, droughts, and heat stress, the project will enable a more inclusive and equitable approach to resilience planning. Crucially, the project ensures the continuity of early warning, climate data services, and energy resilience during outages. This guarantees that communities maintain reliable access to power and actionable information even under severe weather conditions, directly reducing exposure to hazards, safeguarding livelihoods, and minimising climate-induced losses. Consequently, vulnerable populations, including rural households, women, and low-income groups, stand to benefit indirectly from better-informed policies, MHEWS, and infrastructure design that consider their specific exposure to climate risks. The project will apply disaggregated monitoring indicators to ensure equitable access across gender and vulnerable groups.

Beyond participation, the project will support women's economic empowerment by fostering women-led micro and small enterprises linked to climate services. This includes opportunities for women to act as local data intermediaries, climate advisory providers, and operators of digital platforms. These activities aim to reduce structural barriers to women's participation in technology-driven sectors and promote inclusive economic growth.

In addition, capacity-building and collaboration with local educational and research institutions will promote knowledge sharing and help build the technical expertise needed to sustain and expand climate monitoring systems nationally. A significant share of the project's capacity-building resources will be directed toward farmers, community-based organisations, women's groups, local technicians, village health volunteers, and other vulnerable community stakeholders. Capacity-building investments will prioritise strengthening local adaptive capacity, improving access to climate information, supporting community-level use of early warning services, and developing the skills required for long-term operation, maintenance, and utilisation of climate information systems. This approach ensures that project benefits extend beyond institutional strengthening and directly contribute to resilience-building among climate-vulnerable populations.

To address gendered vulnerabilities, the project will implement targeted measures including: (i) gender-sensitive design of early warning dissemination channels (e.g., SMS, community networks accessible to women), (ii) inclusion of women's groups and female leaders in local decision-making and feedback mechanisms, and (iii) development of training materials adapted to women's roles in agriculture, water management, and household resilience. These measures aim to enhance women's adaptive capacity and agency in climate risk management.

To mitigate the risk of excluding populations without access to mobile technology, the project incorporates inclusive communication channels, including radio announcements, to ensure widespread and equitable dissemination of climate and early warning information, thereby avoiding the reinforcement of existing inequalities.

The project will actively create pathways for women to participate as entrepreneurs, innovators, and technical leaders within the climate technology ecosystem. This includes setting minimum targets (e.g. at least 40%) for women's participation in technical training on sensor installation, maintenance, and data analytics; reserving a defined share of service contracts (e.g. 30%) for women-led enterprises or cooperatives involved

in sensor deployment and operations; and establishing a small grant or incubation window to support women-led businesses providing climate-related services (such as local data collection, advisory services for agriculture, or maintenance of monitoring equipment).

In addition, the project will partner with local universities and technical institutes to support women in STEM fields through internships, applied research opportunities, and mentorship linked to the AI platform and data systems. Women will also be prioritised for leadership roles within community-level governance structures, managing the sensor networks and data use. These measures ensure that women are not only recipients of climate information but active contributors to, and beneficiaries of, the emerging climate innovation ecosystem.

Environmental benefits

From an environmental perspective, the project will strengthen Thailand's capacity to monitor and manage climate variability with greater precision. Enhanced local data will guide sustainable land and water management, improve resource efficiency, and enable the early detection of environmental stressors such as soil degradation, drought, or heat-related crop losses. Over time, this will curb unsustainable resource use, preserve ecosystem services, and bolster the resilience of Thailand's agricultural and natural landscapes to climate change.

The climate information and improved weather forecasting generated by the project will support practical adaptation decisions, including drought preparedness, irrigation scheduling, water allocation, heat-risk management, crop planning, anticipatory action and local adaptation planning. They will also strengthen the continuity and reliability of adaptation-critical services during climate shocks by enabling public-sector operators to anticipate and mitigate disruptions to Early Warning Services, Multi-Hazard Early Warning System (MHEWS) data flows, CCIC data services and the public-sector solar infrastructure hosting the sensor network. More accurate, location-specific forecasts will support proactive maintenance, safeguard adaptation-critical assets and minimise downtime during extreme weather events. The data may also inform public-sector planning, site-risk assessments and operational-resilience considerations for the climate-resilient and efficient future deployment of renewable-energy systems. Any benefits for renewable-energy operation, grid integration, PV asset management or future deployment will remain incidental co-benefits outside the project's results framework; they will not be measured by project indicators or drive project decisions, and no Adaptation Fund resources will finance renewable-energy assets or their deployment.

In sum, the pilot project in Nakhon Ratchasima represents an important step toward a data-driven model of climate adaptation. By generating high-resolution, localised climate information and integrating it with national systems anchored under DCCE's Climate Change Information Center (CCIC), it will deliver benefits that extend beyond the province, laying the groundwork for more resilient, climate-informed development across Thailand.

E. Describe or provide an analysis of the cost-effectiveness of the proposed project/programme and explain how the regional approach would support cost-effectiveness.

The project is designed to maximise impact while minimising costs through strategic use of existing assets and scalable technologies. By integrating sensors with existing solar infrastructure, installation and maintenance expenses are significantly reduced, avoiding the need for new civil works or standalone power systems. The use of AI-driven forecasting enhances analytical capacity without relying on costly supercomputing infrastructure, lowering long-term operational costs for national agencies. In addition, the modular design of both the hardware and the data platform allows for phased expansion and targeted scaling, ensuring resources are deployed efficiently and only where demand and climate risk justify investment. This approach ensures high value for money while enabling replicability across other vulnerable provinces.

Strategic Cost Efficiency

The project avoids costly civil works by co-locating microclimate sensors on existing public-sector solar PV infrastructure (Tessaban, Sub-district Administrative Organisation and Provincial Administrative Organisation installations already financed under the Provincial Governor budget and the Ministry of Energy fund) that serve only as physical host infrastructure, rather than constructing dedicated towers. The all-in deployed cost per station is approximately USD 8,300 — composed of an IEC 61724-1 Class A weather-station head at USD 4,000, a site gateway and data logger at USD 2,500, and approximately USD 1,800 for Photovoltaic-integration kits, electrical interface, site surveys, calibration traceable to NIMT and TMD reference standards, logistics and installation contingency. This represents a substantial reduction compared to the USD 50,000 per site benchmark for conventional fully-equipped hydrometeorological stations on dedicated towers with standalone power systems and complex installations.

By leveraging the existing solar baseline as a mounting platform, the project also avoids tower, foundation and grounding costs of approximately USD 100,000–120,000 across the 205-station network, eliminates the need for stand-alone solar/battery kits at each sensor site (free electrical supply from the host system), and benefits from existing site security at municipal Photovoltaic installations. This ensures uninterrupted uptime of adaptation-critical systems during climate shocks — safeguarding Early Warning Services integrated with Thailand's Multi-hazard Early Warning System — and delivers high value per dollar compared to reactive approaches.

The PV assets themselves are not financed, deployed or optimised under the Adaptation Fund investment; any benefits accruing to renewable-energy operation are treated as incidental co-benefits outside the project's results framework. The cost-effectiveness claim is therefore substantiated by a verifiable unit-economics outcome — approximately USD 8,300 per station all-in for Nakhon Ratchasima, and approximately USD 7,600 per station for replication in other Thai provinces - anchored on a vendor bill of quantities, validated by the Thai Meteorological Department on technical specifications and aligned with the Department of Climate Change and Environment on the 205-station provincial density target.

The use of AI-driven forecasting further enhances cost-effectiveness. By relying on cloud-based analytics rather than supercomputing infrastructure, the project lowers long-term operational costs for national agencies while improving predictive accuracy and sectoral relevance.

Modular and Scalable Design

The sensor network and data platform are designed for phased deployment, leveraging modular, locally maintainable technologies for long-term sustainability. This allows resources to be allocated based on climate risk and demand. This modularity ensures that investments are targeted and adaptable, reducing the risk of underutilised infrastructure and enabling replication across other provinces.

Regional Cooperation and Shared Value

The project benefits from South–South cooperation with Malaysia, which contributes technical expertise, access to existing photovoltaic monitoring databases, and lessons learned from similar deployments. This collaboration supports:

- Bulk procurement of hardware and software components.
- Shared algorithm development, reducing duplication and enhancing model performance.
- Joint training and capacity-building, lowering per-unit training costs and fostering regional knowledge exchange.

The Malaysia partnership is expected to generate primarily non-monetary cost-effectiveness benefits through technology transfer, validation of algorithms using comparable datasets, avoidance of design errors, and accelerated learning. Any direct procurement or training-related cost savings will be assessed and quantified during full proposal preparation and are not currently counted in the project's cost-effectiveness calculations.

Integration with Private Sector Data

The platform is designed using open-source database management systems, enabling integration with private-sector data sources such as agri-businesses, insurance companies, and energy providers provided access is granted. This feature expands the platform's utility while reducing the need for redundant data collection, enhancing cost-effectiveness and long-term sustainability.

Avoided Losses and Economic Value

By improving Multi-hazard Early Warning Systems and climate intelligence, the project is expected to reduce economic losses from floods, droughts, and heatwaves events that have cost Thailand over USD 160 million in recent years. Enhanced forecasting and planning will help protect agricultural productivity, reduce disaster recovery costs, and improve public health outcomes, delivering substantial return on investment.

Full Cost of Adaptation Justification

The project is scoped entirely within the USD 5 million envelope requested from the Adaptation Fund. All activities from sensor deployment to platform development and capacity-building are calibrated to this budget. No co-financing is required to achieve the intended outcomes, ensuring full compliance with the Fund's full cost of adaptation principle.

F. Describe how the project/programme is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist. If applicable, please refer to relevant regional plans and strategies where they exist.

Table 3: National and Sub-national Sustainable Development Strategies

Framework / Strategy	Key Objectives / Priorities	Project Alignment and Contribution
Thailand's National Adaptation Plan 2024	- Enhance climate resilience across six priority sectors: water resources, agriculture, health, tourism, natural resources, and human settlements. - Strengthen information systems, early warning, and institutional capacity for adaptation.¹⁹	Directly supports four NAP priority sectors: - Water Resources Management: improved climate forecasting and flood/drought risk mapping. - Public Health: supports heat stress monitoring and climate-health surveillance. - Food Security: provides localised weather data for crop and yield management. - Human Settlements: enhances early warning and risk-informed infrastructure planning. Builds institutional capacity through improved climate data integration. Directly operationalises NAP priorities related to climate information systems, localised climate services, climate risk management and evidence-based adaptation planning at provincial and community levels.
Climate Change Master Plan (2015–2050)	- Promote a low-emission and climate-resilient society. - Strengthen climate data systems, innovation, and stakeholder participation.- Integrate science-based adaptation into national planning.²⁰	- Establishes a localised microclimate data network, improving the accuracy and accessibility of climate information. - Enhances the government's data-driven decision-making for adaptation planning. - Supports innovation and technology deployment in climate monitoring and forecasting.
Thailand's Nationally Determined Contribution	- Integrate adaptation in key sectors including agriculture, land use, and water management. - Advance climate-smart agriculture (CSA) and early warning systems.²¹ - Improve coordination among agencies and data systems²²	- Provides foundational data to strengthen CSA practices and inform sectoral adaptation strategies. - Aligns with national commitments to reduce climate risk and improve adaptive capacity. - Supports the development of early warning systems and reporting mechanisms identified in the NDC.
FAO-UNDP SCALA Programme (2020–2025)	- Support implementation of NAP and NDC in agriculture and land use sectors. - Address data and capacity gaps for climate-smart land management. - Strengthen institutional coordination and resource mobilisation.²³	- Complements SCALA's goal to enhance data integration and land use information systems. - Provides a pilot model for microclimate monitoring that can be scaled nationally. - Strengthens institutional collaboration with the DCCE.
ASEAN Climate Change Strategic Action Plan (ACCSAP) 2025–2030	- Enhance regional cooperation on finance, technology, and capacity-building. - Accelerate NDC implementation through shared adaptation and mitigation actions.²⁴	- Supports ASEAN objectives by piloting technology and data systems that can be replicated across the region. - Facilitates cross-border knowledge sharing on climate forecasting and risk management. Specific ACCSAP action lines that the project aligns with:

¹⁹ [Thailand National Adaption Plan](#)

²⁰ [Climate Change Master Plan](#)

²¹ [Thailand CSA](#)

²² [Thailand NDC](#)

²³ [Scaling Up Climate Ambition on Land Use and Agriculture \(SCALA\)](#)

²⁴ [ASEAN Climate Change Strategic Action Plan](#)

		- Enhancing adaptation and resilience, including disaster risk management - Promoting cross-sectoral coordination and integration of climate into planning - Supporting evidence-based decision-making and climate information systems - Enabling multi-stakeholder collaboration (government, private sector, academia, civil society) - Creating enabling environments for long-term climate resilience and NDC implementation - Strengthening technology, data, and capacity-building for climate action
National Strategy (2018–2037)	- Achieve sustainable, resilient, and innovation-driven development while reducing economic inequalities. - Build environmental sustainability and disaster resilience across all sectors.²⁵	- Contributes to strategic objectives on sustainable growth and resilience. - Advances innovation and digital transformation for climate-informed planning. - Contributes to reducing poverty by targeting vulnerable and climate-exposed communities.
Bio-Circular-Green (BCG) Economy Model (2021–2027)	- Promote sustainable agriculture, renewable energy, and circular economy principles. - Integrate innovation and technology into resource management.²⁶	- Supports BCG objectives by deploying green, solar-powered, and data-driven technologies. - Encourages efficient, climate-resilient agricultural and land-use practices.
Sendai Framework for Disaster Risk Reduction (2015–2030)	- Priority 1: Understanding disaster risk. - Priority 2: Strengthening disaster risk governance. - Promote risk-informed decision-making.	- Enhances hazard data and early warning capability at provincial and national levels. - Builds institutional capacity to anticipate and reduce disaster risk.
Thailand's Technology Needs Assessment (TNA)	Identifies priority technologies, barriers and enabling conditions to strengthen climate resilience across sectors including water resources, agriculture, disaster risk management and climate information systems.	TNA's broader objectives of strengthening climate information systems, climate-risk management and evidence-based adaptation planning by improving the availability, accessibility and usability of localised climate data. While microclimate sensor networks, AI-enabled forecasting and PV-hosted climate monitoring systems are not currently identified as standalone priority technologies within the concept-stage assessment, the project supports the underlying TNA objectives of improving climate information services and adaptive decision-making. During full proposal preparation, a detailed TNA crosswalk will be undertaken to identify the specific technology priorities, barriers and enabling actions to which the project contributes.
Technology Action Plan (TAP)	Supports implementation of priority adaptation technologies through institutional strengthening, capacity-building, financing mechanisms, stakeholder coordination and enabling policy frameworks.	The project contributes to TAP implementation by strengthening institutional capacity for climate information management, supporting inter-agency coordination, demonstrating scalable deployment models, engaging academic and private-sector partners, and building technical capabilities at national, provincial and community levels. A detailed mapping between project activities and specific TAP implementation actions will be undertaken during full proposal development.
National Strategy (2018–2037) and National Economic and Social Development Plan	Promote inclusive, resilient and sustainable economic development, reduce inequalities, strengthen resilience to climate-related shocks, and support vulnerable populations.	The project contributes to national poverty reduction and resilience objectives by reducing the climate vulnerability of smallholder farmers, low-income households, women, climate-exposed rural communities, and other vulnerable groups in Nakhon Ratchasima Province. Through improved early warning services, localised climate information, enhanced adaptive planning and strengthened institutional preparedness, the project aims to reduce livelihood losses

²⁵ [National Strategy](#)

²⁶ [Bio-Circular Green Economy Model](#)

		associated with droughts, floods, heat stress and extreme weather events. These benefits are expected to improve income stability, reduce disaster-related economic losses, strengthen food and water security, and reduce the disproportionate burden of climate shocks on vulnerable populations. During full proposal preparation, poverty-disaggregated baselines, beneficiary targets and contribution pathways will be incorporated into the results framework to demonstrate alignment with national and provincial poverty reduction objectives.
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It is also notable that Thailand has already made substantial progress, though there are some limitations in MHEWS. Multiple data repositories that are hosted and maintained by different national agencies. This has hindered user access and interoperability, leading to inconsistencies across data sets. Moreover, there are plans to implement the Associated Programme on Flood Management (APFM) in Thailand, alongside HydroSOS of WMO²⁷.

The project contributes to Thailand's national SDG targets by strengthening climate resilience, improving access to climate information, and supporting inclusive, data-driven decision-making. It directly advances SDG 13 (Climate Action) through enhanced climate monitoring and Multi-hazard Early Warning Systems (MHEWS), enabling better preparedness for floods, droughts, and heat stress. It also supports SDG 2 (Zero Hunger) and SDG 6 (Clean Water and Sanitation) by providing localised data for more resilient agriculture and improved water resource management. The use of solar-powered systems for critical services contributes to SDG 7 (Affordable and Clean Energy), while the deployment of AI and sensor technologies aligns with SDG 9 (Industry, Innovation and Infrastructure). Finally, the project promotes inclusive access to climate services and capacity-building, contributing to SDG 5 (Gender Equality), SDG 10 (Reduced Inequalities), and SDG 11 (Sustainable Cities and Communities) by ensuring that vulnerable populations benefit from improved resilience and planning – with the gender lens in particular included in various project activities.

G. Describe how the project/programme meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and complies with the Environmental and Social Policy of the Adaptation Fund.

The project will be implemented in full compliance with relevant Thai technical, environmental, and safety standards, as well as the Environmental and Social Policy (ESP) of the Adaptation Fund. Compliance measures will be integrated throughout project preparation, implementation, and monitoring to ensure that all activities are environmentally sound, socially equitable, and technically robust.

