



ADAPTATION FUND

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

PROPOSAL FOR LARGE INNOVATION PROJECT FOR SRI LANKA



ADAPTATION FUND

ADAPTATION FUND BOARD SECRETARIAT
TECHNICAL REVIEW OF PROJECT PROPOSAL FOR
"CLIMATE DIGITAL TWIN FOR INNOVATIVE NATURE-BASED SOLUTIONS AND
ADAPTATION INTERVENTIONS IN THE COLOMBO METROPOLITAN AREA"

Project Title Climate Digital Twin for Innovative Nature-based Solutions and Adaptation Interventions in the Colombo Metropolitan Area

Project ID AF00000590

Category Innovation large project

Type Single country project

Stage Concept

Country Sri Lanka

Implementing Entity UNHAB

Financing Requested USD 5,000,000.00

Reviewer Jonathan Cook

Co-reviewer(s)

IE Contact Person

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Secretariat's Overall Comment

The Climate Digital Twin for Innovative Nature-based Solutions and Adaptation Interventions in the Colombo Metropolitan Area (CMA) project aims to protect vulnerable urban populations from extreme heat, urban heat island (UHI) effects, and severe flooding. The project aims to co-develop downscaled climate hazard projections and deploy an interactive GIS-based Climate Digital Twin (adapted from an existing framework) to model climate risks; to draft a metropolitan Urban Heat Action Plan and deliver targeted training to highly exposed groups; and to run a competitive 'Climate Resilience Accelerator' innovation competition to test and implement community pilot adaptation projects that prioritize nature-based and hybrid solutions.

A PFG of \$146,475 USD is requested.

The initial technical review raises several issues, such as the need to add SMART indicators, include budget figures by outputs, and strengthen information about relevant policies and projects, as is discussed in the number of Clarification Requests (CRs) and Corrective Action Requests (CARs) raised in the review.

Country Eligibility

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

Response: Yes

Secretariat: Ratified September 3, 2002.

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

Response: Yes

Secretariat: Yes. The Colombo Metropolitan Area is exposed to both extreme heat and hydrometeorological hazards, severe heat stress that restricts outdoor labor, and flood events such as Cyclone Ditwah. These threats

directly endanger the region's dense population (over half of whom reside in informal settlements) and disproportionately impact marginalized groups like outdoor workers, housebound women, children, older adults, and persons with disabilities.

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 As per the Endorsement letter dated 10 August 2026.

CAR1: Please check the letter of endorsement box on page 1 (cover page).

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: Pending

Secretariat: Yes. However, more information is needed.

The proposed project will support concrete adaptation actions that enhance adaptive capacity and build long-term climate resilience in Sri Lanka. More than 65% of the total budget is allocated to physical pilot projects, and there is a strong focus on supporting Colombo's most vulnerable informal settlement communities. A Theory of Change diagram (p. 7) illustrates the causal pathways, key assumptions, and risk drivers.

CAR2: Please break down the budget in Table 01(pp. 8-9) by individual output. Also, please ensure that outputs and outcomes are appropriately defined and nested. In particular, the technically focused Outputs 1.1.2 and 1.1.3 do not clearly contribute to Outcome 1.1, which is framed around community capacity.

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: Pending

Secretariat: Yes. However, more information is needed.

The project would transfer technology previously deployed in New York City and Germany to a new context, while establishing a process to identify, test, and scale locally appropriate nature-based and hybrid adaptation solutions.

CR1: Please explain the feasibility and appropriateness of adapting the proposed digital-twin approach to the Sri Lankan context, including relevant data, technical, institutional, and capacity constraints and how the project design will address them.

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: Pending

Secretariat: Yes. However, more information is needed.

Section D (pp. 21-22) describes economic, social and environmental benefits. The project is well-aligned with the ESP and Gender Policy, and was project was screened overall as Low-to-Moderate risk. All sub-projects (USPs) must undergo mandatory ESP/Gender screening before contracting.

CAR3: Please quantify expected benefits in Table 2. When exact figures are not available, please include estimates or proxies to support the project's intended impact alongside a brief explanation of the method used.

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

Response: Cleared

Secretariat: Yes. However, more information is needed.

The project promises to engage, empower, and benefit the most vulnerable communities in the Colombo Metropolitan Area. It includes a strong focus on social inclusion and participatory design approaches, and was designed with input from a set of structured consultations (Dec 2025-Jan 2026).

CR2: Please consider adding a quota/ quotas within the selection framework for sub-grants (e.g., requiring a certain percentage to be allocated to women-led organizations, CBOs, or informal settlement residents).

At the fully developed proposal stage, please strengthen the selection framework with clear and measurable provisions to ensure that vulnerable groups and their representative organizations, including women-led organizations, CBOs, and informal-settlement communities, can meaningfully participate in and benefit from the innovation challenge.

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

Response: Pending

Secretariat: Yes. However, more information is needed.

The project includes an initial gender analysis, targeted sub-grants, and mainstreamed gender indicators.

CR3: Please provide details on how gender-responsive design and a gender lens (mentioned on p. 22) will be

applied and what kinds of outputs might be expected.

CAR4: Please strengthen the initial gender analysis with available quantitative and sex-disaggregated data on disparities relevant to the project's climate risks and interventions, such as exposure to heat and flooding, livelihoods and employment, access to early-warning information and services, unpaid care responsibilities, and participation in decision-making.

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: Pending

Secretariat: Yes.

The project presents a robust cost-effectiveness analysis based on approaches like predictive risk modeling (to prevent costly investments in ineffective or maladaptive infrastructure) and nature-based solutions (which can yield lower long-term operations costs than hard infrastructure, while providing co-benefits).

The project empowers Colombo's most vulnerable populations through a participatory, community-led adaptation framework. It mandates that at least 50% of all supported innovation challenge projects must directly serve vulnerable communities; and proposes interactive workshops and pilot simulations across schools and youth organizations to empower youth as climate resilience leaders.

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. However, more information is needed.

Section F (p. 24) briefly explains how the project is consistent with Sri Lanka's national and sub-national climate change, disaster risk reduction, and urban development strategies. It also identifies relevant national and subnational climate, disaster-risk, and urban-development frameworks. However, the explanation of their relationship to the project could be strengthened.

CAR5: Please revise Table 4 to include the following columns: (i) specific name of the plan/strategy, (ii) years of implementation, (iii) goals/objectives, (iv) relevance with the proposed project, (v) project's compliance status.

CR4: Please reference any relevant policies and frameworks related to gender. Also, given the strong focus of the project on technology, please make appropriate linkages to Sri Lanka's TNA and TAP documents, as relevant.

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

Response: Cleared

Secretariat: Partly.

Table 5, Section G (p. 25) provides a list of relevant standards (including building codes, environmental assessment requirements, and geospatial data guidelines), maps them to the Fund's ESP principles, and describes initial compliance procedures.

CR5: Please add any other relevant standards, such as those related to coastal development, occupational safety and health, and agrarian development.

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

Response: Not Cleared

Secretariat: Not cleared.

Table 6, section H (p. 26) describes complementarity with seven other projects funded by the government and/or other donors. However, several potentially relevant initiatives are missing.

CR6: Please describe relationship to the Metro Colombo Urban Development Project and Climate Resilience Improvement Project, both funded by the World Bank.

CAR6: Please ensure that the table includes the following details: (i) Project title, donor/funding Entity (ii) Main project interventions, (iii) Timeline and specific location within the country, (iv) Target population, (v) Implementing entity, (vi) Lessons learned (if applicable) and how they have influenced the design of this project where relevant, (vii) Overlaps and synergies with the proposed project, including how proposed project will build upon an existing or previous project

CR7: Please include a brief discussion of any coordination mechanisms that will help to ensure operational synergies during project execution.