Compliance with Thai Technical Standards

The project will adhere to all applicable national and sectoral regulations governing environmental management, infrastructure, ICT systems, and occupational safety, including:

- Environmental Assessment and Management: In accordance with the [Enhancement and Conservation of the National Environmental Quality Act \(1992, updated 2018\)](#) and related [Ministry of Natural Resources and Environment \(MONRE\) guidelines](#), project sites will undergo environmental and social screening to confirm minimal or no adverse impacts.
- Construction and Building Standards: Any installation of sensor units or supporting structures will comply with the [Building Control Act \(1979\)](#) and relevant engineering and safety codes issued by the Department of Public Works and Town & Country Planning. All equipment will meet [Thai Industrial Standards \(TIS\)](#) for electrical and structural safety.
- ICT and Data Management Standards: The project's digital infrastructure and data-sharing systems will conform to the Digital Government Development Agency (DGA) and Ministry of Digital Economy and Society (MDES) regulations on data security, interoperability, and cybersecurity. Cloud-based data management will follow the information security standards and comply with Thailand's [Personal Data Protection Act \(PDPA, 2019\)](#).
- Renewable Energy Standards: Solar-powered systems will follow the [Energy Regulatory Commission \(ERC\)](#) guidelines and certified solar installation and maintenance codes to ensure safe, efficient, and sustainable operations.

²⁷ [Global Status of MHEWS](#)

The proposed hydro-meteorological sensor network will be designed, procured, calibrated and operated in full compliance with the technical standards and data quality framework applied by the Thai Meteorological Department (TMD) as a member of the World Meteorological Organization (WMO), and with the data architecture required by the Climate Change Information Center (CCIC) under DCCE. Specific relevant standards and how they will be adhered to are described below.

Applicable technical standards. The sensors and automatic weather stations (AWS) to be deployed will meet the technical specifications set out in the WMO Guide to Meteorological Instruments and Methods of Observation (WMO-No. 8, CIMO Guide), the WMO Integrated Global Observing System (WIGOS) metadata standard (WMO-No. 1160), and the TMD internal equipment specifications for national observation stations. Key parameters — rainfall, air temperature, relative humidity, wind speed and direction, atmospheric pressure, solar radiation and, where relevant, soil moisture and water level will be measured with sensor accuracy classes meeting the operational measurement uncertainty requirements set out in the WMO Guide to Meteorological Instruments and Methods of Observation (WMO-No. 8, CIMO Guide), Annex 1.B (ANNEX 1B - Operational Measurement Uncertainty Requirements and Instrument Performance), and calibrated against ISO/IEC 17025-traceable reference standards through the National Institute of Metrology Thailand (NIMT) and the Thai Meteorological Department (TMD) calibration laboratory.

Data quality and interoperability requirements. Data will be (i) time-stamped in UTC with station-level metadata aligned to WIGOS, (ii) transmitted in TMD-compatible formats (CSV/JSON over MQTT or FTPS, with BUFR encoding for integration into the WMO Global Telecommunication System where required), (iii) subjected to automated QA/QC routines covering range, step, persistence and inter-parameter consistency checks, and (iv) mirrored to both the TMD data system and the DCCE/CCIC dashboard to avoid data silos. The system will support the CCIC data model confirmed with DCCE during stakeholder consultations.

Calibration protocols and reference standards. All sensors will be factory-calibrated with certificates traceable to the International System of Units (SI) via nationally accredited laboratories (ISO/IEC 17025). Traceability in Thailand will be assured through the National Institute of Metrology Thailand (NIMT) and, where applicable, TMD's own calibration laboratory, which serves as the national reference for meteorological instruments. Field calibration and inter-comparison with the nearest reference TMD station will be conducted at commissioning and at defined intervals (typically annually for rainfall and temperature/humidity, biennially for radiation and wind), with records archived and shared with TMD and DCCE.

TMD endorsement. As recorded in Minute 3 of the Stakeholder Consultation report (annexed to this proposal), TMD has been formally engaged and has confirmed, in principle, that additional sensors funded under the AF project can be integrated into the national TMD observation network provided they meet TMD standards and that a post-project institutional owner is designated. Formal written endorsement of the detailed equipment specifications will be obtained from TMD during the full proposal development phase prior to procurement through a Technical Specifications Validation Note jointly signed by TMD, DCCE/ERTC/CCIC and UNIDO. This note will also confirm suitability for feeding into national early warning systems and will form an annex to the full proposal.

Specifically related to the end of life for the technology used, the following apply:

E-waste and End-of-Life Management: The project will comply with applicable Thai regulations governing electronic and hazardous waste management, as well as relevant international good practice, including the Basel Convention. An E-Waste and Hazardous Waste Management Plan will be developed during the PFG phase and incorporated into the ESMF. The plan will cover procurement requirements, asset tracking, maintenance, collection, recycling, disposal arrangements, and the use of licensed waste management providers to ensure environmentally sound end-of-life management of project equipment.

Certified handlers. UNIDO confirms that only DIW-licensed hazardous waste transporters and treatment facilities (including licensed e-waste recyclers and battery recyclers certified under ISO 14001 and, where applicable, R2 or equivalent responsible recycling standards) will be contracted. Selection will be made through UNIDO's competitive procurement process with mandatory environmental and social due-diligence screening, and contracts will contain explicit clauses on Basel Convention compliance, no export to non-OECD facilities without prior informed consent, and worker safety.

Occupational Health and Safety (OHS) standards:

All sensor installation, operation and maintenance activities financed by the project will comply with applicable Thai occupational health and safety legislation, relevant technical standards, and UNIDO's Environmental and Social Safeguards requirements. Contractors and service providers engaged under the project will be required to implement appropriate safety procedures, provide suitable personal protective equipment, ensure adequate worker training and certification, maintain appropriate insurance coverage, and comply with all applicable labour and workplace safety requirements.

All sensor installation, operation and maintenance activities will comply with the specific Thai occupational health and safety legislation applicable to the works involved, namely: (i) the Occupational Safety, Health and Environment Act B.E. 2554 (2011) and its implementing Ministerial Regulations; (ii) the Ministerial Regulation on Work at Heights B.E. 2564 (2021) governing rooftop and elevated installation activities; (iii) the Ministerial Regulation on Electrical Work B.E. 2558 (2015) governing electrical connection and PV-integration activities; (iv) the Labour Protection Act B.E. 2541 (1998) on working conditions, hours and welfare; and (v) the Social Security Act B.E. 2533 and Workmen's Compensation Act B.E. 2537 requiring employer registration and insurance coverage for all workers. Internationally, the project will apply IEC 62446 (grid-connected PV system inspection), IEC 62305 (lightning protection) and ISO 45001 (OHS Management Systems). Potential risks associated with electrical work, rooftop installation, work at height, heat exposure and equipment maintenance will be assessed and managed through site-specific risk assessments, standard operating procedures, contractor supervision, and regular monitoring. Contractors will be required to appoint certified Safety Officers, maintain Contractor All-Risk / Public Liability / Workers' Compensation insurance, and enforce use of appropriate personal protective equipment (PPE). Detailed OHS requirements, training provisions, contractor obligations, emergency response procedures and monitoring arrangements will be further developed during the PFG phase and incorporated into the project's ESMF, procurement documentation, and installation contracts.

Compliance with the Adaptation Fund Environmental and Social Policies

The project will apply the Adaptation Fund's Environmental and Social Policy and Gender Policy, ensuring that all activities are designed and implemented to avoid, minimise, or mitigate adverse environmental and social impacts. The implementing entity (UNIDO) will conduct an environmental and social screening during the project preparation phase to determine the risk category.

In line with Adaptation Fund guidance on Unidentified Sub-Projects (USPs), the project will establish a formal USP management procedure to govern activities where exact locations and beneficiaries are not known at approval stage. All sensor deployment sites and associated infrastructure will undergo site-specific environmental and social screening prior to implementation. Only activities classified as low or moderate risk and consistent with Category B requirements will be approved. Where minor risks are identified, appropriate mitigation measures will be applied in accordance with Adaptation Fund's Environment and Social Policy (ESP). Records of screening, risk categorisation, and mitigation actions will be maintained and reported to the Adaptation Fund as part of regular monitoring.

Environmental and social risks associated with this project have been assessed as limited, site-specific and readily mitigable, and the project has been classified as Category B (moderate risk) under Adaptation Fund's updated Environmental and Social Policy (ESP). Given the AF ESP, an environmental and social assessment considering the identified risks will be developed and annexed to the full proposal at the PFG stage, covering e-waste management, occupational health and safety, gender and inclusion, stakeholder engagement and a Grievance Redress Mechanism, with implementation monitored through the project M&E framework and reported in the annual Project Performance Report to the Adaptation Fund.

Gender-specific risks have been identified, including unequal access to training, limited participation in technical roles, and potential exclusion from decision-making processes. These risks will be addressed through targeted measures, including gender-responsive outreach, participation quotas, and integration of gender considerations into monitoring and evaluation systems.

Environmental and social aspects will be monitored throughout implementation, and regular reporting to the Adaptation Fund will ensure transparency and accountability.

Grievance Redress Mechanism

It will be established in line with UNIDO and Adaptation Fund requirements to address any environmental or social concerns raised by project stakeholders. The mechanism will provide accessible, transparent, and culturally appropriate channels for individuals or communities to submit complaints or suggestions related to

project activities. All grievances will be recorded, acknowledged, and resolved in a timely and fair manner. The GRM will be publicised during community consultations and integrated into national and provincial implementation processes.

Technical Maintenance and Quality Assurance

To ensure long-term functionality and safety, all installed equipment, including weather sensors, solar systems, and communications components, will follow manufacturer-certified maintenance schedules and be covered under standard warranties. Periodic inspections will be conducted by qualified technicians in coordination with national partners such as the DCCE and the TMD. Technical guidelines and training will be provided to local institutions to ensure proper operation, calibration, and replacement procedures, ensuring compliance with both Thai standards and UNIDO's quality assurance protocols.

H. Describe if there is duplication of project/programme with other funding sources, if any

The following is a list of relevant projects and a description of how the proposed Adaptation Fund project's activities complement these projects.

Project	Funder/Authority	Description	Complementarity / description of avoidance of duplication
Royal Rainmaking Project	Royal Rainmaking and Agricultural Aviation Department (RRAA)	Utilizes cloud-seeding and atmospheric interventions to induce rainfall, thereby supporting drought mitigation and effective water management.	The Royal Rainmaking Project focuses on weather modification rather than systematic data generation. This project complements such efforts by establishing real-time microclimate data collection and predictive analytics to inform adaptation planning.
Enhancing Climate Resilience in Thailand through Effective Water Management and Sustainable Agriculture	GCF: UNDP / Royal Thai Government	Builds capacity for sustainable water and agricultural management in drought-prone areas through planning and community participation.	While both address resilience, the UNDP project emphasizes institutional and community capacity building. This project introduces high-frequency environmental data and AI-based forecasts to strengthen those same systems with a technical foundation for decision-making.
Strengthening Thailand's Agricultural Drought Resilience (STAR)	UK Centre for Ecology and Hydrology (UKCEH) / Thai Research Fund	Focused research on drought monitoring and response using satellite and meteorological data.	STAR relies primarily on remote sensing and modelling. This project deploys ground-based sensor networks to produce granular, real-time data feeding into predictive models, enhancing spatial accuracy and local applicability.
Urban-Act	International Climate Initiative (IKI) / GIZ / ONEP	Supports Thai cities to integrate climate adaptation into urban planning, focusing on low-carbon transport and policy frameworks.	Urban-Act targets policy integration and planning; it does not generate new datasets or predictive tools. This project provides data-driven inputs to such planning processes through AI-based microclimate forecasting.
Enhancing Resilience to future Hydro-meteorological extremes in the Mun River basin in Northeast Thailand (ENRICH)	UK Research and Innovation (UKRI)	Collaborative research on climate resilience and innovation in the energy and environmental sectors.	ENRICH is primarily research-oriented and limited to pilot demonstrations. This project operationalizes complementary insights, creating a nationally integrated, scalable data system that supports public sector adaptation efforts.
Early Warning and Drought Resilience Initiatives	Stockholm Environment Institute (SEI)	Enhances early warning systems and builds resilience to drought and climate change, especially along the Thailand–Myanmar border.	SEI's work is localized and research-driven. This project extends coverage nationally, using AI-based analysis and large-scale sensor deployment to enable real-time monitoring and forecasting across sectors. The Adaptation Fund project will: - inventory and digest SEI and other key datasets into the CCIC dashboard according to agreed data standards (metadata, formats, temporal/spatial resolution)

Project	Funder/Authority	Description	Complementarity / description of avoidance of duplication
			- deploy additional sensors to fill spatial data gaps and raise data resolution - establish automated data-exchange and update processes with SEI and other partners. - develop central standards and data-quality requirements to prevent duplication and ensure national dataset consistency.
National Hydroinformatics & Climate Data Centre (NHC)	Hydro-Informatics Institute (HII) / Ministry of Higher Education, Science, Research and Innovation	Serves as the national hub integrating hydrological and meteorological data from multiple agencies.	The NHC aggregates existing datasets. This project complements it by creating new, high-resolution microclimate data and feeding these into predictive models that can enhance the NHC's analytical capabilities.
NSTDA–DOAE Weather Data Integration Project	National Science and Technology Development Agency / Department of Agricultural Extension	Uses automatic weather stations to improve agricultural land use and planning.	While aligned in purpose, NSTDA–DOAE focuses on sector-specific agricultural data. This project provides cross-sectoral climate intelligence spanning agriculture, water, and health through AI forecasting and spatial analytics. DCCE have already taken place and DCCE and HII are already structurally interlinked through reciprocal committee membership, making them established institutional collaborators on water and climate data
Friends in Need (of “Pa”) Volunteers Foundation – Disaster Warning Stations	Royal Household-supported foundation / national agencies	Installs automated telemetry and monitoring stations for disaster warnings in forest and watershed areas.	This project differs by focusing not only on alerts but also on long-term adaptation planning, linking sensor data to resource management and climate resilience strategies.
Hydrometeorological Forecasting Tools	ALICE-LAB	Provides hydrological forecasts and seasonal models to support water management.	ALICE-LAB focuses on research and hydrological modelling. This project complements it by contributing high-frequency field data that improves forecast accuracy and model calibration.
Smart Weather Station Pilot (Nakhon Ratchasima)	SEI / ONWR / RMUTI	Installed pilot weather stations with farmer groups to support climate-smart agriculture.	The Smart Weather Station Pilot in Nakhon Ratchasima was implemented by the Stockholm Environment Institute (SEI) — Asia Centre in partnership with the Office of the National Water Resources (ONWR) and Rajamangala University of Technology Isan (RMUTI) as part of SEI's climate-smart agriculture research programme in Northeast Thailand. UNIDO has undertaken a preliminary desk review of the pilot and has initiated direct outreach to SEI Asia, ONWR and RMUTI to secure detailed information ahead of full proposal development Outcomes: The pilot installed a small number of automatic weather stations alongside farmer field schools in selected sub-districts of Nakhon Ratchasima, generating localised rainfall, temperature and soil-moisture data to support farmer decisions on planting timing, water management and crop selection. The pilot demonstrated that farmer

Project	Funder/Authority	Description	Complementarity / description of avoidance of duplication
			engagement in weather-data interpretation is feasible when linked to concrete agricultural decisions, and produced peer-reviewed and policy-relevant research on climate-smart agriculture and local adaptation practices. Challenges and limitations observed: The pilot faced three main constraints that directly inform the AF project design: (i) limited spatial coverage — a small number of stations across a large province could not support province-wide EWS or MHEWS integration; (ii) short-term financing and post-project sustainability gaps — the research grant cycle did not include a long-term host institution for continued operation, maintenance, calibration or data hosting; and (iii) limited institutional integration — data was used primarily for research outputs rather than integrated into national systems (TMD, DCCE, CCIC). Operational status: Based on preliminary outreach, some SEI-installed stations may remain operational at RMUTI and partner farmer sites, while others have degraded due to the absence of a maintenance budget after project closure. A full station-by-station inventory (sensor condition, data continuity, host site status) will be completed during the PFG phase with SEI, ONWR and RMUTI as part of the coordination protocol. How the SEI pilot's limitations inform the AF project design: AF project design directly responds to each observed limitation: (i) spatial coverage, providing the province-wide coverage the SEI pilot lacked; (ii) long-term sustainability — the AF project is anchored institutionally on DCCE/CCIC with recurrent costs absorbed by Thai public budget lines, directly addressing the post-project sustainability gap experienced by SEI; (iii) institutional integration — the AF platform is designed from inception to integrate with TMD, MHEWS and CCIC, adhering to WMO/WIGOS and MDES cybersecurity standards, ensuring that data flows into national systems rather than remaining in research silos. Integration commitment: Any SEI stations confirmed as still operational during the PFG-stage inventory will be assimilated into the AF sensor network and CCIC data flow, subject to compatibility with IEC 61724-1 Class A / WMO CIMO Guide standards. SEI Asia, ONWR and RMUTI researchers will be formally engaged during the PFG phase to (i) complete the operational station inventory, (ii) document

Project	Funder/Authority	Description	Complementarity / description of avoidance of duplication
			detailed pilot outcomes and lessons for the AF project design annex, and (iii) advise on farmer engagement modalities and site selection methodology in Nakhon Ratchasima.
Mekong EbA South: Enhancing Climate Resilience in the Greater Mekong Sub-region through Ecosystem-based Adaptation in the Context of South-South Cooperation (Thailand, Viet Nam)	Adaptation Fund: International Union for Conservation of Nature (IUCN) / Ministry of Natural Resources and Environment of Vietnam / Ministry of Natural Resources and Environment of Thailand / UN Environment Programme,	Regional initiative that builds community and ecosystem resilience to droughts and floods in the Greater Mekong Subregion through climate-resilient agriculture, water management, and livelihood diversification.	This project complements the GMS initiative by strengthening the data and forecasting systems that underpin effective local adaptation. While the GMS project builds resilience through community-based and ecosystem interventions, this project enhances climate monitoring and predictive capacity, enabling more targeted drought management, improved agricultural planning, and evidence-based decision-making across the region.
Groundwater resources in the Greater Mekong Subregion: Collaborative management to increase resilience (Cambodia, Lao People's Democratic Republic, Thailand, Viet Nam)	Adaptation Fund: United Nations Educational, Scientific and Cultural Organization / Adaption Fund / Coordinating Committee for Geoscience Programmes in East and Southeast Asia–Technical Secretariat (CCOP-TS) / International Water Management Institute (IWMI) / International Groundwater Resource Assessment Centre (IGRAC)	Regional initiative to strengthen transboundary governance and institutional capacity for the sustainable management of groundwater resources across the Greater Mekong Subregion	While the groundwater project focuses on institutional collaboration and sustainable management of shared water resources, the proposed climate data and forecasting project complements it by improving the availability of localised climate and hydrological data. This enhanced data infrastructure can inform groundwater modelling, recharge assessments, and drought monitoring, supporting evidence-based water management and climate adaptation across the region.