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

Response: Not Cleared

Secretariat: Yes. However, more information is needed.

Table 7, Section I (pp. 27-28) describes a comprehensive learning and KM approach across the project components, with learning objectives and indicators as well as knowledge products specified.

CR8: Describe which institution will be the primary host for data after the project ends (e.g., University of Moratuwa or Urban Development Authority).

CR9: Table 7 lists standard technical deliverables (e.g., GIS layers, workshop reports, software manual, and the Urban Heat Action Plan) as its primary knowledge products. Please describe plans for any dedicated, synthesized KM tools tailored for external practitioners.

CAR7: Please allocate a distinct budget line for knowledge management activities, and consider assigning a

dedicated KM lead for the project.

CR10: Given that the project aims to support scaling across Sri Lanka and the region, please provide some discussion of external dissemination channels.

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: Yes. However, more information is needed.

Section J (pp. 29-30) and Annex 1 describe a meaningful consultation process that included national and local governments, the private sector, civil society, and affected populations. It describes how initial input informed the project design, and offers some ways to maintain broad participation during the project. A dedicated Gender Action Plan includes gender-disaggregated performance indicators across all components,

CR11: Please explain how persons with disabilities, the elderly, and outdoor/informal workers were or will be consulted, given that they have been identified as highly vulnerable to extreme heat and flooding.

CR12: Please clarify whether the project will consult with other areas within the Colombo Metropolitan Area during the PFG stage given that initial consultations were restricted to a small number of neighborhoods.

CR13: Initial private-sector engagement seems to have been channeled through Biodiversity Sri Lanka. Please clarify any plans for broader engagement (for instance, SMEs and other businesses impacted by urban heat).

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

Response: Cleared

Secretariat: Yes.

Section L (p. 31) explains that AF funds would cover the full cost of adaptation, and external co-financing is not needed. The concept note demonstrates that making urban systems climate-resilient through nature-based solutions and hybrid interventions is an explicit adaptation measure rather than baseline development.

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

Response: Cleared

Secretariat: Yes. However, more information is needed.

Annex 6 (pp. 46–48) provides an initial mapping to the Adaptation Fund Strategic Results Framework, but the alignment and indicators require further refinement.

CAR8: Please revise Annex 6 in accordance with the current Adaptation Fund results framework template and

guidance, ensuring that each project outcome and output is mapped to the appropriate Fund outcome, output, and indicator. At the fully developed proposal stage, please also refine the project indicators to include appropriate baselines and quantitative targets.

CAR9: Please include the corresponding grant amount for each result in the final column.

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

Detailed guidance - <https://www.adaptation-fund.org/document/strategic-results-framework-guidance-2026/>

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

Response: Not Cleared

Secretariat: Yes. However, more information is needed.

Section M (pp. 31-32) describes a comprehensive approach to economic, social, environmental, and institutional sustainability. Output 1.2.2 envisions the creation of a formal Digital Twin Sustainability and Handover Plan. The project focuses on building capacity to house innovative technologies in government and academic institutions.

CR14: Please strengthen the financial-sustainability approach by identifying credible potential sources or mechanisms for financing the continued operation of the Digital Twin and the operation and maintenance of successful nature-based and hybrid interventions after project completion.

CR15: Output 1.2.2 appears to defer designation of the lead agency responsible for operating and maintaining the Digital Twin until the project's midpoint. Please consider identifying the proposed lead agency earlier, preferably during fully developed proposal preparation, as this will inform institutional arrangements, capacity building, data governance, and system design.

CR16: The digital twin relies on advanced machine learning and complex spatial models co-developed with international partners. However, local municipal authorities frequently suffer from high staff turnover and limited specialized capacity. Given the technical complexity of the Digital Twin, please explain how the project will establish and retain sufficient local capacity to operate, maintain, and update the system after international technical support ends.

CR17: Please explain how the project hopes to ensure longer-term financing commitments or operational protocols for O&M related to the nature-based and hybrid physical installations.

CR18: Please describe how data management protocols will be enforced across multiple agencies and whether a legally empowered lead authority will be identified.

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: Yes. However, more information is needed.

The concept note provides an initial assessment against the 15 principles of the Fund's Environmental and Social Policy and describes screening and management provisions for the pilot interventions.

CAR10: Please assign the project an overall Adaptation Fund environmental and social risk category (Category B or C) as appropriate. In Table 8, use an "X" in the "No further assessment required for compliance" column only where no further assessment is required; otherwise, leave the cell blank and present the relevant risk rationale in the final column.

Component 3 includes USPs because the nature and specific locations of the 18 pilot interventions—six medium and twelve small grants—will only be determined through the innovation challenge during implementation. The concept acknowledges this uncertainty and provides indicative intervention types, selection criteria, safeguards screening, and management measures. However, it does not:

- explicitly identify the interventions as USPs;
- classify them using the USP categories;
- provide the required three-part justification for using USPs;
- establish a sufficiently fixed eligibility and exclusion framework; or
- explain whether it is relying on the limited exception applicable to certain process-focused innovation projects.

The current selection criteria are expressly "indicative" and will be refined during implementation. They therefore do not yet constitute a sufficiently fixed USP framework. In addition, statements such as "no involuntary resettlement" and "no impacts on Indigenous Peoples" cannot be assured for unidentified activities and locations unless these are established as binding exclusion criteria.

Under the Fund's guidance, a proposal must explain why the activities cannot be formulated during design, the benefits of deferring their identification, and why those benefits outweigh the increased ESP and Gender Policy compliance risks. Fully unidentified activities, where both the activity and setting are unknown are generally impermissible, subject to a limited exception for certain innovation projects focused on designing and implementing a process.

CAR11: Component 3 includes unidentified sub-projects, as the specific pilot interventions and their locations will be selected through the innovation challenge during implementation. Please explicitly acknowledge and classify the USPs in accordance with Table 1 of the Fund's updated USP guidance and justify their use by explaining: (i) why they cannot be identified during project design; (ii) the specific benefits of deferring their identification; and (iii) how those benefits outweigh the increased risks of non-compliance with the ESP and Gender Policy. Please also clarify whether the proposal relies on the exception for certain process-focused innovation projects.

At the fully developed proposal stage, please establish a sufficiently fixed framework for the USPs, including clear eligibility and exclusion criteria for activities and locations, scale and grant limits, land-access requirements, sensitive or protected areas, and prohibited activities. The ESMP should set out the procedures, responsibilities, budget, consultation requirements, grievance mechanism, monitoring, and reporting arrangements for screening, assessing, approving, and managing each USP before implementation.

The Fund's guidance requires approved USPs to undergo the same risk-identification, assessment, consultation, safeguards, and management process as fully formulated activities, through an adequately resourced ESMP.

Resource Availability

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

Response: Not Cleared

Secretariat: Yes.

The concept note requests \$5 million which is the maximum allowed. However some clarifications or revisions are recommended for the PFG application

CAR12: The requested PFG of USD 146,475 is within the applicable ceiling and the figures add up. However, please: (i) provide detailed cost assumptions and justification for each activity, including unit costs, consultant inputs, workshop and travel costs, and responsible entities; (ii) clarify and remove any overlap among the consultation and travel lines, the data-related activities, and the institutional-planning and proposal-development activities; (iii) consider expanding the safeguards activity to cover the identification, classification, justification, fixed framework, and ESMP/ESMF procedures required for the USPs under Component 3; (iv) ensure that consultations cover the identified vulnerable groups, broader CMA locations, and relevant private-sector actors; and (v) use the institutional and sustainability activity to determine the proposed lead agency, data-governance arrangements, and long-term operational responsibilities before submission of the fully developed proposal.

CAR13: Please list only specifically identified legal entities with confirmed execution responsibilities. Remove generic references such as “Community-Based Organizations (CBOs)” unless a specific CBO has been identified and its role as an Executing Entity confirmed.

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: Cleared

Secretariat: Yes.

The IE Management fee is 8.5%. The project execution costs (including the fee) are at 9.5%. All costs and fees add up correctly, and all values are rounded to whole dollar amounts.

Eligibility of IE

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

Response: Cleared

Secretariat: Yes.

UN-Habitat is accredited through October 30, 2027.



ADAPTATION FUND

SINGLE COUNTRY INNOVATION PROJECT/PROGRAMME PROPOSAL

PART I: PROJECT/PROGRAMME INFORMATION

Title of Project/Programme:

Climate Digital Twin for Innovative Nature-based Solutions and Adaptation Interventions in the Colombo Metropolitan Area

Country: Sri Lanka

Thematic Focal Area: Disaster risk reduction and urban adaptation

Type of Implementing Entity: Multilateral Implementing Entity

Implementing Entity: United Nations Human Settlements Programme (UN-Habitat)

Executing Entities:

Ministry of Transport, Highways and Urban Development

Western Provincial Council

Department of Meteorology

Urban Development Authority

Community based organizations (CBOs) in target neighborhoods

Columbia University

University of Moratuwa

Amount of Financing Requested: US\$5,000,000 (in U.S Dollars Equivalent)

Project Formulation Grant Request: Yes ☒ No ☐

Amount of Requested financing for PFG: US\$146 475 (in U.S Dollars Equivalent)

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

NOTE: The LOE should be signed by the Designated Authority (DA). The signatory DA must be on file with the Adaptation Fund. To find the DA currently on file check this

page: <https://www.adaptation-fund.org/apply-funding/designated-authorities>

Stage of Submission:

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

☒ **This is the first submission ever of the proposal at any stage**

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

1.3. Climate Risks

5. The CMA is highly exposed to climate hazards due to its geography (coastal low-lying terrain), urban development patterns and socio-economic factors. The key climate risks and their impacts are:

- a) **Extreme heat amplified UHI:** With reducing green cover, increasing heat stress threatens health, labour productivity, and infrastructure (power grids, roads, buildings).
 - b) **Extreme rainfall leading to flooding:** With urban pluvial floods, riverine floods, cyclones and sea level rise, combined with degradation of natural buffers like wetlands and marshes have caused higher runoff from paved surfaces while stressing outdated drainage system causing recurrent flooding, infrastructure damage, disease outbreaks, and displacement.
6. Heat and flooding disproportionately affect vulnerable populations (especially older persons, housebound women and children, pregnant women, outdoor workers) living in the most vulnerable areas, lacking cooling, safe housing, or early action resources.

Key vulnerable groups affected by extreme heat / UHI and flooding:

- a) Women (especially caregivers and informal workers): High sensitivity due to caregiving responsibilities that bound women at places of care (often at home) with limited ability to escape floodings and prolonged exposure to extreme and trapped heat in poorly ventilated homes or unshaded outdoor work. Limited adaptive capacity due to unequal access to resources, information, and decision making.
- b) Outdoor and informal workers: Extremely high exposure during peak temperature hours combined with physically demanding work and lack of access to cooling or shade. Outdoor and informal workers often depend on daily wages with no social protection and income security. Floods interrupt economic activities and even short-term disruption translates into direct lost earnings.
- c) Children and older persons: High physiological sensitivity to heat stress, reduced mobility, and limited ability to take independent protective actions. Urban heat stress disrupts outdoor learning, physical education, and sports, while increasing the risk of dehydration, heat exhaustion, and reduced concentration among school children. In addition, floods disrupt access to education and vital healthcare services, increase contamination with sewage water and with this, waterborne diseases. Studies have shown heightened anxiety, stress, and trauma among children and older persons affected by loss of homes due to flooding.
- d) Persons with disabilities: Vulnerability to floods and extreme heat is mainly due to physical, sensory, or cognitive barriers (mobility issues due to inaccessible roads, shelter, transport, difficulty accessing disability-inclusive warnings, lack of assistive devices, etc.). Persons with disabilities face higher physical, social, and institutional barriers to prepare for, evacuate from, or recover from a flood event or heat stress.
- e) Informal settlement residents: High sensitivity due to congestion, poor housing quality, and inadequate access to early warning for flood and extreme heat events or cooling facilities, living in high flood and heat risk areas.

7. In late March and early April 2026, the Meteorological Department of Sri Lanka issued a warm weather advisory with an ‘amber’ warning (indicating ‘caution’) for the majority of the country, including districts in the CMA, the Heat Index ranges from 39-45 °C (see Figure 2), calculated using both maximum temperature and humidity, to reflect the condition felt on the body. These indices were prepared on the advice of the Ministry of Health and Indigenous Medical Services.

8. Leading climate model projections indicate continued warming for the CMA, particularly under high greenhouse gas emissions scenarios.

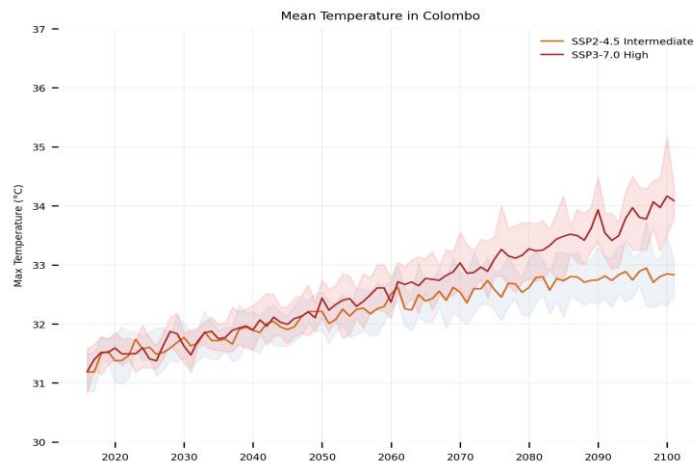


Figure 2. Annual average maximum temperature projections for the Colombo Metropolitan Area. The line represents the multi-model mean, where the shading around represents the 25th and 75th percentiles across 35 climate models for SSP2-4.5 and SSP3-7.0 (Source: CMIP6 NASA NEX GDDP)

March 26, 2014, 10:24 AM

March 5, 2024, 10:23 AM

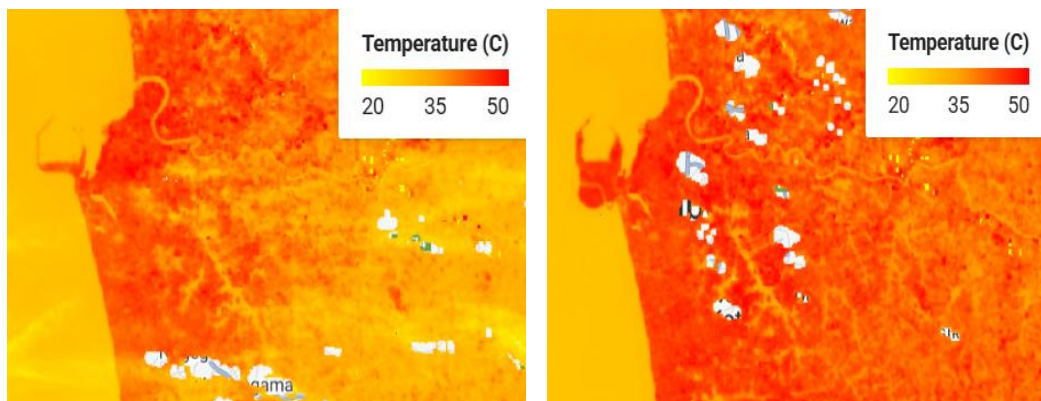


Figure 3. Land surface temperatures in the Colombo Metropolitan Region a decade apart (between March 2014 and March 2024) (Source: LANDSAT, NASA/USGS)

Notes: Surface temperatures can exceed 50 °C and indicate urban heat impacts. Cloud covered pixels are masked. A detailed multiyear trend analysis will be conducted under the proposed project.