There are also two UNIDO projects being developed currently – at Concept phase including “Building climate-resilient community-based tourism and sustainable supply chains in Chiang Rai, Thailand” and “Building Climate Resilience of Small-Scale Fisheries and Aquaculture in Southeast Asia”. Where relevant, the UNIDO team will ensure complementarity and no overlap with these projects. Two other initiatives are also worth noting. While the proposed project is distinct in terms of geography, financing and scope, these initiatives provide useful lessons and opportunities for coordination and knowledge exchange.

1. ENRICH (Enhancing Resilience to future Hydro-meteorological extremes in the Mun River basin, NE Thailand): ENRICH was a 3.5-year research project (September 2018 – March 2022) jointly funded by Thailand's NRCT and the UK's NERC under the Newton Fund, implemented by the Asian Institute of Technology (AIT) and the University of Exeter. It investigated the combined impacts of climate variability, climate change and land-use change on hydro-meteorological extremes in the Mun River Basin across four work packages (land-use change, climate variability and change, hydro-meteorological extremes, and drought adaptation strategies), and generated recommended adaptation measures to improve water security. While ENRICH was not implemented at the provincial scale but through selected case-study locations within the basin, its basin footprint includes Nakhon Ratchasima, Buri Ram, Surin, Si Sa Ket and Ubon Ratchathani. The UNIDO AF project will build on ENRICH's scientific outputs — particularly the hydro-meteorological extreme analyses and drought adaptation recommendations relevant to Nakhon Ratchasima — to inform the design of the densified observation network, the Early Warning System, and the community-level adaptation measures, and UNIDO will engage AIT as a knowledge partner during the full proposal phase to avoid duplication and maximise use of ENRICH's research findings. ENRICH closed in March 2022; there is therefore no operational overlap, only leveraging of completed research.

2. GCF/UNDP Project — "Enhancing climate resilience in Thailand through effective water management and sustainable agriculture" (FP170): This US\$17,533,500 GCF-financed project (approved 7 October 2021; expected completion 10 January 2027) is implemented by UNDP with the Thai Ministry of Agriculture and Cooperatives, GIZ and King Mongkut's University of Technology North Bangkok. It focuses exclusively on the Yom and Nan sub-river basins of the Greater Chao Phraya River Basin in northern Thailand (Phitsanulok, Sukhothai and Uttaradit provinces), directly benefiting 62,000 people and indirectly benefiting up to 25 million. Its three outputs address (i) climate-informed water and agriculture planning, (ii) strengthened

water infrastructure combined with Ecosystem-based Adaptation (EbA), and (iii) reduced agricultural livelihood volatility through extension, on-farm adaptation and market access. There is no geographical overlap with the UNIDO AF project, which targets the Northeastern province of Nakhon Ratchasima in the Mun/Chi basin system. There is also no thematic overlap: the GCF/UNDP project centres on grey-green water infrastructure and on-farm agricultural adaptation in northern Thailand, whereas the UNIDO AF project centres on integrated climate data, densified hydro-meteorological sensing, an Early Warning System linked to communities and public-sector solar (rooftop and ground-mounted) assets, and institutional integration with the forthcoming Climate Change Information Center (CCIC) under DCCE — a national data backbone that does not currently exist. Coordination will be ensured through DCCE as the national adaptation focal point, by engaging UNDP as a sister UN agency during full proposal development to exchange lessons on climate-informed planning, tailored climate information services, and extension-based community engagement, and by ensuring that observation data and EWS products generated by the UNIDO AF project flow into the national CCIC platform that can ultimately also serve Greater Chao Phraya basin stakeholders.

More broadly, to ensure effective coordination with existing initiatives, the project will establish a proactive, structured coordination framework throughout implementation. This will include:

- Multi-stakeholder coordination committees at national and provincial levels, bringing together relevant government agencies, NGOs, research institutions, and private sector actors to align activities, share lessons, and avoid duplication.
- Regular data and progress sharing through online dashboards and periodic technical workshops, ensuring that sensor deployments, AI models, and forecasting outputs complement rather than overlap with other initiatives.
- Designated coordination focal points within the project team responsible for liaising with other climate adaptation programs and reporting on integration opportunities.
- Joint planning and review sessions during pilot phases to incorporate lessons learned from other initiatives into deployment strategies, platform design, and community engagement approaches.

Specifically, the HII under the Ministry of Higher Education, Science, Research and Innovation and the DCCE will engage with each other as follows:

- The HII has the mandate to serve as the national water information center, responsible for collecting, processing, and providing water data.
- DCCE is the national focal point for National Adaptation Plan (NAP) which covers 6 sectors: agriculture, water, public health, natural resources, human settlements, and tourism. Water is one of the subset within the mandate of DCCE to responsible. Informal discussions on collaboration with HII, including DCCE, have already taken place and DCCE and HII are already structurally interlinked through reciprocal committee membership, making them established institutional collaborators on water and climate data rather than new counterparts. This existing relationship provides a ready-made platform for HII's involvement in the AF project's sensor data integration and flash-flood EWS, with formal coordination arrangements to be confirmed at the PFG stage.
- The CCIC led by DCCE is confirmed as the central platform for collecting climate change-related data across sectors, while HII is responsible for managing the core datasets related to water resources. As confirmed in the coordination meeting with DCCE and TMD, data are already being exchanged between the two agencies, and further integration will be achieved through progressive API-based connectivity ensuring that water-related climate data flows seamlessly between HII and CCIC without creating parallel infrastructures. Technical-level discussions between DCCE and HII have been initiated and are ongoing on the CCIC platform's data architecture and interoperability standards specifically, that HII has not raised concerns about the platform being developed alongside the NHC, as documented at Minute 10 (meeting between DCCE and HII). The AF-financed platform will therefore complement HII's existing infrastructure rather than replace it, using open interoperability standards and adhering to the Practices for Government Cybersecurity issued by the Ministry of Digital Economy and Society (MDES). During development of the full proposal, HII will be invited to join the Project Steering Committee (PSC) to provide technical input on platform architecture, data standards and interoperability, and to oversee data integration.

The project's monitoring and evaluation framework will include specific indicators to track coordination effectiveness, such as:

- Number and frequency of coordination meetings and information exchanges with parallel initiatives
- Instances of joint data use, or shared AI model enhancements
- Early identification and mitigation of overlapping activities or gaps in coverage

This structured approach ensures that complementarity is maintained throughout implementation, maximising synergies, avoiding duplication, and strengthening the overall resilience outcomes for communities and national systems.

The project team has specifically screened potential overlap with domestic modernisation activities by TMD and DCCE, in addition to external partners. As confirmed in the coordination meeting with DCCE and TMD TMD is responsible for managing the network of weather stations that comply with the standards of the World Meteorological Organization (WMO). Expanding the weather station network in accordance with WMO standards requires substantial financial resources. Currently, they have plans to expand at a national level but not specific to NR. The proposed AF project will support in expanding this to other provinces in the country but implementing it within the scopes and budget of the CCIC mandate. Meanwhile, DCCE serves as the coordinating agency that promotes implementation at the local level. Therefore, the activities of TMD and DCCE do not overlap with this project in terms of network expansion. Instead, this project serves as a demonstration in Nakhon Ratchasima Province, with the intention of promoting replication in other provinces in line with provincial climate adaptation plans.

During full proposal development, the project team will additionally conduct a detailed review of further ongoing and planned investments by SOFF, JICA, ADB, the World Bank and other development partners in hydrometeorological observation systems, climate information services, disaster risk reduction and adaptation planning. Preliminary assessment suggests that these initiatives are largely complementary rather than duplicative, as the proposed project focuses on adaptation-oriented microclimate monitoring, AI-enabled decision support, community-centred early warning services and integration into the Climate Change Information Center (CCIC). Particular attention will be given to SOFF-supported observation investments and any hydrometeorological modernization initiatives to ensure interoperability, avoid duplication of sensor deployment, and maximise synergies with national meteorological and climate information systems.

I. If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.

A strong learning and knowledge management component will be embedded throughout the project to ensure that lessons learned are systematically captured, synthesised, and disseminated at local, national, and regional levels. Lessons will inform continuous improvement during implementation and promote replication in other provinces and ASEAN countries. Gender-disaggregated data and lessons on women's participation, leadership, and entrepreneurship in climate adaptation will be systematically documented to inform scaling and replication.

A community knowledge integration framework will be established to document, validate, and feed local adaptation practices into the project's data and learning systems. This includes the use of participatory mapping, local knowledge registries, and community-led monitoring to ensure that lived experience continuously informs system refinement. Knowledge generated through the project will be documented in accessible formats and shared through multiple channels, including the project's online platform, workshops, academic collaborations, and ASEAN knowledge-sharing networks. The platform itself will serve as both a technical tool (for data collection and visualisation) and a learning hub, hosting open-access dashboards, technical manuals, and training resources for practitioners, policymakers, and researchers.

The project's learning and knowledge management approach is designed not only to document project outputs and lessons but also to support continuous reflection, adaptive management, and evidence-based improvement throughout implementation. Building on the structured co-design, community validation, and iterative review processes described in Sections A, B and C, the project will establish regular learning cycles through which stakeholders including communities, government agencies, technical partners, and vulnerable groups can assess whether the project's underlying assumptions, technologies, and service delivery approaches are achieving their intended adaptation outcomes. Feedback generated through community consultations, grievance redress mechanisms, user surveys, platform analytics, technical reviews, and annual validation workshops will be systematically analysed and used to inform adjustments to system design, forecast models, communication channels, training approaches, and implementation strategies. The learning framework will explicitly document both successes and challenges, including technology performance issues, data quality limitations, community adoption barriers, institutional constraints, and unforeseen contextual factors, ensuring that lessons from what does not work are captured alongside good practices. Consistent with the project's co-production approach, community-generated knowledge including farmer observations, traditional weather indicators, local risk perceptions, and experiential adaptation practices will be

systematically documented through participatory processes and integrated into the project's knowledge base, model calibration processes, and learning products alongside scientific and technical data.

1. Knowledge products to be developed will include:
 - 1.1. Technical manuals, hardware integration documentation, operation guides on sensor installation, calibration, and maintenance, promoted by the DCCE and the Thai Meteorological Department.
 - 1.2. Training curricula and e-learning modules for provincial officials, community technicians, and data users to strengthen capacity in climate data interpretation and evidence-based local planning.
 - 1.3. Case studies documenting pilot experiences in Nakhon Ratchasima, highlighting institutional coordination, implementation, and lessons on sustainability.
 - 1.4. Policy briefs and synthesis reports summarising recommendations for integrating microclimate data into national adaptation frameworks and sectoral planning processes.
2. Knowledge and lessons learned will be shared nationally and regionally through multiple mechanisms:
 - 2.1. National-level dissemination workshops hosted by UNIDO will present interim results, lessons learned, and best practices to ministries, provincial departments, and civil society stakeholders.
 - 2.2. Regional learning exchanges with ASEAN partners, beginning with Malaysia and later expanding to other member states, will promote cross-country learning, platform demonstration, and scalability.
 - 2.3. Online dissemination through the project's open-access portal will feature data visualisations, publications, and multimedia summaries.
 - 2.4. Integration into existing ASEAN knowledge networks — particularly the ASEAN Climate Resilience Network (CRN) and the ASEAN Centre for Energy (ACE) — will ensure that project lessons inform ongoing regional dialogues, contribute to South–South knowledge exchange, and create a pathway for future regional collaboration on climate adaptation and resilient energy infrastructure. To operationalise this engagement, the project will pursue ASEAN-level outreach through the Ministry of Energy of Thailand, which serves as Thailand's institutional interface with ACE and which has expressed openness to coordination with UNIDO on the project. The Ministry of Energy will, where appropriate, also facilitate engagement with MoNRE/DCCE — Thailand's institutional interface with the ASEAN Working Group on Climate Change (AWGCC) and the broader ASEAN Climate Resilience Network ensuring that the project's adaptation lessons (climate observation densification, AI-enabled MHEWS-integrated forecasting, PV co-location, community-level EWS in three pilot zones) are channelled into the appropriate regional forum.. Note that outreach to the relevant ASEAN knowledge networks will be carried out during the full project preparation phase.
3. Monitoring, evaluation, and adaptive learning will be central to the knowledge management framework:
 - 3.1. A dedicated Monitoring and Evaluation and Knowledge Officer will oversee systematic learning capture and reporting.
 - 3.2. Reports will include a “lessons learned” section summarising challenges and adaptive responses, while mid-term and terminal evaluations will assess the effectiveness of knowledge capture and application. Beyond the formal mid-term and terminal evaluations, the project calendar includes dated review points ie inception, monthly technical meeting, quarterly meeting, 6-month data review, end-of-first-rainy-season, end-of-first-drought/heat-season and an Annual Theory of Change.
 - 3.3. Continuous feedback loops will be embedded in community engagement to improve the system and ensure that climate information translates into practical action. To test whether the information leads to behaviour change and improved adaptation outcomes, the project introduces a Behaviour-Change and Adaptation-Outcome Test (BCAOT) with three elements: (1) a Behavioural Indicator Panel tracking whether Early Warning System recipients act on advisories and whether relevant public-sector operators use climate information to identify risks to adaptation-critical infrastructure, including public-sector solar host sites, and undertake preventive, preparedness, emergency-response and post-disaster recovery measures, with data disaggregated by sex, age and disability where applicable; (2) an Adaptation-Outcome Panel measuring reduced climate impacts, including avoided losses, reduced health incidence, reduced damage to public-sector solar host infrastructure and improved continuity of EWS, MHEWS and CCIC data services during extreme events; and (3) an Independent Assumption Review Panel, comprising a gender specialist and representatives from civil society, communities and academia, convened annually to assess the validity of the project's assumptions and recommend adjustments. Findings from these mechanisms will be used to refine risk communication, training materials, preparedness protocols and system design throughout implementation. These activities will focus on climate-risk identification, capacity building and operational preparedness; Adaptation Fund resources will not finance the rehabilitation, expansion or upgrading of renewable-energy assets.

- 3.4. Lessons learned from USP screening, risk management, and community engagement processes will be systematically documented to inform continuous improvement and replication in future scaling phases.
4. Academic and research partnerships are expected to play a key role in supporting knowledge generation and enhancing the project's long-term sustainability. In Thailand, the Climate Change and Environmental Research Centre and selected universities in Nakhon Ratchasima may collaborate to analyse field data, support curriculum development, and contribute to sensor calibration and performance studies. Where feasible, universities will be encouraged to host training sessions or integrate project learnings into academic programmes, helping to sustain capacity building and institutional knowledge beyond the project's duration.

The project will generate a replicable model for integrating distributed microclimate monitoring, AI-assisted forecasting and public-sector climate information services. Technical specifications, governance arrangements, implementation lessons and knowledge products will be documented and shared through national, regional and Adaptation Fund learning channels.

J. Describe the consultative process, including the list of stakeholders consulted, undertaken during project/programme preparation, with particular reference to vulnerable groups, including gender considerations, in compliance with the Environmental and Social Policy of the Adaptation Fund.

The project has been developed through a participatory and inclusive consultative process involving national, provincial, and regional stakeholders to ensure that design and implementation are fully aligned with local needs, institutional mandates, and the Adaptation Fund's Environmental and Social Policy. Particular attention has been given to engaging stakeholders representing vulnerable groups, integrating gender considerations, and ensuring that project outcomes promote equitable access to benefits.

DCCE, through its Climate Change and Environmental Research Centre, has played a central role in shaping the project concept and will continue to provide strategic oversight during implementation. DCCE has actively participated in all design discussions and has been confirmed as the Chair of the Project Steering Committee (PSC). During consultations in August and September 2025, DCCE provided key inputs on the alignment of activities with national climate priorities and requested that budget provisions be included for subcontractors to implement tasks relevant to its technical scope of work. DCCE also endorsed the decision for UNIDO to serve as the Project Management Unit (PMU), responsible for fund management and overall coordination.

Thai communities in Korat face vulnerabilities that are multi-dimensional (livelihood, food/water, health, social, knowledge, governance), demographically concentrated (women, elderly, persons with disabilities, low-income, informal workers, smallholder farmers), and place-specific (urban heat in Mueang, flash floods in Pak Chong, drought in Chok Chai)

Stakeholder engagement followed a structured and inclusive consultative process during the development of the proposed AF project concept. The process was led by UNIDO in close coordination with DCCE, Thailand's Designated Authority for the Adaptation Fund. It is formally documented in the Stakeholder Consultation Minutes (September 2025 – March 2026), which have been submitted as supporting evidence of country ownership and inclusive consultation.

During national-level consultations, preliminary discussions included gender-differentiated dimensions of climate vulnerability, particularly in relation to access to climate information, agricultural decision-making roles, and differential exposure to climate risks. While gender-focused organisations were not formally represented in all initial consultations, the project recognises this as a gap and will ensure the inclusion of organisations with a gender mandate (e.g., women's cooperatives, gender-focused NGOs, and relevant government agencies such as the Department of Women's Affairs and Family Development) during the Project Formulation Grant (PFG) phase.

The consultations engaged all key stakeholder groups necessary to ensure country ownership and an inclusive project design. These included national-level government institutions, DCCE as the Adaptation Fund Designated Authority, ERTC as the national environmental training institution under DCCE, the forthcoming CCIC, the Thai Meteorological Department (TMD) under the Ministry of Digital Economy and Society, and the Ministry of Energy.

At the provincial and local levels, engagement included the Office of the Governor of Nakhon Ratchasima, with further consultations planned during the full proposal phase involving Provincial Administrative Organizations (PAOs), Subdistrict Administrative Organizations (SAOs), and Tessaban municipalities.

Scientific and academic stakeholders were also actively involved. Members of the DCCE National Committee comprised senior officials, experts, and researchers from universities and research centres. This engagement builds on ongoing collaboration with Suranaree University of Technology, Wongchawalitkul University, and the Thammasat University Research and Consultancy Institute, drawing from the 2023–2024 Provincial Working Group on Climate Change.

In addition, the process incorporated experts engagement, including a Malaysian technical expert contributing to South–South cooperation and an external gender specialist, further strengthening the inclusiveness and technical depth of the consultations.

Consultation with vulnerable groups has been pursued through two complementary streams. First, the process builds on the 2023–2024 Provincial Adaptation Planning initiative led by ONRE Nakhon Ratchasima and Thammasat University. This initiative engaged a 42-member Provincial Working Group on Climate Change that included community-level representation, notably the Village Natural Resource and Environment Volunteer Network, and documented autonomous adaptation practices of farmers, water-user groups, and community health volunteers across 11 agency field consultations.

Second, a more in-depth community and civil society engagement programme is planned for the full proposal development phase. This will explicitly address the gender and CSO representation gaps identified in the 2023–2024 Working Group, where women's groups were not represented, through targeted consultations with women's groups, Village Health Volunteers, water-user groups, farmer associations, and national-level CSOs active in Thailand's climate adaptation sector. This phased approach is consistent with Adaptation Fund guidance, whereby early consultation with institutional stakeholders at the concept stage is complemented by deeper engagement with communities and vulnerable groups during the full proposal stage.

The project will specifically engage women-led enterprises, women's cooperatives, and female entrepreneurs in agriculture and digital services to identify opportunities for integrating women into the climate technology value chain. Their inputs will inform the design of entrepreneurship support mechanisms and innovation pathways.

Initial Gender Assessment

An initial gender assessment was undertaken based on available secondary data, relevant literature and information generated through project preparation. The assessment considered women's and men's roles in climate-sensitive livelihoods, their exposure and adaptive capacity in relation to floods, droughts and heat stress, their access to climate information and productive resources, and their potential participation in the climate technology ecosystem.

The initial gender assessment confirms that women constitute a significant share of the climate-exposed agricultural population in Nakhon Ratchasima. The assessment therefore focused on the gender-specific constraints that may affect women's access to climate information, adaptation resources, technical opportunities and project decision-making.

The evidence reviewed indicates that these roles do not necessarily translate into equal access to the resources and services needed for adaptation. Women may face constraints in accessing land, credit and other productive resources, agricultural extension and technical training, timely climate and early warning information, digital technologies, and decision-making structures. Time constraints associated with unpaid household and care responsibilities, differences in literacy and digital access, and women's underrepresentation in technical fields may further limit their ability to participate in training, operate monitoring technologies or benefit from emerging climate-service markets. These constraints could reduce women's capacity to anticipate climate hazards, adjust farming and water-management decisions, and recover from climate-related losses. They also create a risk that a technology-centred intervention could reinforce existing inequalities if access, communication and participation arrangements are not deliberately designed to address them.

The initial assessment also identified opportunities for the project to strengthen women's role. Women's existing roles position them as important users and disseminators of climate information. At the same time,

the project's sensor network, data platform and associated climate services can create new roles for women as technicians, data intermediaries, climate advisory providers, entrepreneurs, innovators and leaders in community-level climate governance.

These findings have shaped the concept in the following ways:

- Women, particularly women farmers and female-headed households, are explicitly prioritised among the project's vulnerable beneficiary groups. At least 40–45% of direct beneficiaries are expected to be women, consistent with their representation in the provincial agricultural workforce.
- Early warning information and climate advisories will be disseminated through multiple gender-responsive and locally accessible channels, including SMS, radio, community networks, women's groups and village-level intermediaries, to reduce barriers related to digital access and ensure that information reaches women in a timely and actionable form.
- Training formats, schedules and materials will be adapted to identified barriers, including time constraints, literacy and digital access. A minimum target of 40% women's participation will be applied to relevant technical training, including sensor installation and maintenance, data analytics and the use of climate information for agricultural and water-management decisions.
- Women's groups, female farmer networks and women leaders will be formally included in consultations, co-design processes, community feedback mechanisms and local governance structures. This addresses the absence of women's organisations from the 2023–2024 Provincial Working Group and helps ensure that women influence sensor siting, platform design, communication channels and the development of locally relevant climate advisories.
- The project will support women's economic participation in the climate technology value chain through mentorship, internships, technical training, incubation or small-grant support, market linkages and opportunities for women-led enterprises and cooperatives to provide climate advisory, data collection and equipment-maintenance services. The proposed full project will assess the feasibility of reserving a defined share of relevant service contracts for women-led enterprises.

A comprehensive gender assessment will be conducted during the Project Formulation Grant (PFG) phase, building on secondary data and stakeholder consultations to identify gender-specific needs, roles, constraints, and opportunities. This will include sex-disaggregated data collection; separate and mixed consultations with women and men; engagement with women's groups, female farmers, women-led enterprises and relevant government and civil-society organisations; and analysis of differentiated climate vulnerabilities, information-access patterns, livelihood roles, time use, adaptive capacities and barriers to technical and economic participation. This assessment will inform the development of a Gender Action Plan, including targeted interventions, indicators, and institutional responsibilities to ensure compliance with the Adaptation Fund Gender Policy.

The project design also draws on regional collaboration and technical exchange with Malaysia, reflecting the shared climate and energy challenges across ASEAN. Consultations were held with the Sustainable Energy Development Authority (SEDA) Malaysia, which expressed strong support for the project's data platform and offered technical cooperation. SEDA will provide access to Malaysia's existing photovoltaic (PV) monitoring database to test and validate algorithms developed under the Thai platform. SEDA also indicated readiness to support capacity-building activities and, if feasible, adapt the algorithms for potential use in their national system. During consultations, SEDA raised practical implementation issues, including data sustainability challenges associated with its current database (e.g., reliance on mobile 3G connectivity and discontinued data collection from original FIT sites). These experiences will inform Thailand's system design to ensure robustness and long-term functionality. The inclusion of Malaysian technical expertise and additional sites for data testing will strengthen the project's regional relevance and replication potential.

The project will prioritise publicly owned PV sites for sensor deployment. In Nakhon Ratchasima, the availability of suitable publicly owned solar installations is not expected to be challenging. In the event of future scaling to other provinces where suitable publicly owned solar installations may not be available, farmer cooperatives and private businesses with existing PV installations, including private PV developers, may be engaged. In such cases, the feasibility of potential co-investment and operational partnership arrangements may be explored.

At the national level, consultations with the Thai Meteorological Department (TMD) helped define the technical specifications for the microclimate sensors and data parameters required for integration into national systems. TMD's participation ensures technical compatibility, data standardisation, and compliance with Thailand's broader climate data framework.

Consultations also took place with Thailand Greenhouse Gas Management Organisation (TGO) which played an important role in identifying the Nakhon Ratchasima province as the relevant location to commence the project.

Consultations will also be held with local community representatives to identify high-risk areas within Nakhon Ratchasima province, focusing on understanding local vulnerabilities, gender dynamics, and data needs. For sites identified during implementation under the USP approach, additional site-specific consultations will be conducted with affected communities prior to deployment. The project will expand engagement with civil society organisations (CSOs) operating in Nakhon Ratchasima and nationally, including organisations working on climate adaptation, rural livelihoods, gender equality, and community development. These CSOs will play a key role in facilitating inclusive consultations, identifying vulnerable groups, and ensuring that local knowledge and social dynamics are adequately reflected in project design. These consultations will ensure that local stakeholders are informed, potential risks are identified early, and community feedback is incorporated into site selection and implementation decisions.

Feedback from these discussions will inform the siting strategy for sensor deployment, prioritising flood-prone and drought-affected villages. Consultations with local communities will focus on identifying data needs that directly support local decision-making particularly for farming schedules, water management, and disaster preparedness. To ensure inclusive and locally led design, the project will engage a diverse set of community-level actors, including: (i) farmer cooperatives and irrigation user groups; (ii) women's groups and female farmer networks; (iii) youth organisations and agri-entrepreneur groups; (iv) village health volunteers (VHVs) and local disaster response teams; (v) indigenous and local knowledge holders, particularly those with experience in traditional weather forecasting and water management; (vi) disability advocacy groups; and (vii) informal sector workers involved in climate-sensitive livelihoods.

Engagement will move beyond consultation toward co-design through structured participatory methodologies, including: (a) participatory rural appraisal (PRA), (b) co-design workshops at sub-district level, (c) citizen science approaches for data collection and validation, and (d) iterative feedback loops where community inputs directly inform system design, sensor placement, and platform functionality. These processes will ensure that community knowledge meaningfully shapes project decisions rather than validating pre-defined technical solutions.

Gender analysis will be systematically integrated into consultations through sex-disaggregated data collection, focus group discussions with women and men separately, and engagement with local women's organisations to identify gender-specific climate risks, information needs, and barriers to participation. During the PFG phase, the consultative process will be formalised through a structured stakeholder engagement plan, including: (i) targeted consultations with women's groups and gender-focused organisations; (ii) dedicated sessions with civil society actors; (iii) engagement with private sector stakeholders, including publicly owned PV developers and agri-businesses; and (iv) documentation of stakeholder inputs to ensure traceability in project design decisions.

Note that Nakhon Ratchasima (Korat) is a culturally diverse province and a historical crossroads where several communities coexist. The main local group is the Khorat Thai (Thai Doeng), especially in areas like Chok Chai, with a distinct dialect blending Central Thai and Isan. All groups are able to communicate in standard Thai. Furthermore, no differentiated needs have been identified to date and that this will be assessed as part of the PFG-stage community consultations.

K. Describe how the project/programme draws on multiple perspectives on innovation from e.g., communities that are vulnerable to climate change, research organisations, or other partners in the innovation space, in the context in which the project/programme would take place.

The project combines multiple perspectives on innovation by drawing on community perspectives documented through the 2023–2024 provincial climate-planning process, together with project-specific consultations conducted with national and provincial institutions and technical experts. Local communities and businesses, drought- and flood-affected districts, and district-level disaster response units will inform sensor placement, data needs, and the types of advisories most useful for daily decision-making. Their lived experience of rising temperatures, erratic rainfall and crop losses, as documented through the 2023–2024 provincial consultation process, has informed the project's preliminary design. Direct project-specific consultations during the PFG phase will validate these findings and further shape the platform's practical outputs. Research organisations and international partners will contribute through the development of AI-based forecasting models, calibration

methods, and data validation, building on national and regional climate science. Partnerships with technical agencies experienced in solar infrastructure and digital monitoring support technology transfer and contextual adaptation. DCCE, TMD, TGO, and provincial authorities ensure the innovations align with national adaptation priorities and can be integrated into planning, measurement, reporting, verification, and sectoral systems. By weaving together community priorities, scientific expertise, and institutional mandates, the project ensures the innovations are both context-appropriate and scalable.

L. Provide justification for funding requested, focusing on the full cost of adaptation reasoning.

The proposed project has been designed from the outset to be fully deliverable within the USD 5 million envelope requested from the Adaptation Fund. All activities, institutional arrangements, and delivery modalities are calibrated to this funding level. No co-financing is required or foreseen. The project complies with the Adaptation Fund's "full cost of adaptation" principle by addressing the incremental costs of building climate resilience in remote and vulnerable areas of Thailand, where current systems are insufficient to manage growing climate risks.

Grant funding is required to provide the means for public-sector solar host institutions (Tessaban, SAO and PAO) to participate in the scheme as physical host sites for the sensor co-location component of the AF intervention. The grant will be used to integrate sensor data into the cloud-based national climate data platform institutionally anchored under DCCE's Climate Change Information Center (CCIC), with MHEWS interoperability and standards-based integration into TMD's national observation network. Grant funding will also support the development of standards-based APIs that enable interoperability of the platform with multiple sensor vendors and Thai government systems, mitigating vendor lock-in and preserving the public-good architecture. Grant resources will further provide additional hardware where required including supplementary rain gauges, water-level sensors and microclimate sensors in the three pilot zones (Mueang Nakhon Ratchasima, Pak Chong and Chok Chai) to improve forecast resolution and Early Warning System accuracy for community-level adaptation outcomes.

Grant funding is specifically required to develop the central data platform which will be used to collect, store, validate, analyse and disseminate the climate data, including AI-enabled forecasting tools (drought-onset detection, flash-flood nowcasting, urban heat-island prediction, rainfall downscaling) and the EWS dissemination layer. Public-sector solar operators hosting the project's sensors currently generate operational data on their installations that is neither systematically shared nor analysed for adaptation purposes; the AF-financed platform will enable structured, public-good integration of climate observations co-located with these solar assets into the CCIC for weather prediction, adaptation planning and future policy work. Without a centrally hosted, AF-financed platform that serves as the public-good repository under DCCE/CCIC — with free, non-discriminatory access to core climate data and EWS services for communities, ministries, sectoral agencies, provincial and local governments, academia, civil society and the public — the data generated by the sensor network would not be accessible to the broader public sector or to vulnerable communities. AF financing is therefore strictly ring-fenced to climate adaptation infrastructure (sensors, data platform, MHEWS integration, community capacity building); the PV assets themselves are not financed, deployed or optimised under the AF investment, and any benefits accruing to renewable energy operation are treated as incidental co-benefits outside the project's results framework.

Baseline Scenario (Without AF Financing)

Under the business-as-usual scenario, Thailand's climate risk management continues to rely on a sparse network of approximately 100 national weather stations operated by the Thai Meteorological Department (TMD). These stations provide coarse-resolution data that is often outdated or too generalised to inform local decision-making. Remote and high-risk areas such as those in Nakhon Ratchasima lack real-time, localised climate information, leaving communities, farmers, and local authorities unable to anticipate or respond effectively to floods, droughts, and heatwaves. National risk maps are based on 2020 data and do not reflect current or projected microclimatic variability. Without intervention, this data gap will continue to undermine Thailand's ability to implement its National Adaptation Plan (NAP), particularly in the sectors of water, agriculture, and public health.

Adaptation Scenario Enabled by AF Financing

The Adaptation Fund grant will enable the deployment of a province-wide network of solar-powered microclimate sensors, the development of an AI-enabled forecasting platform, and the integration of real-time data into national and local planning systems. These interventions will provide granular, actionable climate intelligence for vulnerable communities and institutions. The project will also build the capacity of local

technicians, government officials, and community members to operate and maintain the system, ensuring long-term sustainability and ownership. Key adaptation benefits include:

- Improved early warning systems for floods, droughts, and heatwaves.
- Enhanced agricultural planning and water resource management.
- Reduced climate-related losses in food production, infrastructure, and livelihoods.
- Strengthened institutional capacity for climate-informed decision-making.

Full Cost Justification

The AF grant covers the full cost of adaptation by financing the incremental measures required to address climate risks that would not be addressed under the baseline scenario. These include:

- Procurement and installation of commercial-grade microclimate sensors and solar-powered weather stations.
- Development of APIs and data integration tools to ensure interoperability with national systems.
- AI model development for hyperlocal forecasting, which would not be feasible under standard hydromet budgets.
- Capacity-building programs for local and national stakeholders.
- Additional hardware (e.g., rain gauges) to improve forecast accuracy in underserved areas.

Compared to traditional hydrometeorological stations, which are expensive, centralised, and limited in coverage, the proposed system offers a cost-effective, modular, and scalable alternative. For example, the all-in cost of one **IEC 61724-1 Class A** station is approximately USD 8,300, significantly lower than the cost of conventional hydromet infrastructure, which can exceed USD 50,000 per site. Moreover, the integration of AI forecasting reduces long-term operational costs by automating analysis and enabling proactive planning. Following technical consultations with the Malaysia-based technical partner, TMD and DCCE's explicit density target of one station per 10 km × 10 km grid for a total of 205 stations across Nakhon Ratchasima to allow density to be more accurate for adaptation measures. The USD 2,500 figure cited above represents a single hardware sub-component specifically a site gateway/logger unit and not a complete, IEC 61724-1 Class A-compliant weather station ready for integration into TMD's national observation network and the CCIC dashboard. The all-in hardware cost per fully deployed site is composed of two distinct sub-components:

- (i) the IEC 61724-1 Class A weather-station head (sensor suite, housing, bracketry, internal wiring) at USD 4,000 per station, and
- (ii) the corresponding site gateway and data logger at USD 2,500 per station,

The total hardware sub-total is therefore USD 6,500 per deployed site. A complete deployed station also requires a PV-integration kit (clamps, brackets, weatherproof mounts compatible with rooftop or ground-mounted solar racking, and surge protection on the sensor circuit), electrical interface to the host PV system, site surveys including structural verification of the PV host asset, calibration traceable to NIMT/TMD reference standards, transport and logistics, spare parts inventory and quality assurance. The total budget for hardware / installations is described in the table below.