November 30, 2025

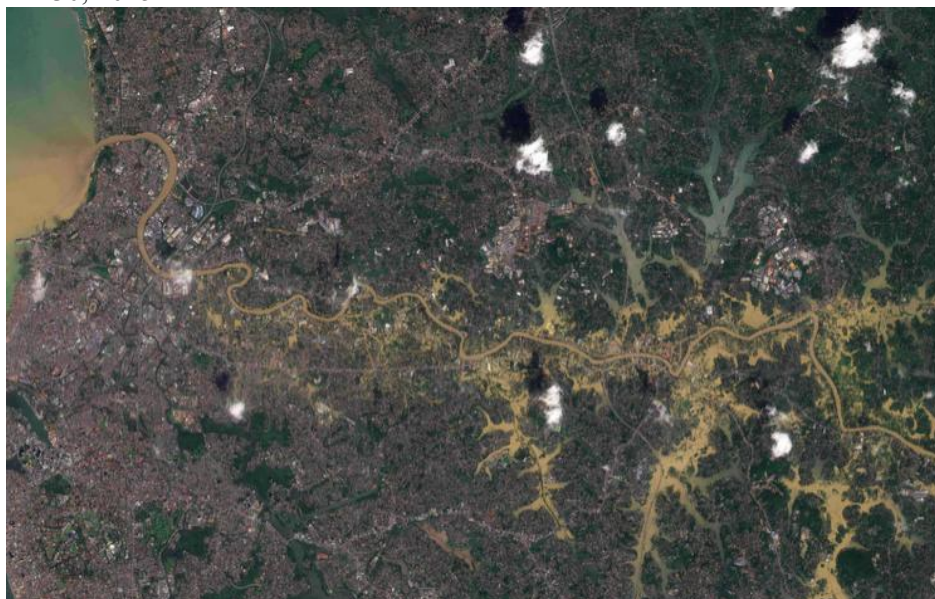


Figure 4: Flooding in the Kaduwela area of the CMA post-Cyclone Ditwah (Source: Planet Labs/Google Earth Engine)

1.4. Desired Future

9. A resilient, equitable, climate smart CMA where science-based tools (including digital twins) guide urban planning, innovative NbS and hybrid solutions are scaled, vulnerable communities have reduced disaster risk, enhanced adaptive capacity, and adaptation is mainstreamed into policy and investment decisions.

1.5. The Gap the Innovation Addresses

10. Sri Lanka lacks localized, high resolution climate projections and decision support tools for urban areas, particularly for extreme heat, the Urban Heat Island (UHI) effect, and risks from flooding. There is no comprehensive Heat Action Plan for the CMA, and adaptation interventions remain limited, reactive, and insufficiently evidence based. Flood risk information is often fragmented and not effectively linked to urban planning or the potential of NbS.

11. This project addresses these critical gaps by introducing a Climate Digital Twin technology, adapted from proven international approaches including that of UN-Habitat's own digital facility, UNITAC, and combined with a locally driven innovation challenge to identify, test, and scale context specific NbS and hybrid solutions. This approach is novel in Sri Lanka's urban context and supports a shift from incremental to science-based, transformative adaptation, ensuring that the innovation is a replication and localization of a proven digital solution rather than a first-time pilot.

1.6. The Proposed Project

12. The proposed project aims to enhance the resilience of the CMA, Sri Lanka's largest urban area, to extreme heat and flooding, including rising temperatures, UHI effect, and flooding. It will develop a digital twin (a GIS-based digital replica of a physical space) components that respond to environmental and system changes, and climate projections to identify vulnerabilities and adaptation priorities. These results will then be used to identify and implement pilot adaptation interventions selected through innovation challenges, using the best available science tailored for the CMA. The project will have an emphasis on extreme heat, due to the limited urban adaptation focused climate risk information and/or solutions in urban areas in Sri Lanka, which was highlighted by stakeholders during consultations. It will develop the capacity of stakeholders and communities in their diversity to support science-based, transformative adaptation and will enhance the resilience and adaptive capacity of vulnerable groups, such as outdoor workers, house-bound women, children, persons with disabilities, older persons, and those who reside in informal settlements.

13. The project is grounded in UN-Habitat's people-centred smart cities approach, which prioritizes inclusive, accessible, and rights-based digitalization of urban systems. Rather than focusing solely on technology, this approach ensures that digital tools such as the Climate Digital Twin are designed to respond to the needs of vulnerable communities, support participatory decision-making, and enable equitable access to climate risk information and adaptation solutions. Therefore, the project will also leverage UN-Habitat's internal digital capacity through its innovation facility, UNITAC (Urban Innovation Technology Accelerator for Climate), which specializes in the development of open-source, modular, and scalable digital tools for urban climate action. Through UNITAC and its long-standing collaboration with HafenCity University Hamburg, UN-Habitat has developed and applied a structured digital twin methodology, including the implementation of the largest urban digital twins in Germany. Drawing on important lessons from this experience, including having built a strong modular, interoperable approach, the project makes sure that the proposed digital twin for Colombo is not piloted from scratch, but builds on tested, adaptable, and transferable frameworks that can be customized to different urban contexts and institutional capacities.

2. Project/Programme Objectives:

2.1. Overall Objective

14. The project aims to enhance the climate resilience of vulnerable communities in the CMA by adapting and scaling two proven climate digital twin technologies: one previously tested and applied in New York City combining with locally driven innovative, adaptation solutions, with a strong focus on nature based and hybrid measures, to effectively address extreme heat, urban heat island effects, and flooding risks; and the other, UN-Habitat's in-house digital development capacity through UNITAC. In this digital

facility, a tool was developed that applies an open-source, modular architecture for digital twin systems. It enables interoperability across datasets, adaptability to different governance levels (national, metropolitan, and local), and flexibility to integrate new data layers and functionalities over time. The modular design allows components (e.g. heat modelling, flood layers, vulnerability mapping) to be deployed independently or as part of an integrated system, making the solution scalable and replicable across diverse urban contexts.

2.2. Specific Objectives

I. Strengthening evidence-based identification of climate risks, vulnerabilities, and adaptation priorities to support science-based decision making

- a. To adopt and scale the proven climate digital twin technology, tools, and tailored climate projections co-developed with stakeholders to identify current and future climate risks, map vulnerable communities, and prioritize adaptation needs.
- b. Technology and knowledge transferred to support scalability and replication.

II. Enhance adaptive capacity, awareness, and early action among vulnerable populations

- a. To improve the awareness of climate risks and strengthen the capacity of vulnerable groups, including women to prepare and respond to extreme heat, and flood through tailored risk information and inclusive trainings.

III. Enable innovative and scalable adaptation through pilot interventions and knowledge transfer

- a. To support the implementation of innovative pilot adaptation interventions selected through innovation challenges, and to facilitate the transfer of technology and knowledge to government and local institutions, enabling scaling and long-term integration into urban climate planning processes.