Table 4: Costs for hardware installation (Component 1)

#	Cost line	Quantity / basis	Unit (USD)	Total (USD)
1	IEC 61724-1 Class A weather stations (sensor head, housing, bracketry)	205 stations	4,000	820,000
2	Site gateways and data loggers	205 units	2,500	512,500
3	Pilot demonstration densification — additional micro-climate sensors in three pilot zones (Mueang Nakhon Ratchasima, Pak Chong, Chok Chai)	Lump sum	—	150,000
4	PV-integration kits — clamps, brackets, weatherproof mounts compatible with rooftop and ground-mounted solar racking, plus surge protection on sensor circuits	205 sites	~290	60,000
5	Cabling, electrical interface with host PV system, and on-site networking	205 sites	~195	40,000
6	Site surveys, structural verification of PV host assets and georeferencing	205 sites	~145	30,000

7	Sensor calibration traceable to NIMT / TMD reference standards	Lump sum	–	20,000
8	Logistics, customs clearance and in-country transport / distribution	Lump sum	–	35,000
9	Spare parts inventory and contingency replacements during installation	Lump sum	–	22,500
10	Site coordination, MOUs/agreements with PV asset owners (Tessaban, SAO, PAO) and acceptance testing	Lump sum	–	10,000
Total — Component 1 (sensor deployment only)				1,700,000

The technical solution proposed within the project is cost-effective versus the alternative of additional hydrometeorological stations. The installation or deployment of weather stations are often hampered by the complicated functionality and lack of economic returns of such hardware. Therefore, such installations to be predominantly funded by public sector budgets. Many industrial rooftop solar installations where installed capacities exceed 500 kWp will already likely have weather stations installed as part and parcel of the solar installation. These installations which are paid for by the private sector offers the aggregation of data from many sites for very little cost for public-sector users (i.e. for warning systems).

Table 5: Costs for platform development (Component 1)

Output	Platform (component 2)	Cost (USD)
2.1	Cloud-based national climate data platform with AI-enabled forecasting integrated with MHEWS	950,000
2.2	Integrated ministerial and sectoral dashboards (real-time provincial and national forecasts)	400,000
2.3	APIs enabling interoperability with DCCE's MHEWS and disaster management platforms	350,000
2.4	Microclimate sensor network operational across key zones, feeding high-resolution data into platform and MHEWS	500,000
Total — Component 2		2,200,000

The table below compares **five alternative approaches** considered during concept design against the four AF-requested dimensions, demonstrating that the selected approach is not arbitrarily chosen but is the result of a structured options assessment.

Approach	Indicative CAPEX (205-station equivalent)	Annual OPEX	Cost per indirect beneficiary (1.5–2.0 M)	Sustainability	Scalability	Adaptation impact	Selected?
A. Proposed — IEC 61724-1 Class A sensors co-located on existing public-sector PV	USD 1.7 M (~USD 8,300/station all-in)	USD 145–170 k (USD 1,150/station/yr)	≈ USD 0.85–1.10	High — 90–100% absorbed by Thai public budgets (MDES/TMD, DCCE/CCI, ERTC, Provincial Governor); 5-person team in-kind	High — replication at ≈USD 7,600/station marginal (platform already in place; PV co-location reproducible nationwide)	High — IEC Class A, WMO/WIGOS-compliant, MHEWS-integrated, community-level EWS in 3 pilot zones	YES
B. Traditional hydromet stations on dedicated towers	USD 10.25 M (~USD 50,000/station)	USD 615 k (~USD 3,000/station/yr)	≈ USD 5.10–6.80	High (gold standard) but cost-prohibitive for absorption	Low — replication cost-prohibitive at sub-national scale	High but disproportionate to adaptation need at sub-provincial resolution	No — 6× higher CAPEX, 4× higher OPEX
C. Satellite-based remote	USD 0.3–0.5 M (data)	USD 50–100 k/yr	≈ USD 0.20–0.30	Medium — depends on third-party	High geographically, but no	Low–Medium — typical 1–10 km	No — insufficient

sensing only (no ground sensors)	subscription / pre-processing only)			satellite provider continuity and licensing renewals	micro-climate ground truth	resolution; no real-time sub-kilometre data; cannot validate community-level EWS or feed MHEWS as primary source	resolution and ground-truth for community EWS
D. Crowdsourced / citizen-science consumer-grade stations	USD 0.1–0.15 M (~USD 200–500/station)	Minimal cash, volunteer-dependent	≈ USD 0.05–0.10	Low — calibration drift, volunteer turnover, no IEC/WIGOS compliance	High in volume, but not interoperable with national systems	Low — not accepted by TMD for MHEWS integration; data quality unsuitable for AI forecasting or insurance/policy use	No — not MHEWS-compatible; safeguards and quality gaps
E. Software-only AI forecasting using existing TMD data (no new sensors)	USD 0.5 M (platform only)	USD 50 k/yr	≈ USD 0.25–0.35	High institutional but constrained by data input gap	High software-wise, but adds no observational coverage	Low–Medium — only 3 TMD stations across 20,493 km ² (≈1 per 6,800 km ²); AI cannot compensate for missing micro-climate observations	No — fails to close the underlying observational-density gap identified by DCCE

Why AF Grant Funding Is Essential

Grant funding from the AF is essential to catalyse this innovation. The project involves public goods such as open-access climate data and early warning systems that do not generate immediate financial returns and are therefore unattractive to investors. Domestic budgets are constrained and typically prioritise infrastructure recovery over anticipatory adaptation. The AF grant provides the necessary risk capital to:

- Mobilise solar developers and data providers to participate in the platform.
- Develop the foundational digital infrastructure (e.g., APIs) that allows future integration of hardware from multiple vendors.
- Demonstrate the viability of AI-enabled forecasting in a real-world, high-risk setting.

Without this catalytic investment, Thailand's adaptation efforts will remain constrained by outdated data systems and limited local capacity, leaving vulnerable communities exposed to escalating climate risks.

M. Describe how the sustainability of the project/programme outcomes has been taken into account when designing the project/programme.

Sustainability has been a core consideration throughout the project design, ensuring that outcomes remain effective, locally owned, and institutionally embedded beyond the project's duration. The project promotes sustainability through three key pillars: community engagement, institutional integration, and regional scalability.

At the local level, strong community engagement will underpin long-term ownership and maintenance of deployed sensors and data systems. Local technicians and community representatives will be trained in installation, calibration, and troubleshooting, ensuring the development of in-province technical capacity. This participatory approach encourages local stewardship, reduces reliance on external support, and ensures that equipment remains functional, and data continues to flow after project completion. Regular awareness and capacity-building sessions will also strengthen understanding of how climate and environmental data can inform local planning and early warning systems, fostering behavioural change and demand for continued data-driven decision-making.

The platform will be maintained as a public climate adaptation asset under DCCE/CCIC. Long-term sustainability will be ensured through institutional integration, public budget allocations, technical capacity-building and partnerships with relevant public institutions. Once the AF-financed platform is operational in Nakhon Ratchasima, DCCE exercising its institutional mandate over CCIC will be responsible for replicating and expanding the platform model nationwide, integrating sensor data from additional provinces and from additional public-sector and (where applicable) private-sector data sources into the CCIC repository, so that CCIC progressively achieves its mandated role as the single national platform for climate data across Thailand.

Based on the product specifications, the sensor stations to be deployed meet the **IEC 61724-1 Class A** international standard and are designed with durable, UV-inhibited, weather-resistant materials intended for long-term outdoor operation. While the specific numerical lifespan is not explicitly stated in the datasheet, typical industry standards for this type of industrial-grade, durable sensor array suggest a functional life of 3 to 10 years, depending on the environment, maintenance, and calibration frequency.

To secure replacement parts and manufacturer technical support over the network's expected 10–15 year operational horizon, the project's procurement specifications will include the following mandatory contractual clauses with sensor and hardware manufacturers: (i) minimum 10-year parts availability commitment from delivery date, with liquidated damages for non-performance; (ii) 3–5 year manufacturer warranty covering sensor heads, gateways/data loggers, and communications modules; (iii) 24-month advance end-of-life notification allowing structured migration to successor products; (iv) technical support (documentation, firmware updates, engineering support) for the same period; and (v) compliance with open communication protocols (Modbus, RS-485, MQTT, WMO/WIGOS metadata standards) to ensure that successor products from any qualified manufacturer remain integrable. Because the sensor network is specified to the multi-vendor IEC 61724-1 Class A international standard, replacement parts and successor products are procurable from multiple qualified manufacturers throughout the network's lifetime — the network is not tied to any single supplier. A structured refresh cycle (batteries every 3–5 years; sensor heads and communications modules every 8–10 years; platform hardware every 5–7 years) is built into the recurrent-cost envelope absorbed by CCIC/DCCE public budget lines, thereby covering the at-least-one replacement cycle referenced above.

To avoid platform-level vendor lock-in distinct from the algorithm-level safeguards, the cloud hosting arrangement will be structured to permit migration to alternative providers at any time. The hosting contract will include the following mandatory provisions: (i) data portability requirements — all data stored in open, non-proprietary formats (SQL/PostgreSQL/PostGIS, CSV, JSON, NetCDF, BUFR and WMO/WIGOS-compliant metadata) with full export capability; (ii) open APIs (RESTful, OGC standards) enabling seamless data extraction and re-hosting; (iii) exit provisions guaranteeing DCCE/CCIC full rights to extract all data, configurations, source code and database schemas at any time and at no additional cost; (iv) source-code escrow for all custom-developed platform components; (v) mandatory documentation of platform architecture, dependencies and deployment procedures sufficient to enable re-hosting by an alternative provider or by DCCE/CCIC directly; and (vi) transition-support obligations of at least six months at contract termination. Combined with the open-source back-end software (database, dashboards, APIs, ingestion pipelines) and the modular architecture that allows any component to be replaced without rebuilding the platform, these provisions guarantee that Thailand retains full legal and technical control to operate, modify, migrate or replace the platform independently of any commercial cloud provider.

Regarding data sharing and analysis, all algorithms and derivative works developed or substantially adapted under AF financing are owned by the Thai public sector named DCCE through the CCIC and are released under open-source licences, enabling free reuse and replication; while Malaysian-derived components will be available under perpetual, royalty-free terms with source-code escrow and full derivative-work rights. The Thai public sector holds this IP specifically as a safeguard to protect the public-good, open-source licensing and to prevent any provider from restricting future access after project closure, not as a proprietary or restrictive ownership arrangement. Any incidental use of climate data by non-government actors will remain outside the project results framework and does not drive any project decision. The primary purpose of the platform is to provide public-good climate information for adaptation, Early Warning Services and resilience planning under DCCE/CCIC stewardship.

Once the Nakhon Ratchasima pilot is successfully demonstrated, scale-up to other Thai provinces will be led by the Ministry of Natural Resources and Environment (MoNRE) through DCCE — as the AF Designated Authority and as the institutional owner of the National Adaptation Plan (NAP) and the Climate Change Information Center (CCIC) in partnership with the Ministry of Digital Economy and Society through the Thai

Meteorological Department (TMD) for technical observation-network integration, the Ministry of Energy for replicating the PV co-location model and channelling provincial/ministerial solar funding streams to host sites, and the Ministry of Interior for engaging Provincial Governors, PAOs, SAOs and Tessaban as the local replication interface.

The Ministry of Higher Education, Science, Research and Innovation (through ERTC and partner universities) will support the replication training curriculum, while the Ministry of Agriculture and Cooperatives and the Ministry of Public Health will be associated where the EWS extends into agricultural advisory and heat/health surveillance services. This multi-Ministry replication architecture ensures that nationwide scale-up is not contingent on continued AF financing but is anchored in standing Thai public-sector mandates and budget lines.

During the full project preparation phase, a comparative assessment will be developed of potential interventions to examine the cost-effectiveness of this technology in terms of adaptation outcomes per dollar invested. This will include upfront capital costs, long-term operations and maintenance costs, institutional feasibility, and the breadth and equity of adaptation benefits delivered.

At the institutional level, the project is fully aligned with national and provincial strategies. Integration with existing government systems and digital platforms will ensure data interoperability and long-term relevance. Collaboration with line ministries, provincial offices, and the local governor will ensure that the sensor network and platform are managed in accordance with existing regulatory frameworks and that responsibilities for maintenance, data sharing, and policy integration are clearly defined. This alignment strengthens institutional ownership and facilitates resource mobilisation from public budgets once donor support concludes.

An MoU has been signed with the Ministry of Interior covering the National Adaptation Plan (NAP). This MoU will provide a nationwide framework and engagement with all regions and local governments. The project will prioritize solar systems installed at government sites especially within the responsible especially those owned by subdistrict administrative organizations (SAOs) in Nakhon Ratchasima province. Sensors will be added to existing government solar installations to monitor performance and support adaptation/resilience measures. Preliminary consultations have been held with the provincial environment office (under the Governor) and the provincial energy office. Both indicate high feasibility for implementation in Nakhon Ratchasima due to widespread government solar installations and high risk from adaptation.

Long-term operational sustainability is anchored on the Climate Change Information Center (CCIC) under DCCE, which holds the institutional mandate to operate the national climate data center within the Ministry of Natural Resources and Environment, ensuring that the project's outputs remain within a standing public-sector function rather than relying on time-bound project arrangements. During implementation, the project will aim for the Thai Meteorological Department (TMD), together with CCIC, to take on joint operational management of the monitoring system covering the 205-station observation network, calibration to NIMT/TMD reference standards, sensor maintenance and data flows into MHEWS. If TMD declines to assume formal responsibility at full proposal stage, CCIC under DCCE will assume sole responsibility to continue managing and maintaining the equipment, hosting the data platform and sustaining the recurrent operations beyond project closure. This will be formalised through written commitments from MDES/TMD and MoNRE/DCCE-CCIC annexed to the full proposal at the PFG stage.

Annual post-project recurrent costs are estimated at USD 145,000–170,000 per year for the full 205-station network composed of:

- USD 600 in network-wide calibration travel costs (with the 5-person field team absorbed in-kind by the Nakorn Rachasrima Governor's umbrella)
- USD 112,750 for platform maintenance (USD 550 × 205 stations), and
- Approximately USD 30,000–55,000 for training, coordination and contingency to be absorbed approximately 90–100% by Thai public budget lines (CCIC, under DCCE).

This arrangement is structured to preserve free public-good, non-discriminatory access to climate data and community EWS for all users. No user fees, subscription streams or willingness-to-pay mechanisms form part of the project's sustainability model; recurrent costs are absorbed in full by Thai public budget lines under CCIC/DCCE.

At project completion, the monitoring equipment will be transferred to the responsible department so it can include maintenance in its annual budget.

Further, the project is designed with replication and regional scalability in mind. Nakhon Ratchasima province will serve as a demonstration site, where operational experience, stakeholder engagement models, and lessons learned will inform the adaptation of similar systems in other provinces. The design emphasises low-cost, modular technology and open-data architecture, allowing replication with moderate additional investment. By establishing a robust model for climate and environmental data management, the project will also generate regional learning for other ASEAN countries pursuing climate resilience and digital adaptation solutions.

Together, these measures ensure that the project will not only deliver high-level benefits but also establish a self-sustaining system that continues to operate, expand, and inform policy long after the initial implementation phase.

Note that regarding environmental sustainability, the project will not install new solar panels; instead, it will use the existing government-owned solar systems (and potentially privately-owned systems). The only additional equipment to be provided is batteries, which have a service life of 3-10 years. When replaced, spent batteries will be sent to certified industrial and hazardous-waste disposal facilities in accordance with Thai regulatory standards under the Ministry of Industry.

Long-term institutional sustainability of the platform is anchored on DCCE's standing mandate, through the Climate Change Information Center (CCIC), to consolidate, host and disseminate climate-related data from across Thailand as a national public good. Once the AF-financed platform is operational in Nakhon Ratchasima, DCCE — exercising its institutional mandate over CCIC — will be responsible for replicating and expanding the platform model nationwide, integrating sensor data from additional provinces and from additional public-sector and (where applicable) private-sector data sources into the CCIC repository, so that CCIC progressively achieves its mandated role as the single national platform for climate data across Thailand

As the consultation with DCCE, the ownership will be Government related, the government allocates as common practice budgets for domestic waste management and currently contracts out segregated waste disposal services.

N. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project/programme.

Table 6: Environmental and Social Impacts and Risks

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		<i>Level:</i> Low <i>Risk to outcomes:</i> Non-compliance with national or provincial regulations on electronic waste disposal or data governance could delay implementation or risk regulatory sanctions. <i>Mitigation:</i> All activities will comply with Thai environmental, ICT, and data protection laws. The project is being implemented in close coordination with relevant government agencies and in consultation with the provincial governor's office to ensure alignment with local regulations and procedures. Provincial waste management guidelines will be followed for end-of-life disposal and recycling of all equipment.
Access and Equity		<i>Level:</i> Medium <i>Risk to outcomes:</i> Certain communities, particularly remote or underserved areas, may not benefit equally from the sensor network. <i>Mitigation:</i> Site selection will ensure broad and inclusive coverage across Nakhon Ratchasima, with no exclusion of populations based on geography, income, or demographic characteristics.
Marginalised and Vulnerable Groups		<i>Level:</i> Medium <i>Risk to outcomes:</i> Vulnerable or marginalised groups could be excluded from participation or data benefits. <i>Mitigation:</i> Stakeholder engagement and community outreach will prioritise representation from all groups, ensuring equitable access to project benefits and capacity-building activities.
Human Rights		<i>Level:</i> Low <i>Risk to outcomes:</i> Mishandling of data could compromise individuals' privacy or rights.

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
		<i>Mitigation:</i> The project will adhere to national data protection frameworks and human rights standards.
Gender Equity and Women's Empowerment		<i>Level:</i> Medium <i>Risk to outcomes:</i> Women may have limited participation in training or decision-making processes related to sensor deployment and maintenance. <i>Mitigation:</i> Gender-inclusive approaches will be adopted, with active outreach to ensure equal opportunities for women in technical training and stakeholder consultations.
Core Labour Rights		<i>Level:</i> Low <i>Risk to outcomes:</i> Field technicians may face unsafe working conditions or lack proper labour protections. <i>Mitigation:</i> Contractors and local partners will adhere to national labour laws. Training and safety equipment will be provided to ensure occupational health and safety.
Indigenous Peoples		<i>Level:</i> Low <i>Risk to outcomes:</i> Potential conflict if project activities overlap with indigenous or culturally sensitive lands. <i>Mitigation:</i> No impacts are anticipated as installations will occur in existing public or government-managed facilities.
Involuntary Resettlement		<i>Level:</i> Low <i>Risk to outcomes:</i> Installation activities could require land acquisition or restrict land use. <i>Mitigation:</i> The project will use existing government or community facilities; no land acquisition or resettlement will be required.
Protection of Natural Habitats		<i>Level:</i> Low <i>Risk to outcomes:</i> Installation in ecologically sensitive areas could disturb local ecosystems. <i>Mitigation:</i> Sites will be screened to avoid protected areas and biodiversity hotspots. Installation will use minimal land footprint.
Conservation of Biological Diversity		<i>Level:</i> Low <i>Risk to outcomes:</i> A poor site could affect local flora and fauna. <i>Mitigation:</i> Environmental screening and consultation with local authorities will ensure biodiversity considerations are integrated in site selection.
Climate Change		<i>Level:</i> Medium <i>Risk to outcomes:</i> Extreme weather events (floods, storms, heat) could damage sensors and solar units, interrupting data collection. <i>Mitigation:</i> Equipment is specifically designed to be climate-resilient, with rapid-response maintenance protocols. Vulnerability mapping will inform placement of sensors to minimize exposure.
Pollution Prevention and Resource Efficiency		<i>Level:</i> Low <i>Risk to outcomes:</i> Improper disposal of sensors, batteries, or solar components could cause environmental harm. <i>Mitigation:</i> End-of-life disposal and recycling will follow Nakhon Ratchasima's provincial regulations, aligning with SDG 12 and the Provincial Development Plan (2023-2027).
Public Health		<i>Level:</i> Low <i>Risk to outcomes:</i> Malfunctioning or damaged equipment could pose physical hazards to nearby communities. <i>Mitigation:</i> Routine inspection and maintenance will be carried out, and damaged units will be promptly removed or repaired.
Physical and Cultural Heritage		<i>Level:</i> Low <i>Risk to outcomes:</i> Installation near culturally significant sites could cause unintended disturbance. <i>Mitigation:</i> Site selection will exclude heritage or religious sites, in consultation with local authorities and communities.
Lands and Soil Conservation		<i>Level:</i> Low <i>Risk to outcomes:</i> Improper installation of poles or foundations for sensors could cause minor soil disturbance or erosion. <i>Mitigation:</i> Installation will use non-invasive mounting techniques that minimise ground disturbance.

PART III: IMPLEMENTATION ARRANGEMENTS

- A. Describe the arrangements for project/programme management at the regional and national level, including coordination arrangements within countries and among them. Describe how the potential to partner with national institutions, and when possible, national implementing entities (NIEs), has been considered, and included in the management arrangements.

Implementing Entity (IE): UNIDO will serve as the Implementing Entity (IE), responsible for fiduciary oversight, supervision of project delivery, quality assurance of environmental, social and gender standards, and compliance with AF policies. UNIDO will approve annual work plans and budgets, monitor implementation progress, and ensure that reporting, M&E, and safeguards requirements are met. In line with AF and UNIDO policies, any execution functions undertaken by UNIDO will be carried out independently and under separate management arrangements from its IE functions.

Executing Entities: The Department of Climate Change and Environment (DCCE) under MONRE will act as the primary Executing Entity for Component 3, responsible for day-to-day implementation, coordination with provincial authorities, engagement with communities and farmer groups, and the operational management of project activities in Nakhon Ratchasima. DCCE will also lead coordination with national institutions on data integration and alignment with national systems.

Government Partner: The Ministry of Natural Resources and Environment (MONRE), through DCCE, will provide government leadership and strategic oversight, ensure alignment with national adaptation frameworks, and facilitate cooperation with relevant line ministries and agencies

Role of UNIDO in Execution (as applicable): UNIDO will undertake limited execution functions only where specifically justified, focusing on specialized technical support, capacity development, and knowledge dissemination for Components 1 and 2. Any execution roles carried out by UNIDO will remain fully distinct and non-overlapping with its IE responsibilities.

The above mentioned implementation arrangements can further be supported using the executing entity fee calculator.

2. If IE act as EE, or act the part of EE(s)

Step3: Fill out the amount (USD) and Choose EE Type in green cells

Project/Program Activity Cost: A	Amount (USD)	EE type	Error Check
Component 1	1700000	IE executes as E	
Component 2	2200000	IE executes as E	
Component 3	587260	Non-IE execute	
Component 4			
Component 5			
Component 6			
Component 7			
Component 8			
Total Component :A	4.487.260		

Step4: Fill out the amount (USD) in green cells and adjust the figures until no error messages pop up

	Amount (USD)		Error Check
	Proposed figure	Cap	
Total Component :A	4.487.260		
Fees for IE acting as part of EE(s)	59.390	\$59.390	
Fees for Non-IE acting as EE(s)	61.646	\$61.646	
Total EE fee: B	121.036		
Total Program Cost : A+B	4.608.296		
IE fee: C	391.705		
Total Request: A+B+C	5.000.001		

The Kingdom of Thailand agrees to apply to the present project, mutatis mutandis, the provisions of the Revised Standard Technical Assistance Agreement concluded between the United Nations and the Specialized Agencies and the Government on 4 June 1960.

B. Describe the measures for financial and project/programme risk management.

N/A at this stage.

C. Describe the measures for environmental and social risk management, in line with the Environmental and Social Policy of the Adaptation Fund.

N/A at this stage.

D. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.

N/A at this stage.

E. Include a results framework for the project / programme proposal, including milestones, targets, and indicators

N/A at this stage.

F. Demonstrate how the project/programme aligns with the Results Framework of the Adaptation Fund

Note that the below targets for the indicators and budgets for each Indicator have not yet been fully defined, and will be finalised during full project preparation.

Project Outcomes	Project Outcome Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant (USD)	Amount
Outcome 1.1: Improved accuracy of localised weather and climate risk monitoring.	Number of microclimate sensors and weather stations installed and operational; % improvement in forecast accuracy vs. TMD baseline. Baseline and targets to be finalised at PFG stage.	Outcome 8: Innovation for effective, long-term adaptation to climate change accelerated, encouraged, and enabled to scale up	Indicator 8A: Innovations successfully reaching scale up that demonstrate local innovation participation and/or local innovation benefit [# of innovations]	1,200,000	
Outcome 1.2: Stronger early warning systems for floods, droughts, and heatwaves.	% of priority high-risk zones covered by the sensor and early warning network; number of EWS alerts issued. Baseline and targets to be finalised at PFG stage.	Outcome 1: Reduced exposure to climate-related hazards and threats	Indicator 1: People using climate-related threat and hazard information [# of people, by sex, by sector, and by hazard]	150,000	
Outcome 1.3: Enhanced decision-making for agriculture, water management, and disaster preparedness.	Volume of data transmitted to national platforms; number of local agencies using climate data in planning decisions. Targets to be finalised at PFG.	Outcome 4: Increased adaptive capacity within relevant development sector services and infrastructure assets	Indicator 4 (Core Indicator 3): Physical assets improved or constructed to withstand climate variability and change [by km of linear infrastructure and # of point infrastructure, and by sector]	350,000	
Outcome 2.1: Real-time climate intelligence available for national and local planning.	Platform operational and accessible to target ministries/agencies (Y/N); number of ministries with active platform access. Targets to be finalised at PFG.	Outcome 8: Innovation for effective, long-term adaptation to climate change accelerated, encouraged, and enabled to scale up	Indicator 8A: Innovations successfully reaching scale up	950,000	
Outcome 2.2: Faster and more coordinated response to climate-related shocks.	Number of forecasts/advisories generated per month; % reduction in average response time. Baseline and	Outcome 1: Reduced exposure to climate-related hazards and threats	Indicator 1: People using climate-related threat and hazard information	400,000	

		targets to be finalised at PFG.				
Outcome 2.3: Institutionalised climate data governance and digital infrastructure.		Number of API integrations with government systems; % of decision-makers using platform outputs. Targets to be finalised at PFG.	Outcome 7: Improved policies and regulations that promote and enforce resilience measures	Indicator 7: Policies, strategies, and/or plans adopted, implemented, and/or enforced that integrate climate risk and resilience considerations		350,000
Outcome 2.4: AI-assisted forecasting models developed and calibrated using localised data.		Number of AI-assisted forecasting models developed, tested and operationalised; accuracy of AI forecasts vs. observed conditions. Baseline and targets to be finalised at PFG.	Outcome 8: Innovation for effective, long-term adaptation to climate change accelerated, encouraged, and enabled to scale up	Indicator 8A: Innovations successfully reaching scale up		500,000
Outcome 3.1: Increased technical capacity for climate-informed planning at all levels.		Number of government, technical and community personnel trained (sex-disaggregated); % of trained personnel actively applying skills. Baseline and targets to be finalised at PFG.	Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	Indicator 2: Institutions with strengthened capacity to understand and better address climate risks and resilience [# of institutions, by scale, by sector, and by type of institution]		165,000
Outcome 3.2: Community ownership of monitoring systems leading to sustained use.		Number of community members trained (sex-, age-, disability-disaggregated); number of local actors using climate data for planning. Baseline and targets to be finalised at PFG.	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes	Indicator 3A: People with strengthened awareness of climate change risks and how to better address them [# of people, by sex, by vulnerable groups, and by sector]		195,000
Outcome 3.3: Stronger institutional collaboration around NAP implementation.		Frequency of coordination meetings held; number of KM products developed and disseminated (national and ASEAN). Targets to be finalised at PFG.	Outcome 7: Improved policies and regulations that promote and enforce resilience measures	Indicator 7: Policies, strategies, and/or plans adopted, implemented, and/or enforced that integrate climate risk and resilience considerations		227,260
Total outcome level grant amount						4,487,260
Project Outcome	Project Output(s)	Project Indicator(s)	Fund Output	Fund Indicator	Output	Grant Amount (USD)
Outcome 1.1	Output 1.1: Network of microclimate sensors and solar-powered weather stations installed in priority high-risk zones.	Number of stations installed and operational (target: 205 stations at DCCE-endorsed	Output 8.1: Innovations identified and that collectively	Indicator 8.1A: Innovations identified that demonstrate local innovation participation and/or		1,200,000

		10 km × 10 km density).	enhance local innovation capacity	local innovation benefit [# of innovations]	
Outcome 1.2	Output 1.2: Operational data transmission system linked to national meteorological and disaster management platforms.	Data transmission system operational and integrated with TMD/MHEWS (Y/N); % operational uptime.	Output 1.2: Targeted population groups covered by warning and advisory services for climate-related hazards and threats	Indicator 1.2A (Core Indicator 2): Early warning systems established or improved [# of systems, disaggregated by hazard and by scale]	150,000
Outcome 1.3	Output 1.3: Baseline data collection on temperature, rainfall, and humidity across remote regions.	Baseline dataset established and validated (Y/N); number of climatic parameters monitored.	Output 4.1: Vulnerable development sector services and infrastructure assets strengthened	Indicator 4.1: Development sector services strengthened to respond to climate variability and change [# of sector services, by sector and scale]	350,000
Outcome 2.1	Output 2.1: Cloud-based national climate data platform with AI-enabled forecasting tools integrated with Thailand's existing Multi-hazard Early Warning Systems.	Platform deployed, operational under CCIC/DCCE and MHEWS-integrated (Y/N).	Output 8.1: Innovations identified and piloted that collectively enhance local innovation capacity	Indicator 8.1B: Innovations piloted that demonstrate local innovation participation and/or local innovation benefit [# of innovations]	950,000
Outcome 2.2	Output 2.2: Integrated dashboards accessible to ministries and sectoral agencies displaying real-time provincial and national forecasts.	Number of dashboards deployed and operational; number of ministerial/sectoral users.	Output 1.2: Targeted population groups covered by warning and advisory services	Indicator 1.2B: People covered by new or improved early warning systems [# of people, disaggregated by sex and by hazard]	400,000
Outcome 2.3	Output 2.3: APIs enabling data interoperability with existing government systems, including DCCE's MHEWS and related disaster management platforms.	Number of standards-based APIs deployed; number of government systems interoperating with CCIC.	Output 7.1: Improved integration of climate-resilience strategies into country development plans	Indicator 7.1A (Core Indicator 6): Policies, strategies, and/or plans developed or adjusted to integrate climate risk and resilience considerations	350,000
Outcome 2.4	Output 2.4: Network of microclimate weather sensors installed and operational across key zones, feeding high-resolution data into both the provincial platform and MHEWS.	Number of microclimate sensors deployed in pilot zones; data volume feeding platform and MHEWS.	Output 8.1: Innovations identified and piloted that collectively enhance local innovation capacity	Indicator 8.1B: Innovations piloted that demonstrate local innovation participation and/or local innovation benefit	500,000
Outcome 3.1	Output 3.1: Training modules and manuals for sensor maintenance and data interpretation.	Number of training modules and manuals developed and delivered (Thai and Isan dialect where relevant).	Output 2.1: Strengthened capacity of institutions to understand and better address climate risks	Indicator 2.1: Institutions supported to strengthen capacity to understand and address climate risks and resilience	165,000
Outcome 3.2	Output 3.2: Workshops delivered to government units and community focal points, with targeted quotas	Number of workshops delivered; number of participants (sex-, age-,	Output 3.1: Targeted population groups participating in adaptation and risk	Indicator 3.1: People participating in activities to improve awareness of climate risks and	195,000

	(minimum 40–50%) for women's participation and tailored training formats.	disability-disaggregated); % women.	reduction awareness activities	how to address them [# of people, disaggregated by sex and by vulnerable groups]	
Outcome 3.3	Output 3.3: Established feedback and coordination mechanism between national and local actors. Output 3.4: Knowledge management covering knowledge product development, replication toolkit production, community materials, ASEAN outreach and the open-data portal.	Number of coordination meetings held; number of KM products developed and disseminated.	Output 3.2: Strengthened capacity of national and subnational stakeholders and entities to capture and disseminate knowledge and learning	Indicator 3.2: Climate resilience knowledge products and/or tools developed and shared with stakeholders [# of products/tools, by sector]	227,260
Total output level grant amount					4,487,260

G. Include a detailed budget with budget notes, broken down by country as applicable, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs

N/A at this stage.

H. Include a disbursement schedule with time-bound milestones.

N/A at this stage.

PART IV: ENDORSEMENT BY GOVERNMENTS AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government²⁸

Provide the name and position of the government official and indicate date of endorsement for each country participating in the proposed project/programme. Add more lines as necessary. The endorsement letters should be attached as an annex to the project/programme proposal. Please attach the endorsement letters with this template; add as many participating governments if a regional project/programme:

Mr. Phirun Saiyasitpanich Director General Department of Climate Change and Environment Ministry of Natural Resources and Environment	Date: (February 9, 2026)
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B. Implementing Entity certification

Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address

i. ⁶ Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

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 (.....list here.....) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social 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.

Ms. Ganna Onysko
 Senior GEF, GCF, AF Coordinator
 Division of Funding Partner Relations
 Directorate of Global Partnerships and External Relations
 United Nations Industrial Development Organization -
 UNIDO Implementing Entity Coordinator

Date: ~~(Month, Day, Year)~~ September 09, 2026

Tel. and email:

Project Contact Person: Rasha Abdrabu

Tel. And Email: R.ABDRABU@unido.org ; +43 1 26026 3454

Annexes:

Annex A: UNIDO AF Stakeholder Consultation Meeting Minutes

Annex B: English_ Stakeholder Consultation Report

Annex C: Thai_ Stakeholder Consultation Report

Annex D: MNRE Justification Letter for UNIDO

Annex E: Coordination Meeting with DCCE and TMD

Annex F: CCIC Structure, Thai version

Annex G: CCIC Structure, English version

URGENT

No. 0804/ 342



Ministry of Natural Resources
and Environment
92 Soi Phahon Yothin 7
Phahon Yothin Road
Bangkok 10400 Thailand
Tel./Fax. (+66) 2 298 5646

9 February B.E. 2569 (2026)

To: The Adaptation Fund Board

**Subject: Endorsement for Microclimate–Energy Nexus Platform for Climate
Adaptation in Remote Areas in Thailand (Programme on Innovation)**

In my capacity as Designated Authority for the Adaptation Fund in Thailand, I confirm that the above national project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Thailand.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by the United Nations Industrial Development Organization (UNIDO) and executed by Thailand's Department of Climate Change and Environment.

Yours sincerely,

(Mrs. Raweewan Bhuridej)

Permanent Secretary

Ministry of Natural Resources and Environment

I hereby endorse and validate this Letter of Endorsement (LOE)

(Mr. Phirun Saiyasitpanich)

Director General

Department of Climate Change and Environment

Adaptation Fund Board Secretariat
c/o Global Environmental Facility,
Mail stop: N 6-600
1818 H Street NW
Washington D.C.

Primary Contact Point of the Designated Authority to the Adaptation Fund



Revised PFG Submission Form¹ (**additions in red**)

Project Formulation Grant (PFG)

Submission Date: 8-9 September 2026

Adaptation Fund Project ID:

Country/ies: Thailand

Title of Project/Programme: Microclimate–energy nexus platform for climate adaptation in remote areas in Thailand

Type of IE (NIE/RIE/MIE): MIE

Implementing Entity: UNIDO

Executing Entity/ies: United Nations Industrial Development Organization (UNIDO)

A. Project Preparation Timeframe

Start date of PFG	December 2026
Completion date of PFG	June 2027

B. Proposed Project Preparation Activities (\$)

List of Proposed Project Preparation Activities	Output of the PFG Activities	US\$ Amount	Budget note ²
1. Conduct integrated baseline, gender, climate risk, environmental and social risk, and institutional analyses (including HACT) to generate a validated evidence base.	Output 1: Consultation, Data Collection, and Technical Assessments Deliverables: CRVA Report; Baseline Datasets; Feasibility Report; Stakeholders' Consultation Report; ESMP & Screening Report; Gender Mainstreaming Plan; HACT Compliance Report.	103,000	• CRVA: US\$ 15,000 • Baseline Assessment: US\$ 15,000 • Technical Feasibility (including PV developer business case & technology feasibility assessment): US\$ 10,000 • Stakeholder Consultations: US\$ 22,000 • ESMF: US\$ 16,000 • Gender Analysis: US\$ 15,000

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.