15. The three project objectives are interlinked, forming an integrated urban adaptation package for the CMA. The application of digital twin technology and tailored climate projections provides the analytical foundation for identifying climate risks, vulnerable populations, and priority interventions. Community engagement that ensures all members of the community can engage, and knowledge transfer strengthen adaptive capacity, awareness, and early action among those most exposed to extreme heat, and flooding. Lastly, innovative adaptation interventions demonstrate effective, scalable responses to priority climate risks. Together, these components reflect the Adaptation Fund's emphasis on systemic, multi-sectoral, and evidence-based adaptation. The project delivers a holistic, participatory, and innovation-driven response to escalating urban climate hazards, ensuring that its goal and objectives are mutually reinforcing and that vulnerable communities benefit from improved climate risk information and management, reduced exposure to climate risks, and strengthened institutional capacity for long-term urban resilience.

2.3. Alignment with Adaptation Fund Strategic Results Framework

16. This project strongly contributes to Adaptation **Fund Outcome 8**: Innovation for effective, long-term adaptation to climate change accelerated, encouraged, and enabled to scale up.

17. It also supports the following outcomes.

- a) Outcome 1: Reduced exposure to climate related hazards and threats
- b) Outcome 2: Strengthened institutional capacity to reduce risks
- c) Outcome 3: Strengthened awareness and local ownership of adaptation processes
- d) Outcome 4: Increased adaptive capacity of development sector services and infrastructure
- e) Outcome 5: Increased ecosystem resilience

2.4. Theory of Change

18. If stakeholders (government agencies, local authorities, academia, and communities) co-develop high resolution climate datasets able to inform climate projections and build a functional Digital Twin with effective technology transfer and capacity building.

19. Then national and local institutions together with vulnerable communities will gain science-based evidence, and capacities to identify climate risks, prioritize adaptation needs, and design targeted

interventions.

20. Because the Digital Twin and related tools and knowledge products are co-created through a people centred participatory approach with local stakeholders, tailored to Colombo's urban context, and supported by strong institutional commitment and participatory processes, it will lead to strengthened adaptive capacity, evidence informed urban planning, tested nature based and hybrid solutions and ultimately a more resilient and inclusive CMA with reduced exposure and vulnerability to extreme heat, Urban Heat Island effects, and flooding.

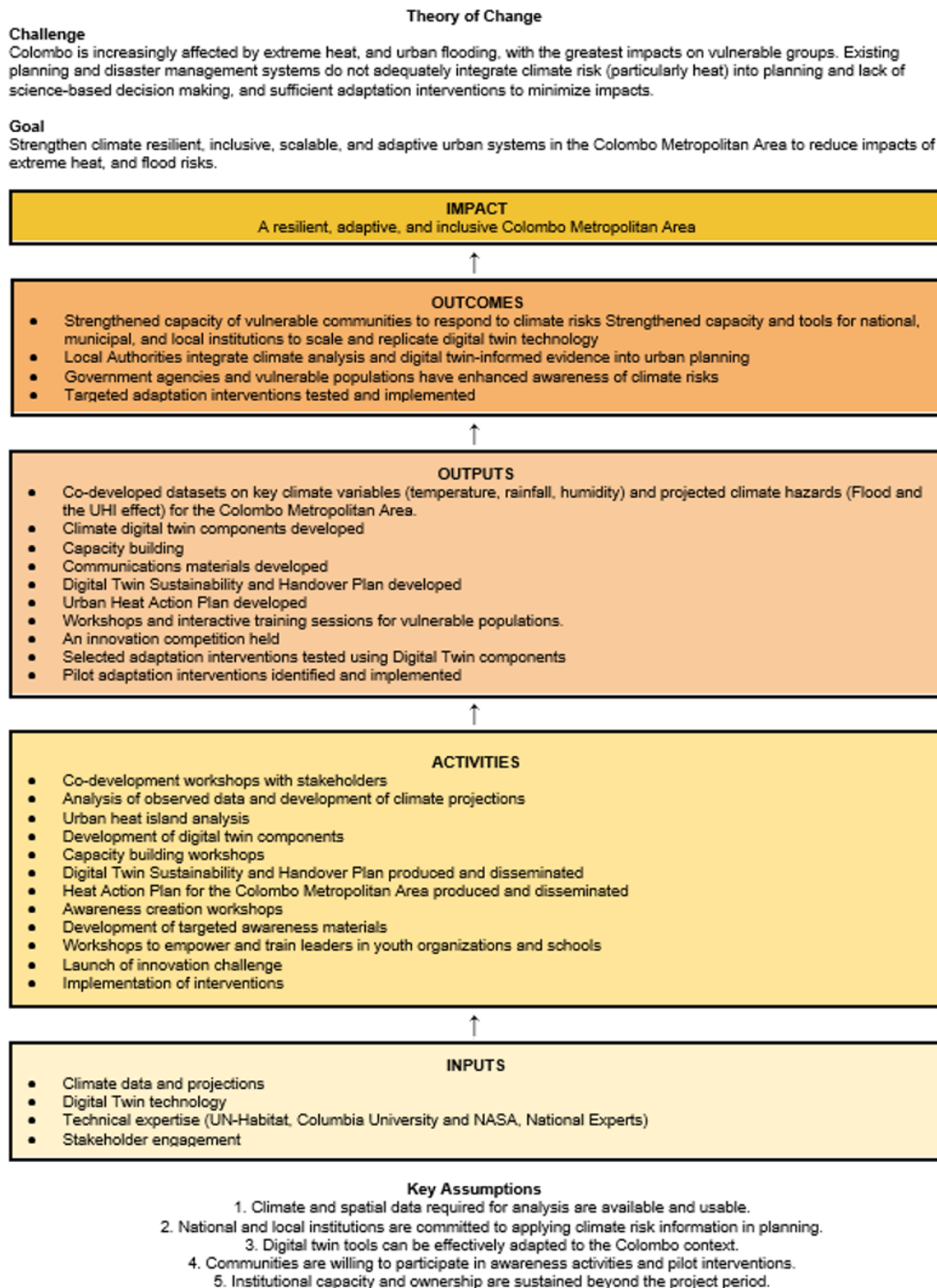


Figure 5. Theory of Change for the proposed project 'Climate Digital Twin for Innovative NbS and Adaptation Interventions in the CMA

3. Project/Programme Components and Financing:

Table 01: Project components and financing

Project/Programme Components	Expected Outcomes	Expected Outputs	Amount (US\$)
1. Component 1: Adoption of digital twin technology and tailored climate projections co-developed with stakeholders to identify vulnerabilities and adaptation needs and priorities	Outcome 1.1.: Strengthened capacity of vulnerable communities, including women and girls, to respond to climate risks and identify and prioritize adaptation needs	Output 1.1.1: Co-developed datasets with community and stakeholders for observed and projected climate hazards (flood, cyclones, UHI) for the CMA. Output 1.1.2: Digital twin components/replica of CMA using a GIS platform is developed for extreme heat and UHI (including future climate scenarios) to highlight exposure, vulnerability and adaptation needs and priorities. Output 1.1.3: Integration of available flood datasets, including areas flooded by Cyclone Ditwah, into the Digital Twin components, setting up a foundation for future phased development of a flooding component.	454,000
	Outcome 1.2.: Strengthened capacity and knowledge resources for national, municipal, and local institutions to scale and replicate digital twin technology	Output 1.2.1: Guidelines, user manuals, and knowledge materials developed, and training provided to government institutions and stakeholders to support effective knowledge transfer and capacity building for the use of the climate digital twin Output 1.2.2: A Digital Twin Sustainability and Handover Plan developed including governance structure, data management protocols, technical maintenance procedures, and institutional arrangements for long-term operation and updating of the system.	134,500
2. Component 2. Strengthening urban climate planning and awareness for enhanced resilience	Outcome 2.1.: Local Authorities integrate climate analysis and digital twin-informed evidence into urban planning and policy processes.	Output 2.1.1: Informed by the evidence generated under Outcome 1.1, an Urban Heat Action Plan developed with government agencies and stakeholders for integration into city planning and policy processes.	60,000