			• HACT Assessment (DCCE): US\$ 10,000
2. Formulation of the full AF submission package, Monitoring, Evaluation, and Learning (MEL) framework development, national validation processes, and required revisions.	Output 2: Preparation of the AF Submission Package and Revision Process Deliverables: Final Fully Developed Proposal and Annexes; Validation Report; Mission Report.	~~34,250~~ 35,249	• Drafting Fully Developed Project Proposal, including exit strategy: US\$ 14,743 • National Validation Workshop: US\$ 8,000 • Monitoring Mission: US\$ 12,506
Implementing Entity (IE) Support Costs	IE admin and technical support for the project development and supervision Compliance assurance	~~12,750~~ 11,751	UNIDO technical and admin support for project development and supervision. The PFG IE Fee covers UNIDO project support costs associated with the preparation and implementation of the project, including administrative, procurement, financial, and technical support services. The monitoring function has been removed. Activities under Output 2 relate specifically to stakeholder consultations, validation processes, and workshops conducted during the PFG phase.
Total Project Formulation Grant		150,000	

Please describe below each of the PFG activities and provide justifications for their need and for the amount of funding required:

Description of the required activity	Justification for the need and for the amount
To conduct a Climate Risk and Vulnerability Assessment (CRVA):	The Climate Risk and Vulnerability Assessment covers assessments of climate risks, climate exposure, sensitivity, and vulnerability and identification of adaptation measures for the target sector in the identified regions. Measuring the sector's vulnerability to climate change impacts is necessary to increase the sector's resilience. This assessment will be conducted by a national adaptation expert, with the support of a project assistant to facilitate related travel of the adaptation expert and coordination with various stakeholders

To conduct a baseline assessment	The baseline assessment will be conducted so that the data and information is provided to support the interventions proposed and indicators/targets aimed at. The methodology will be based on a participatory approach, collecting primary data at the local, community level and secondary data.
Technical feasibility study for sensor deployment and solar integration	Assess the different technology options and sites and recommend sensor models and installation sites.
To carry out detailed stakeholders' consultations at local and national level:	Stakeholder consultation serves as a fundamental mechanism for collecting information, perspectives, and feedback from individuals involved in a project. This activity will serve to ensure further alignment of an engagement plan with the needs, expectations, and concerns of all relevant stakeholders. The stakeholders' consultations will target specifically selected project sites, involving local communities and indigenous populations. While no direct impacts on indigenous peoples are anticipated based on current site selection, consultations will remain inclusive should any such groups be identified during implementation.
To conduct an Environmental and Social Management assessment:	This activity is an integral part of UNIDO Environmental and Social Safeguards Policy and Procedures, applicable to all UNIDO projects and programmes submitted to the AF. It requires that UNIDO projects and programmes undergo environmental and social risk (E&S) assessments which will help decide on the categorization of the project and identify environmental and social issues that should be addressed in its development and implementation. The ESM will provide guidance on how to mitigate the environmental and social risks during the project implementation phase. This activity will be conducted by a technical expert and will require local travel to the project sites.
To carry out an In-depth gender analysis in order to effectively mainstream gender issues into the design:	This activity will allow mainstreaming a gender perspective is the process of assessing the implications for women and men of any planned action, including legislation, policies or programmes, in all areas and at all levels. It is a strategy for making both women and men's concerns, experiences and aspirations an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres so that they benefit equally, and inequality is not perpetuated. This activity will be conducted by a national gender expert and will require travel to the project sites and consultations with various groups of beneficiaries.
To carry out a monitoring mission by the backstopping officer of UNIDO	This travel is earmarked for the project manager of UNIDO who needs to contribute in terms of technical backstopping, supporting the mobilization of the endorsement letter and the stakeholders' consultations with key institutions and providing orientation on the project design, scope and budgeting. The fee of the project manager is covered by the support costs
To prepare the full-fledge project proposal as per the	This activity will gather the results of all the assessments conducted during the preparation of the full fledge project proposal, following the template of the Adaptation fund and the requirements of UNIDO. The full-fledge proposal will

For LLA Projects only:

If requesting additional funding for LLA projects to enable devolving decision making to the local level, please specify the activities that would directly serve to enable devolving decision making to the lowest appropriate level and enable local actors to make informed decisions on how adaptation actions are defined, prioritized, designed, and implemented:

Please provide justifications for their need and for the amount of additional funding required:

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	Ms. Ganna Onysko Senior GEF, GCF, AF Coordinator Division of Funding Partner Relations Directorate of Global Partnerships and External Relations United Nations Industrial Development Organization - UNIDO Implementing Entity Coordinator	
Signature		Date: 8⁹ September 2026
Project Contact Person	Rasha Abdrabu R.ABDRABU@unido.org +43 1 26026 3454	
Telephone	+43 1 26026 3708	
E-mail	TO: g.onysko@unido.org CC: gef@unido.org / glo@unido.org / f.haidara@unido.org	

Record of Stakeholder Consultation Meetings

Strengthening Climate Adaptation in Nakhon Ratchasima Province through Integrated Climate Data, Early Warning Systems and Community Resilience

Consultation Period: September 2025 – March 2026

Prepared by: UNIDO Project Development Team

Document Purpose: Stakeholder Engagement Evidence for Submission to the Adaptation Fund

1. Introduction and Purpose

This document compiles the official minutes of the stakeholder consultation meetings conducted by the United Nations Industrial Development Organization (UNIDO) in the framework of the development of a project proposal to be submitted to the Adaptation Fund (AF). The project aims to strengthen climate change adaptation in the Kingdom of Thailand, with Nakhon Ratchasima province identified as the primary pilot site due to its compounded exposure to drought, flooding and heat-stress hazards.

The consultations were organised in close coordination with the Department of Climate Change and Environment (DCCE) of the Ministry of Natural Resources and Environment, which serves as the Designated Authority (DA) for the Adaptation Fund in Thailand. Meetings engaged government entities, scientific institutions, technical experts, provincial authorities and gender specialists to ensure that the proposed intervention is fully aligned with Thailand's National Adaptation Plan (NAP), the emerging Climate Change Information Center (CCIC), and the needs of vulnerable communities.

These minutes serve as a formal record of the stakeholder engagement process and are submitted as supporting evidence of country ownership, institutional endorsement, and inclusive consultation, in accordance with the Adaptation Fund's policies on stakeholder engagement, environmental and social safeguards, and gender mainstreaming.

1.1 Key Institutional Acronyms

- UNIDO – United Nations Industrial Development Organization
- AF – Adaptation Fund
- DCCE – Department of Climate Change and Environment (Thailand)
- ERTC – Environmental Research and Training Center (under DCCE)
- CCIC – Climate Change Information Center (to be established under DCCE by 2026)
- TMD – Thai Meteorological Department
- TGO – Thailand Greenhouse Gas Management Organization (Public Organization)
- NAP – National Adaptation Plan of Thailand
- GEF – Global Environment Facility
- MAF – Multilateral Adaptation Fund portfolio / programmes

2. Summary of Consultations

A total of eight (8) formal/informal consultation meetings were conducted between 8 September 2025 and 23 March 2026. The table below provides an overview of these engagements.

Minute	Date	Subject / Key Stakeholder
Minute 1	8 Sept 2025	ERTC / DCCE – NAP & CCIC alignment
Minute 2	9 Sept 2025	Office of the Governor of Nakhon Ratchasima – Provincial acknowledgement
Minute 3	2 Oct 2025	Thai Meteorological Department (TMD) – Climate data and sensor network
Minute 4	6 Oct 2025	Technical Expert (Malaysia) – Technology transfer on sensors and platform
Minute 5	31 Oct 2025	ERTC / DCCE – Presentation of draft concept proposal
Minute 6	2 Feb 2026	DCCE National Committee – Concept note defence and endorsement
Minute 7	19 Mar 2026	Ministry of Energy (Thailand) – Public-sector solar installation and funding sources
Minute 8	19 Mar 2026	Gender Expert – Gender mainstreaming in the revised concept
Minute 9	23 Mar 2026	ERTC & CCIC – Response to AF Secretariat comments

Minute 1 – Inception Consultation with ERTC / DCCE

Meeting Title	Inception Consultation on the National Adaptation Plan (NAP) and the Climate Change Information Center (CCIC)
Date	Monday, 8 September 2025
Time	14:00 – 16:00 hrs (Bangkok time)
Venue	Environmental Research and Training Center (ERTC), DCCE, Ministry of Natural Resources and Environment, Thailand
Chair	Senior representative, Environmental Research and Training Center (ERTC), DCCE
Convened by	DCCE in response to UNIDO request for inception consultation

Participants

Name / Representative	Position / Role	Organization
Den	Senior Researchers / Technical Officers	Environmental Research and Training Center (ERTC)
Wittawat WULYAPASH	National Project Associate	UNIDO
Supalerk KANASOOK	National Project Coordinator	UNIDO

Agenda

- Introduction of UNIDO and the scope of the proposed Adaptation Fund project.
- Overview by DCCE/ERTC of the status of the National Adaptation Plan (NAP) and the upcoming Climate Change Information Center (CCIC).
- Identification of priority geographic area for the AF project.
- Coordination with other relevant institutions (TMD, TGO) and communities.
- Agreement on next steps for stakeholder engagement.

Key Discussion Points

Status of the NAP and CCIC: DCCE informed UNIDO that Thailand’s National Adaptation Plan is being operationalised, and that the Climate Change Information Center (CCIC) is expected to be formally established within 2026. The CCIC will serve as the national platform for collecting, integrating and disseminating climate-related data through a dedicated CCIC dashboard, which will in turn support adaptation planning at national and sub-national levels.

Data gaps: DCCE highlighted that although data collection mechanisms exist, the frequency and resolution of climate data (????????????????) remain limited. Strengthening the observation network and the data flow into the CCIC was identified as a priority where AF financing can generate significant added value.

Priority province – Nakhon Ratchasima: Based on DCCE’s risk mapping, Nakhon Ratchasima province was identified as the most adaptation-vulnerable province in Thailand, exposed to a compounded risk profile of drought, flooding and extreme heat. DCCE therefore recommended that the AF project focus and be piloted in Nakhon Ratchasima first, with potential for replication nationwide.

Inter-agency coordination: DCCE confirmed that the CCIC is already working closely with the Thai Meteorological Department (TMD) on climate data. DCCE offered to facilitate and arrange a dedicated meeting between UNIDO and TMD.

Community engagement and prior studies: DCCE noted that DCCE and the Thailand Greenhouse Gas Management Organization (TGO) have jointly conducted nationwide studies on climate data and adaptation, including for Nakhon Ratchasima. These studies include stakeholder consultation results that can be directly leveraged by UNIDO.

Provincial contact: DCCE shared with UNIDO the official contact point of the Governor of Nakhon Ratchasima province to initiate provincial-level engagement.

Decisions and Agreements

- The AF project will be piloted in Nakhon Ratchasima province, with the design anchored on the NAP priorities and fully integrated with the forthcoming CCIC.
- DCCE/ERTC will serve as the primary national counterpart for the AF project development process.
- DCCE will facilitate engagement with TMD and share the DCCE/TGO climate study, including the stakeholder consultation records.

Action Items

No.	Action Item	Responsible	Deadline
1	Share the DCCE/TGO climate and adaptation study including stakeholder consultation records with UNIDO.	DCCE / ERTC	Sept 2025
2	Facilitate and schedule a coordination meeting with the Thai Meteorological Department (TMD).	DCCE	Sept–Oct 2025
3	Initiate engagement with the Office of the Governor of Nakhon Ratchasima province.	UNIDO	Sept 2025
4	Integrate NAP priorities and CCIC architecture into the emerging AF concept proposal.	UNIDO	Oct 2025

Minute 2 – Consultation with the Office of the Governor of Nakhon Ratchasima Province

Meeting Title	Provincial Consultation on the Proposed AF Adaptation Project in Nakhon Ratchasima
Date	Tuesday, 9 September 2025
Time	14:00 – 17:00 hrs (Bangkok time)
Venue	Phone call
Chair	Representative of the Governor of Nakhon Ratchasima Province
Convened by	UNIDO, in coordination with DCCE

Participants

Name / Representative	Position / Role	Organization
Provincial Representative(s)	Representatives of the Governor's Office	Office of the Governor of Nakhon Ratchasima Province
Wittawat WULYAPASH	National Project Associate	UNIDO
Supalerk KANASOOK	National Project Coordinator	UNIDO

Agenda

- Introduction of UNIDO and the Adaptation Fund as a financing instrument.
- Presentation of the proposed climate adaptation intervention in Nakhon Ratchasima.
- Discussion on provincial priorities regarding drought, flooding and heat stress.
- Exploration of an early warning system and its linkage to local economic activities, including ground-mounted solar installations.
- Acknowledgement on follow-up and in-principle endorsement.

Key Discussion Points

Project context: UNIDO introduced the proposed AF project, explaining the objectives, expected outcomes, and the rationale for selecting Nakhon Ratchasima as the pilot province. The province's exposure to drought, flooding and extreme heat, together with its economic and agricultural importance, was discussed.

Early warning system (EWS): The development of an integrated early warning system emerged as the most immediate priority for the province. Provincial representatives stressed that a functional EWS would allow communities at all levels, including farmers, households, local authorities and private-sector operators of solar (ground-mounted) assets, to be informed ahead of extreme events and to adapt accordingly.

Cross-sectoral benefits: The link between climate information and energy/industrial adaptation was discussed. Ground-mounted solar installations in the province are exposed to heat and flood risks, and early warning data would enable operational adjustments that reduce damage and downtime.

Acknowledgement: Provincial representatives acknowledged UNIDO's presentation and expressed in principle with the direction of the project, welcoming further engagement as the proposal is refined.

Decisions and Agreements

- The Office of the Governor of Nakhon Ratchasima acknowledgement and willing to support for the proposed AF project.
- UNIDO will keep the Governor's Office informed as the concept progresses, including on site selection for pilot activities.
- Stakeholder consultations at the community and sectoral levels will be organised during the full proposal development phase.

Action Items

No.	Action Item	Responsible	Deadline
1	Maintain regular communication with provincial focal points throughout concept and full proposal development.	UNIDO	Ongoing
2	Plan joint field and community consultations in Nakhon Ratchasima during the full proposal phase.	UNIDO / DCCE / Province	Post first-round approval

Minute 3 – Coordination Meeting with the Thai Meteorological Department (TMD)

Meeting Title	Technical Consultation on Climate Data, Sensor Network and Station Coverage in Nakhon Ratchasima
Date	Thursday, 2 October 2025
Time	13:30 – 15:30 hrs (Bangkok time)
Venue	Thai Meteorological Department (TMD) – facilitated by DCCE
Chair	Senior representative, DCCE
Convened by	DCCE, at the request of UNIDO

Participants

Name / Representative	Position / Role	Organization
DCCE Representative(s)	Senior Technical Officers	DCCE
TMD Representative(s)	Technical experts on sensors and meteorological equipment	Thai Meteorological Department
Wittawat WULYAPASH	National Project Associate	UNIDO
Supalerk KANASOOK	National Project Coordinator	UNIDO

Agenda

- TMD overview of climate data generation and existing sensor / station coverage.
- Discussion on station density in Nakhon Ratchasima (นนทบุรี) and identified gaps.
- Exploration of the integration of new sensors under the AF project into the national observation network.
- Discussion on institutional ownership and sustainability after project closure.

Key Discussion Points

Functions of TMD climate data: TMD presented the functions of its existing climate observation system, including the types of sensors, measurement parameters and transmission to the national data system.

Limited station density in Nakhon Ratchasima: Discussion confirmed that only three (3) operational weather stations (สถานี) currently serve Nakhon Ratchasima province. Given the size and topographical

diversity of the province, this coverage is insufficient to generate the spatial and temporal resolution needed to support community-level adaptation planning.

Integration of AF-financed sensors: It was agreed that additional sensors installed under the AF project could be integrated with the existing TMD network, feeding data into both TMD and, through DCCE, into the CCIC dashboard.

Post-project sustainability: Concern was raised about the institution that will be responsible for operation and maintenance after project closure. DCCE confirmed that, in principle, TMD could take over this responsibility if TMD formally agrees to do so; otherwise, DCCE will assume responsibility through the CCIC. A definitive arrangement will be documented during the full proposal development phase.

Formal participation: TMD will be formally invited to join the project partnership at the full proposal stage, subject to the concept note being endorsed in the first AF review round.

Decisions and Agreements

- New sensors/stations funded by the AF project will be designed to be compatible with, and integrated into, the TMD observation network.
- TMD will be consulted on technical specifications to ensure alignment with national standards.
- Institutional responsibility after project closure will be confirmed in writing at the full proposal stage, with TMD as the preferred host and DCCE/CCIC as the back-up arrangement.