	Outcome 2.2: Government agencies and vulnerable populations have enhanced awareness of climate risks and are empowered to take early action to reduce climate-related impacts	Output 2.2.1: Climate risk communication materials and early action resources generated and tailored for targeted groups at highest risk of being left behind (women, older persons, persons with disability, youth, outdoor and informal workers). Output 2.2.2: Workshops and interactive training sessions (15) delivered to school children and youth on climate risks, climate science, and urban resilience.	260,000
3. Component 3. Implementation of innovative pilot adaptation interventions selected through innovation challenges	Outcome 3.1.: Targeted adaptation interventions tested and implemented, generating evidence for inclusive and gender-responsive, scalable and replicable climate resilience solutions in vulnerable communities.	Output 3.1.1: An innovation competition held to select and support scalable solutions for adaptation interventions. Output 3.1.2: Adaptation interventions identified and tested using Digital Twin components. Output 3.1.3: Pilot adaptation interventions identified/prioritized and implemented in vulnerable communities.	3,262,007
4. Project/Programme Execution cost			437,788
5. Total Project/Programme Cost			4,608,295
6. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)			391,705
7. Amount of Financing Requested			5,000,000

3.1. Projected Calendar:

Milestones	Expected Dates
Start of Project/Programme Implementation	June 2027
Mid-term Review (if planned)	February 2029
Project/Programme Closing	June 2030
Terminal Evaluation	February 2031

PART II: PROJECT/PROGRAMME JUSTIFICATION

- A. Describe the project/programme components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.**

1. The project consists of three interlinked components that combine cutting edge technology, capacity building, and on the ground innovation to build urban climate resilience in the CMA.

2. Component I: Adopting digital twin technology, and tailored climate projections co-developed with stakeholders to identify vulnerabilities and adaptation needs and priorities

3. Component 1 focuses on systematically identifying climate risks, vulnerable communities, and priority adaptation needs within the CMA. This component establishes the technical, institutional, and social foundations required for effective and locally led climate adaptation planning.

4. The outputs strengthen climate resilience in the CMA by establishing an integrated, forward-looking evidence based tool that links climate hazards, exposure, vulnerability, and adaptation options within a single decision support system. By combining co-developed observed and projected climate datasets for extreme heat, rainfall, and cyclones (Outputs 1.1 and 1.2) with spatial vulnerability information and real-world disaster impacts (Output 1.3), this component helps identify areas most at risk now and in the future.

5. The Digital Twin components (Outputs 1.1, 1.2, and 1.3) bring climate data together allowing policymakers and planners to understand risks, test adaptation scenarios, and prioritize investments under future climate conditions, facilitating science-based decision making. This evidence is directly operationalized through the integration of extreme heat analysis into municipal climate action planning and the development of a Comprehensive Heat Action Plan (Output 3.1), ensuring that scientific insights translate into concrete planning and policy decisions.

6. Contribution to resilience: The Digital Twin will serve as a decision support system that allows local authorities, planners and communities to visualize current and future climate risks, identify vulnerable hotspots, and test the effectiveness of adaptation options before implementation. This shifts adaptation from reactive to proactive and science-based planning.

7. Outcome 1.1: Strengthened capacity of vulnerable communities to respond to climate risks and identify and prioritize adaptation needs

8. Output 1.1.1: Co-developed datasets with community and stakeholders for observed and projected climate hazards (flood, cyclones, UHI) for the CMA.

9. Historical and current observations of key climate variables (temperature, humidity including wet bulb temperature, and rainfall) will be analyzed to understand past trends using station data and other data (e.g., gridded observational datasets and retrospective analyses). This will include an analysis of wet bulb temperature, temperature trends, and extreme heat. Observed and projected climate risk information for flood and cyclones will be developed to understand past trends and identify spatial patterns of exposure and will include rainfall intensity, duration, and frequency characteristics. Cyclone track and intensity data will be obtained from a range of publicly available sources including national disaster management agencies, regional agencies (e.g., Indian Meteorology Department), and global datasets such as the NASA Modern Era Retrospective-Analysis for Research and Applications (MERRA-2).

10. The analysis will be tailored to the specific conditions of the CMA as tailored climate projections

specifically for this urban area do not exist and will therefore use downscaled provincial projections and locally observed climate datasets. Current climate projections have been developed at the Provincial scale. This work will be built directly upon the Multilayered Vulnerability Assessment (MVA) already conducted under the UN-Habitat RISE-UP project. The MVA identified vulnerability hotspots in selected areas, (Colombo Municipal Council (CMC) and Wattala Urban Council). The proposed Climate Digital Twin will add a detailed climate intelligence layer on top of these existing vulnerability hotspots by integrating high resolution climate hazard and exposure data. This integration will enable a more precise understanding of who and what is vulnerable, how risks will evolve under future scenarios, and where adaptation interventions should be prioritized. Co-development will be carried out with relevant stakeholders including the Meteorology Department, Ministry of Health, Ministry of Environment (specifically Climate Change Secretariat), other government agencies, academic institutions, and communities. Tailoring and co-development will help select appropriate seasons, timescales, and multiple warming scenarios (e.g., SSP1-2.6, SSP2-4.5, SSP3-7.0).

11. Observed climate information (temperature, humidity, and rainfall) will be obtained from Sri Lanka's Department of Meteorology local weather station data and supplemented by global observed datasets, including gridded products. Future climate will be projected using the NASA Earth Exchange Global Daily Downscaled Projections (NEX GDDP) and combined (or supplemented) with regional climate models (e.g., CORDEX-South Asia) where necessary and available. The project will use the best available climate data accessible at the time of analysis, including updated outputs from earth system models anticipated in 2026 and 2027 from the seventh phase of the Coupled Model Intercomparison Project (CMIP7).

12. A UHI analysis will be carried out to identify areas where urban heat is currently concentrated using NASA MODIS, LANDSAT and ASTER satellite products. LANDSAT (~30m) and ASTER observations are at high spatial resolution but are less frequent (~16 days) and often obscured by clouds in Colombo's humid tropical location. ASTER provides additional information on thermal emissivity as well as daytime and nighttime temperatures that are important to understand the UHI. MODIS observations are more frequent but have a coarser resolution, motivating combined products that combine temporal and spatial resolution to better understand Colombo heat across diurnal and seasonal cycles as well as under extreme conditions. The project will utilize secondary source analysis and historical field-validated datasets to cross-reference satellite observations. This ensures the accuracy of the "feels-like" temperature index (Heat Index) and humidity metrics, which are currently hindered by the tropical cloud cover.

Integration and analysis of urban systems data for Digital Twin development will include structured data collection, creation, validation, cleaning, harmonisation, and standardization to ensure a high-quality, usable, and interoperable dataset. Building on the Multilayered Vulnerability Assessment (MVA) and the Project Formulation Grant (PFG), the activity will improve data quality and organise urban information on hotspots and risk areas.

13. The analysis will be done in collaboration with the Meteorology Department of Sri Lanka to ensure that methods are compatible with current or planned projections for the country.

14. Activities related to Output 1.1.1

1.1.1.1 Co-development workshops (02) with stakeholders to analyze context and identify climate information needs, including community (02) workshops that ensure the community in their diversity can participate and engage

1.1.1.2 Analysis of observed data and development of climate projections

1.1.1.3 UHI analysis carried out

15. Output 1.1.2: Digital twin components/replica of CMA using a GIS platform is developed for extreme heat and UHI (including future climate scenarios) to highlight exposure, vulnerability and adaptation needs and priorities.

16. Digital twins are digital replicas of physical environments or processes ([Hazeleger, 2024](#)).¹ They can have real-time capabilities as well. These virtual representations can be used to simulate and visualize the impacts of climate change to support evidence-based planning and resilience strategies ([Ricciardi and Callegari, 2023](#)).²

17. Digital twins are increasingly recognized as a transformative technology for climate adaptation, offering the ability to simulate and analyze climate impacts, thereby informing more effective strategies for building resilience. The analysis will draw from multiple initiatives in New York City, including the digital twin components of the NASA Urban Advanced Information Systems Technology (AIST) project, the 18-year experience (lessons and approaches) from New York City Panel on Climate Change (established in 2008), and NYC's Climate and Resiliency Design Guidelines (2022) as well as from the experience of developing the largest public digital twin developed in Germany, through HafenCity University that is a part of UNITAC.

18. In New York, the digital twin for heat entails the Cool Corridors (CoCo) Tool, used to identify the path with the least heat exposure between any two points, reflecting features such as green infrastructure (Annex 1, Figure A1). Schools have been identified as sites of concern for heat vulnerability, with an analysis done to identify hotspots (Annex 1, Figures A2 and A3). Ongoing analyses in New York also include the identification of key city features that contribute to heat (e.g., roof color, proximity to green spaces etc., wind patterns, building density and height etc.). Similar features will be identified for Colombo.

19. Drawing from these experiences and the evolving digital twin technology will enable a science-based transformative adaptation in Colombo, rather than incremental approaches being implemented due to the absence of urban focused climate projections and climate-related planning at the urban scale. In this proposal we refer to digital twin components as specific elements of a larger digital twin apparatus that could continue to expand for Colombo beyond this project, which could eventually incorporate more city information and key responses with further data and model development.

20. The project will also build on UN-Habitat's Multilayered Vulnerability Assessment (MVA) carried out for Colombo, as well as benefit from instruments such as the City Resilience Profiling Tool and the Climate Proofing Toolkit, which could provide guidance for policymakers, planners and practitioners to factor in climate change impacts in current and future urban infrastructure.

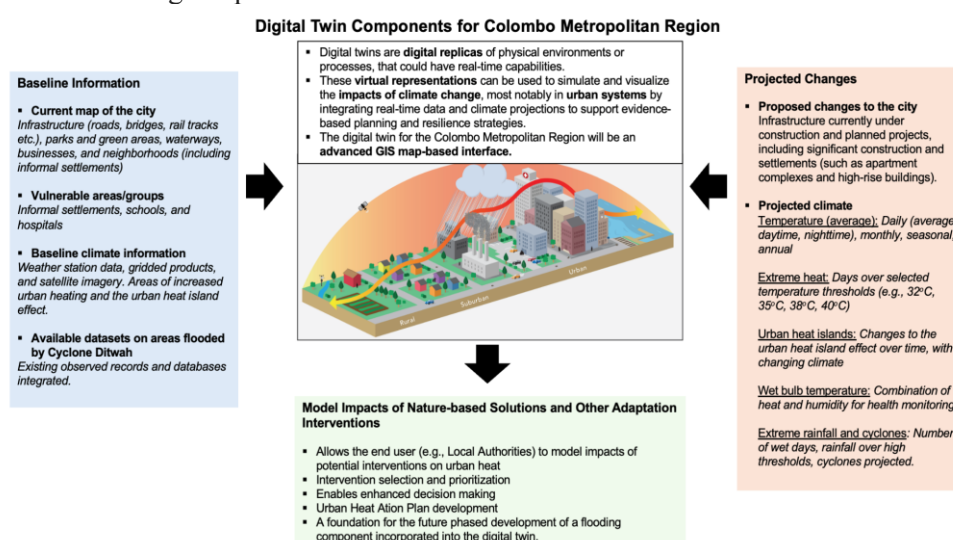


Figure 6. Proposed Digital Twin Components for the Colombo Metropolitan Region

¹ According to the NASA Earth Science Technology Office (ESTO), digital twins have three defining elements: Digital replica of a real-world system; Responsiveness to environmental conditions (e.g., climate change); Sensitivity to system change (e.g., adaptation).

² Good impact data allows a digital twin that includes environmental and system elements, and responds to climate change through environmental features, and adaptation through system features.

21. The project will develop digital twin components for the Colombo Metropolitan Region to support climate-informed urban planning and science-based decision-making. The core method is to use Machine Learning approaches (e.g., Extreme Gradient Boosting; XGBoost) to identify the city features that influence localized temperature hot spots, both identifying drivers and priority solution areas to build resilience to heat. For example, heat is demonstrated to be affected by elevation, proximity to the ocean and Kelani River, land use, land cover (e.g., impervious pavement), green and blue space features (e.g., tree cover and parks), seasonal and diurnal cycles, extreme event characteristics (e.g., heat wave duration), and wind patterns (including land-sea interactions).

22. The digital twin can also highlight the importance of shading (when available) on heat stress. This machine learning model can also be used to explore interventions that alter any of these features (e.g., adding green spaces, introducing shading), helping to understand potential benefits of implementation under present and future climate conditions. Digital twin components will be created to account for population access to cooling shelters or other resilience resources.

23. The digital twin can also explore the siting of key infrastructure in areas with lower risk levels (e.g., which low-heat areas may be suitable for climate sensitive uses, such as childcare centres, healthcare facilities, or community centres). Baseline inputs will include a current map of city infrastructure and spatial data on vulnerable areas and groups, including informal settlements, schools, and hospitals. It will leverage publicly available datasets alongside a specialized multi-layer urban systems dataset obtained through the Project Formulation Grant (PFG). This dataset incorporates key variables such as building energy proxies (e.g., air-conditioning usage patterns), as well as detailed information on building typology and construction materials, which will serve as core inputs to the machine learning model. By prioritizing these parameters, the approach moves beyond conventional land-cover analysis to focus on the physical characteristics of the built environment that drive localized urban heat hotspots. Baseline climate information will draw on weather station data, gridded datasets, and satellite imagery to capture patterns of urban heating, the UHI effect, and areas previously affected by flooding during Cyclone Ditwah, using existing observed records and databases.

24. These baseline conditions will be combined with projected changes to the city, including planned infrastructure and construction projects, as well as projected climate conditions such as changes in average temperatures (daily, monthly, seasonal, and annual), increases in extreme heat days, shifts in UHI intensity, wet bulb temperature for heat-health monitoring, and projected patterns of extreme rainfall. Using an advanced GIS-based interface, the digital twin components will allow users to visualize climate risks (especially extreme heat) across areas of the CMA, and to model the impacts of NbS and other adaptation interventions. It will also include a user-friendly interactive data online visualization tool to enable ease of use by stakeholders, including local authorities and communities. This functionality will enable local authorities to test some solutions, prioritize interventions, support heat management planning, enhance decision-making, and establish a foundation for the future phased integration of flood modeling into the digital twin.

25. The digital twin components will be used to identify the primary explanatory features of urban climate impacts. The models will draw from a wide range of explanatory features including city features and climate hazards (at a variety of tolerance thresholds), vulnerability information (e.g., demographics such as age, gender and income), and exposure datasets (e.g., number of school playgrounds in areas experiencing extreme heat). The project will identify relationships between impacts and existing geographical features corresponding to potential adaptations, such as, the presence of cooling infrastructure (e.g., vegetation and parks).

26. Potential features that could be explored by the digital twin include:

- a) Meteorological: Wind direction, wind speed, relative humidity, solar radiation, cloud cover, rainfall in the last 24 hours, rainfall in the last 48 hours, rainfall in last week, rainfall in the last month
- b) Land cover: Surface material and emissivity, building typology, surface permeability, surface color, soil type, proximity to water bodies, proximity to parks, tree density, fraction of surrounding area with vegetation, population density, vehicle density

- c) Other: Elevation, Day of the year, time of the day, proximity to industrial areas, and building energy usage proxies" and "Anthropogenic heat sources (AC usage)

27. This technical detail is necessary to parameterize the Digital Twin's ability to simulate "what-if" scenarios for Nature-based Solutions (NbS) like cool roofs or building retrofits.