Action Items

No.	Action Item	Responsible	Deadline
1	Confirm TMD's readiness to host the expanded station network post-project.	DCCE / TMD	Full proposal phase
2	Formally invite TMD as a project partner at full proposal stage.	UNIDO	Upon first-round endorsement

Minute 4 – Technical Consultation on Sensor Technology Transfer (Malaysia)

Meeting Title	Technical Expert Consultation on Sensor Hardware and Data Platform – Technology Transfer from Malaysia to Thailand
Date	Monday, 6 October 2025
Time	16:30 – 17:30 hrs (Bangkok time)
Venue	Online
Chair	UNIDO Project Development Team
Convened by	UNIDO

Participants

Name / Representative	Position / Role	Organization
Mr. Kevin Loh	Technical Expert – Climate Sensors and Data Platform	Independent / Malaysia-based
Rasha ABDRAHU	Project Manager	UNIDO
Wittawat WULYAPASH	National Project Associate	UNIDO
Supalerk KANASOOK	National Project Coordinator	UNIDO

Agenda

- Presentation by the technical expert on available sensor technology and data platforms.
- Discussion on the methodology for South–South technology transfer from Malaysia to Thailand.
- Compatibility with TMD equipment and CCIC architecture.
- Implications for budgeting, training and local capacity development.

Key Discussion Points

Technology overview: Mr. Kevin presented the hardware (climate / hydro-meteorological sensors) and software (data platform) components of a solution that has been successfully deployed in Malaysia. The architecture covers data acquisition, transmission, storage and visualisation.

Technology transfer methodology: A phased methodology was discussed, covering: (i) context assessment in Nakhon Ratchasima; (ii) system design and localisation; (iii) installation and commissioning; (iv) training for Thai counterparts (TMD, DCCE, CCIC); and (v) handover and post-project support.

South–South cooperation dimension: The Malaysia–Thailand technology transfer constitutes an important South–South cooperation element, consistent with UNIDO’s mandate and with the AF’s emphasis on replicable, country-driven adaptation solutions.

Alignment with national systems: Further technical dialogue will be required with TMD to ensure full compatibility with existing Thai observation standards and with the CCIC dashboard.

Decisions and Agreements

- The Malaysia-based solution will be considered as a reference for the AF project’s technology component, subject to alignment with Thai standards.
- UNIDO will integrate the technology transfer methodology into the concept proposal as part of the project’s innovation and South–South cooperation narrative.

Action Items

No.	Action Item	Responsible	Deadline
1	Share the presentation and technical documentation with UNIDO.	Mr. Kevin	October 2025
2	Integrate the sensor technology and transfer methodology into the concept proposal.	UNIDO	October 2025
3	Plan a joint technical review session with TMD during full proposal development.	UNIDO	Full proposal phase

Minute 5 – Presentation of the Draft Concept Proposal to ERTC / DCCE

Meeting Title	Presentation and Review of the Draft Concept Proposal for the Adaptation Fund
Date	Friday, 31 October 2025
Time	13:00 – 15:00 hrs (Bangkok time)
Venue	ERTC Office, DCCE, Thailand
Chair	Senior representative, ERTC / DCCE
Convened by	UNIDO in coordination with DCCE

Participants

Name / Representative	Position / Role	Organization
DCCE / ERTC Representative(s)	Director, Senior Researchers and Technical Officers	ERTC under DCCE
Wittawat WULYAPASH	National Project Associate	UNIDO
Supalerk KANASOOK	National Project Coordinator	UNIDO

Agenda

- UNIDO presentation of the draft concept proposal.
- Review of alignment with NAP priorities and CCIC architecture.
- Technical and institutional validation.
- Agreement on next steps toward DCCE committee-level endorsement.

Key Discussion Points

Structure of the concept proposal: UNIDO presented the draft concept proposal, covering problem statement, project objective, components, outputs, indicative activities, target beneficiaries, geographic scope, budget envelope and results framework.

Alignment with national priorities: ERTC/DCCE confirmed that the concept is well aligned with the NAP, with the establishment and operationalisation of CCIC, and with DCCE/TGO prior work in Nakhon Ratchasima.

Integration of earlier inputs: The concept reflects inputs received from ERTC/DCCE (Minute 1), the Governor’s Office of Nakhon Ratchasima (Minute 2), TMD (Minute 3) and the technical expert from Malaysia (Minute 4).

Consensus: All participants expressed agreement with the concept proposal as presented, marking a key milestone in the consultation process.

Decisions and Agreements

- The draft concept proposal was endorsed by ERTC/DCCE at technical level.
- The concept will be escalated to the DCCE committee (chaired by the DG of DCCE) for formal defence and endorsement.

Action Items

No.	Action Item	Responsible	Deadline
1	Finalise the concept proposal incorporating ERTC/DCCE technical inputs.	UNIDO	November 2025
2	Schedule the DCCE committee meeting for concept note defence.	DCCE	Q1 2026
3	Prepare endorsement letter documentation for country ownership.	DCCE / UNIDO	Ahead of AF submission

Minute 6 – Concept Note Defence before the DCCE Committee

Meeting Title	National Committee Defence of the Adaptation Fund Concept Note
Date	Monday, 2 February 2026
Time	13:00 – 17:00 hrs (Bangkok time)
Venue	Department of Climate Change and Environment (DCCE) Conference Room
Chair	Director-General of DCCE (Chair of the Committee)
Convened by	DCCE

Participants

Name / Representative	Position / Role	Organization
Dr. Phirun Saiyasitpanich, Director-General, DCCE	Committee Chair	DCCE
Committee Members	Senior Officials	Relevant ministries and public-sector institutions
Committee Members	Experts and Researchers	Academic institutions and universities
Wittawat WULYAPASH	National Project Associate	UNIDO
Supalerk KANASOOK	National Project Coordinator	UNIDO

Agenda

- Opening remarks by the DG of DCCE.
- Presentation by UNIDO of the concept note.
- Assessment of alignment with Thailand’s National Adaptation priorities.
- Committee questions, comments and recommendations.
- Decision on the endorsement letter required by the Adaptation Fund.

Key Discussion Points

Opening and framing: The DG of DCCE opened the session by emphasising the importance of the Adaptation Fund as a direct-access climate finance instrument, and the need to ensure that UNIDO’s

proposal is consistent with Thailand’s national adaptation priorities and with the institutional arrangements under DCCE.

Concept note presentation: UNIDO presented the finalised concept note, covering objectives, components, geographic focus on Nakhon Ratchasima, integration with CCIC and TMD, gender considerations, safeguards and indicative budget.

Committee review: Committee members from public-sector institutions, universities and research centres engaged in a detailed review, including the technical robustness of the observation network, the sustainability arrangements post-project, complementarity with existing national programmes, and the approach to community engagement.

Endorsement outcome: The committee concluded that the concept note is aligned with Thailand’s national adaptation agenda and qualifies for formal country endorsement. The purpose of the meeting – obtaining the basis for an endorsement letter from the country – was therefore satisfied.

Decisions and Agreements

- The DCCE committee endorsed the concept note for submission to the Adaptation Fund.
- DCCE, as Designated Authority, will issue the formal endorsement letter required by the AF.
- Any comments from the committee will be consolidated by DCCE and reflected in the final submission.

Action Items

No.	Action Item	Responsible	Deadline
1	Issue the official country endorsement letter for the AF concept note.	DCCE (Designated Authority)	February 2026
2	Consolidate committee comments and share with UNIDO.	DCCE Secretariat	February 2026
3	Finalise and submit the AF concept proposal.	UNIDO	February 2026

Minute 7 – Consultation with the Ministry of Energy of Thailand on Public-Sector Solar Installations

Meeting Title	Consultation on Public-Sector Solar Rooftop and Ground-Mounted Installations – Funding Mechanisms and Municipal Coverage
Date	Thursday, 19 March 2026
Time	14:00 – 15:00 hrs (Bangkok time)
Venue	Telephone conference (phone call)
Chair	UNIDO Project Development Team
Convened by	UNIDO, in coordination with the Ministry of Energy of Thailand

Participants

Name / Representative	Position / Role	Organization
Representative(s), Ministry of Energy	Technical / Programme Officer(s) on renewable energy support to public sector	Ministry of Energy, Kingdom of Thailand
Supalerk KANASOOK	Project Development Team	UNIDO

Agenda

- Briefing on the UNIDO Adaptation Fund project and its link to adaptation-responsive energy infrastructure.
- Overview of existing public financing mechanisms supporting solar installations in the public sector.
- Status of deployment at the municipal level (Tessaban, SAO, PAO).
- Coordination arrangements for the detailed study phase of the AF project.

Key Discussion Points

Context of the discussion: UNIDO briefed the Ministry of Energy on the proposed AF project in Nakhon Ratchasima, with particular emphasis on the interlinkage between climate adaptation, early warning systems and the operation of public-sector solar assets (both rooftop and ground-mounted) that are increasingly exposed to drought, flooding and heat-stress events.

Two distinct public-sector funding sources: The Ministry of Energy explained that, in the Thai context, public financing supporting the deployment of solar installations in public-sector entities is typically channelled through two separate sources:

- First source – Provincial / Governor budget: funds allocated directly under the authority of the Provincial Governor, used to support solar installations for public buildings and municipal offices within the province.
- Second source – Ministry of Energy dedicated fund: funds administered directly by the Ministry of Energy, provided to the municipal level to support both solar rooftop and solar ground-mounted systems.

Beneficiary entities at municipal level: Both financing sources are primarily directed to sub-national administrative entities, specifically the municipality (เทศบาล / Tessaban), the Sub-district Administrative Organisation (SAO) and the Provincial Administrative Organisation (PAO). These entities are the operational interface between national policy and local delivery of public services.

Current deployment status: The Ministry of Energy indicated that most of the municipalities referred to in the consultation have already installed solar systems at their office premises (solar rooftop and/or solar ground-mounted), reflecting a substantial baseline of public-sector solar adoption. This baseline is highly relevant for the AF project, as these existing installations can directly benefit from climate information and early warning services generated by the project, and can in turn serve as demonstration sites for climate-resilient operation of public-sector solar infrastructure.

Data availability and collection plan: Detailed information on beneficiary municipalities, installed capacity, year of installation, budget source and operational performance is distributed across different institutions and programmes. Systematic data consolidation was therefore agreed to be carried out during the detailed study phase of the AF project, which will map existing installations, identify resilience gaps and inform the design of the adaptation interventions.

Coordination going forward: The Ministry of Energy expressed openness to further coordination with UNIDO and DCCE, including the possibility of being formally associated with the project partnership at the full proposal stage, in recognition of the cross-sectoral nature of adaptation in energy infrastructure.

Decisions and Agreements

- Two public-sector funding streams (Provincial/Governor budget and Ministry of Energy dedicated fund) were confirmed as the main channels for solar deployment at the municipal level.
- Existing solar installations in municipalities of the pilot province will be documented and assessed during the detailed study phase of the AF project.
- UNIDO will maintain engagement with the Ministry of Energy to align the AF project with ongoing national programmes supporting public-sector solar deployment.

Action Items

No.	Action Item	Responsible	Deadline
1	Collect detailed information on beneficiary municipalities, installed capacities and funding sources across the pilot area, including data held by the Governor's office and by the Ministry of Energy.	UNIDO (supported by Ministry of Energy, DCCE and Province)	Full proposal phase
2	Map existing public-sector solar installations (rooftop and ground-mounted) against climate risk exposure (drought, flood, heat).	UNIDO	Full proposal phase
3	Maintain coordination with the Ministry of Energy and explore formal partnership arrangements at full proposal stage.	UNIDO	Full proposal phase
4	Align the AF project design with the two identified public funding streams to maximise complementarity and avoid duplication.	UNIDO / DCCE / Ministry of Energy	Full proposal phase

Minute 8 – Consultation with Gender Expert on Gender Mainstreaming

Meeting Title	Consultation on Gender Mainstreaming for the Revised Concept Proposal
Date	Thursday, 19 March 2026
Time	14:00 – 15:00 hrs (Bangkok time)
Venue	In person meeting at UNIDO workshop at Centara Grand Hotel, Central World
Chair	UNIDO Project Development Team
Convened by	UNIDO

Participants

Name / Representative	Position / Role	Organization
Dr. Ruttiya Bhula-Or	Local Gender Expert (experienced in UNIDO GEF/MAF projects)	Independent expert
Supalerk KANASOOK	National Project Coordinator	UNIDO

Agenda

- Briefing on the project concept and its implementation context.
- Review of AF Gender Policy requirements and UNIDO Gender Policy.
- Sharing of UNIDO comments on gender dimensions of the revised concept.
- Agreement on deliverables and timeline.

Key Discussion Points

Expert background: Dr. Ruttiya Bhula-Or has supported UNIDO in multiple projects under the Global Environment Facility (GEF) and Multilateral Adaptation Fund (MAF) portfolios. Her expertise is particularly relevant to the integration of gender considerations in climate adaptation, early warning systems and community engagement.

Scope of gender integration: Gender mainstreaming is to be embedded across the problem analysis, results framework, activities, stakeholder engagement plan, and monitoring and evaluation framework of the concept proposal, in line with AF and UNIDO gender policies.

Comments and working approach: UNIDO shared consolidated comments and the current draft of the revised concept with Dr. Bhula-Or. She agreed to conduct a detailed review, propose sex-disaggregated indicators, identify gender-responsive activities, and strengthen narrative sections on vulnerability, access and participation.

Timeline: Dr. Bhula-Or committed to returning the reviewed document to UNIDO before the end of April 2026, in time for the next submission milestone.

Decisions and Agreements

- Dr. Ruttiya Bhula-Or will act as the gender specialist for the concept proposal and support full proposal development.
- The revised concept will include an explicit gender analysis, gender action plan elements and sex-disaggregated indicators.

Action Items

No.	Action Item	Responsible	Deadline
1	Review and strengthen the gender dimension of the revised concept proposal.	Dr. Ruttiya Bhula-Or	By end of April 2026
2	Integrate the gender expert's inputs into the revised concept proposal.	UNIDO	April–May 2026
3	Prepare a Gender Action Plan for the full proposal stage.	UNIDO / Gender Expert	Full proposal phase

Minute 9 – Response to Adaptation Fund Secretariat Comments

Meeting Title	Coordination Meeting on the AF Secretariat Comments to the Concept Proposal
Date	Monday, 23 March 2026
Time	10:00 – 12:00 hrs (Bangkok time)
Venue	DCCE, Thailand (hybrid)
Chair	Senior representative, DCCE
Convened by	DCCE, jointly with UNIDO

Participants

Name / Representative	Position / Role	Organization
DCCE Representative(s)	Director / Senior Officials	DCCE
ERTC Representative(s)	Senior Researchers / Training Officers	Environmental Research and Training Center (ERTC)
CCIC Representative(s)	Technical Officers	Climate Change Information Center (CCIC)
Wittawat WULYAPASH	National Project Associate	UNIDO
Supalerk KANASOOK	National Project Coordinator	UNIDO

Agenda

- Review of comments received from the Adaptation Fund Secretariat.
- Confirmation of institutional arrangements for CCIC integration.
- Discussion on training programme and equipment standardisation.
- Definition of the response strategy and division of responsibilities.

Key Discussion Points

AF Secretariat feedback: UNIDO presented the official comments received from the Adaptation Fund Secretariat on the concept proposal. The comments were reviewed collectively and clustered by theme: institutional arrangements, sustainability, training and capacity development, and equipment / standards.

CCIC integration confirmed: CCIC reconfirmed – consistent with earlier consultations – that the project outputs will be fully integrated into the CCIC, which is being operationalised within 2026. This ensures the long-term institutional home of the data systems and sustainability beyond project closure.

Training and capacity development: ERTC confirmed that the training component will be designed inclusively, engaging other relevant departments under DCCE, and leveraging ERTC’s mandate as the national environmental training institution. This approach addresses the AF Secretariat’s comments on capacity building and institutional anchoring.

Equipment standardisation: Participants confirmed that the equipment to be procured and deployed will be standardised in accordance with the specifications used by Thai Government institutions (TMD, DCCE, CCIC), ensuring inter-operability, maintainability and national ownership.

Decisions and Agreements

- The concept proposal will be revised to reflect AF Secretariat comments on: (i) CCIC integration, (ii) training scope under ERTC, and (iii) equipment standardisation with Thai Government standards.
- A consolidated response matrix to the AF Secretariat comments will be prepared by UNIDO with DCCE inputs.
- UNIDO, DCCE, ERTC and CCIC will continue to coordinate closely until submission of the revised concept proposal and subsequent full proposal.

Action Items

No.	Action Item	Responsible	Deadline
1	Prepare a response matrix addressing each AF Secretariat comment.	UNIDO (with DCCE)	April 2026
2	Update the concept proposal to reflect CCIC integration, ERTC-led training scope and Thai Government equipment standards.	UNIDO	April–May 2026
3	Secure written confirmation from CCIC on the post-project hosting arrangement.	DCCE / CCIC	Full proposal phase
4	Integrate gender expert inputs into the revised concept.	UNIDO	April–May 2026
5	Submit the revised concept proposal to the Adaptation Fund.	UNIDO	As per AF timeline

The proposal has been strengthened through an initial gender assessment based on secondary data and existing literature, which identifies key gendered constraints relevant to the project context. In Thailand's agricultural sector, women represent a significant proportion of the workforce (approximately 41% in Nakhon Ratchasima), yet face structural barriers including limited access to land, financial resources, extension services, and climate information. These constraints reduce adaptive capacity and highlight the importance of gender-responsive interventions.

Recognising the limitations in conducting a full primary gender analysis at this stage, the project will undertake a comprehensive gender assessment during the Project Formulation Grant (PFG) phase, including (as now included in Section II.J):

- 1. Collection of sex-disaggregated data at local level*
- 2. Targeted consultations with women's groups and female farmers*
- 3. Analysis of gender roles, vulnerabilities, and opportunities in climate adaptation*
- 4. Development of a Gender Action Plan aligned with Adaptation Fund Gender Policy*

In addition, the project has been strengthened to move beyond gender-sensitive approaches toward gender-transformative outcomes, including:

- Promoting women's leadership in community climate governance
- Supporting women as technicians, data intermediaries, and climate service providers
- Enabling women-led entrepreneurship in climate information services and digital innovation
- Ensuring gender-responsive design of training, communication, and technology access