28. The digital twin will help decision-makers understand how urban climate risks are changing and evaluate the potential effectiveness of adaptation strategies before they are implemented. The digital twin will be designed to allow for additional complementary activities such as forecasts of extreme heat that may be possible if the digital twin is incorporated into future operational products that could be driven by near-real-time inputs into the digital twin heat models.

29. Activities related to Output 1.1.2

1.1.2.1 Collection of publicly available datasets

1.1.2.2 Development of digital twin components related to extreme heat and flood

1.1.2.3 User-friendly interactive online visualization tool

30. Output 1.1.3: Integration of available flood datasets, including areas flooded by Cyclone Ditwah, into the Digital Twin components, setting up a foundation for future phased development of a flooding component.

31. Available datasets capturing the extent and severity of flooding associated with Cyclone Ditwah will be compiled and incorporated into the Colombo Digital Twin. These datasets may include existing flood inundation maps, damage assessments from national disaster management authorities, community-generated reports, and municipal records of affected neighborhoods, drainage infrastructure, and services (as datasets are available).

32. The integration will enable spatial visualization of Ditwah's flooding impacts, including inundated neighborhoods, transport corridors, and critical facilities. It will also support preliminary analyses of exposure and vulnerability by linking flood-affected zones with demographic, land-use, and infrastructure layers already present in the Digital Twin. This initial integration serves as the technical groundwork for developing a future phased development of a dynamic flood component of the digital twin through complementary projects in the future.

33. Activities related to Output 1.1.3

1.1.3.1 Collection of publicly available datasets on extreme rainfall and flooding events

1.1.3.2 Extreme rainfall and flood datasets incorporated into digital twin components

34. Outcome 1.2: Strengthened capacity and knowledge resources for national, municipal, and local institutions to scale and replicate digital twin technology

35. Output 1.2.1: Guidelines, user manuals and knowledge materials developed and trainings provided to government institutions and stakeholders to support effective knowledge transfer and capacity building for the use of the climate digital twin .

36. Technology and knowledge transfer is a core pillar of the project to ensure long-term sustainability, scalability, and local ownership of digital twin technologies in the CMA. Leveraging the experience of Columbia University, NASA, and New York City's evolving digital twin initiatives, this project will facilitate the strategic transfer of technologies (e.g., digital twin platforms). While Columbia University will lead the technical development of the digital twin components, knowledge and methods will be transferred from early stages of the project through a co-development approach.

37. The technology transfer process will have several components: a Technical Working Group, knowledge transfer documentation, and tailored capacity building sessions. Following an initial assessment of local capacities, a Technical Working Group will be established to ensure the methods

and knowledge are transferred throughout the lifecycle of the project. Data and methods will be documented comprehensively and will be made publicly available.

38. UN-Habitat's open-source digital twin development model, implemented through UNITAC, will underpin the technology transfer process. All digital tools, data structures, and model components developed under this project will be designed for transparency, reusability, and customization by government agencies, academia, and other partners. This ensures that the digital twin system is not dependent on proprietary technologies, but can be continuously adapted, expanded, and maintained locally across different institutional and geographic contexts.

39. Capacity building workshops will focus on the development, maintenance and application of digital twin platforms, including interpretation of outputs, scenario analysis for interventions, integration of urban and environmental data, and supporting evidence-based decision making for climate resilient urban planning, using digital twin components. Cross-learning sessions will include stakeholder engagement, participatory planning, and strategies for replicating interventions in other urban areas.

40. Activities related to Output 1.2.1:

1.2.1.1 Establish Technical Working Group and schedule periodic meetings (06)

1.2.1.2 Document on data and methods and disseminate publication to key stakeholders

1.2.1.3 Conduct capacity building workshops (10) on the development and application of digital twin platforms include results interpretation and decision-making

41. Output 1.2.2: A Digital Twin Sustainability and Handover Plan developed including governance structure, data management protocols, technical maintenance procedures, and institutional arrangements for long-term operation and updating of the system

42. The Digital Twin Sustainability and Handover Plan will ensure good practices, long-term operation, maintenance, and local ownership of the Colombo Digital Twin beyond the project period. The plan will be developed collaboratively with the Technical Working Group (Output 2.1) together with local authorities, technical agencies, and relevant national institutions to establish clear pathways for governance, data transfer, and capacity building. Specifically, Columbia University, local universities, and relevant government agencies such as the Meteorology Department will be the main institutions involved.

43. The agency responsible for the ongoing management of the Digital Twin post project will be identified by the time the project reaches the half-way point. Procedures for regular updating of the platform will also be established.

44. The Digital Twin Sustainability and Handover Plan will be presented and disseminated to stakeholders, including local authorities and partners. This Handover Plan will serve two purposes:

- To support institutions and agencies to use Digital Twin technology as a decision-making tool and planning adaptation interventions,
- To make sure the Digital Twin technology evolves with ever changing climate and environmental risks.

45. Activities related to Output 1.2.2:

1.2.2.1 Develop digital twin sustainability and handover plan held with technical partners and relevant stakeholders

1.2.2.2. Identify the agency responsible for ongoing management and ensure staff are trained for independent operation and updates.

1.2.2.3 Digital twin sustainability and handover plan presented and disseminated at workshop with key stakeholders

46. Component 2. Strengthening urban climate planning and awareness for enhanced resilience

47. Component 2 focuses on strengthening science-based decision-making within local authorities

while empowering communities to understand and act on climate risks. This is fully in line with UN-Habitat's people-centred smart cities approach, ensuring that digital innovation is translated into inclusive planning processes and community level action. Under this component, local authorities will integrate climate analysis and digital twin informed evidence into urban planning, specifically an Urban Heat Action Plan. This will be co-developed with government agencies and key stakeholders, to be later integrated into city planning and policy processes.

48. In parallel, government agencies, relevant institutions, and vulnerable populations will have enhanced awareness of climate risks and be empowered to take early action to reduce climate-related impacts. In order to build the capacity of local populations, targeted awareness sessions will also be delivered to priority groups, such as women, the older persons, youth, outdoor workers, and informal sector workers, supported by tailored climate risk communication materials and early action resources. Complementary workshops and training sessions will engage schoolchildren and youth, strengthening climate literacy, fostering long-term resilience, and embedding early action principles across generations.

49. Contribution to resilience: Strengthened institutional planning capacity and empowered communities will reduce exposure to heat stress and flooding through better preparedness and early response.

50. Outcome 2.1.: Local Authorities integrate climate analysis and digital twin-informed evidence into urban planning

51. Output 2.1.1: Informed by the evidence generated under Outcome 1.1, an Urban Heat Action Plan developed with government agencies and stakeholders for integration into city planning and policy processes.

52. This output will apply the extreme heat and humidity analyses, together with the urban heat island assessment, to directly support the CMA in strengthening climate action planning and developing a Heat Action Plan. Using the heat component of the Digital Twins, planners and technical teams will be able to visualize current and projected heat risks across neighborhoods, identify populations, services, and infrastructure most affected. Stakeholder workshops and consultations with community groups, health officials, and urban planners will guide the interpretation of the climate information, ensuring that local knowledge and lived experience are incorporated into identifying hotspots and feasible interventions.

52. The Heat Action Plan will identify priority zones for intervention and support coordination across municipal departments. By including extreme heat analysis into the city's climate action planning, this output will improve preparedness, strengthen institutional capacity, and establish a foundation for science-based, community-centered heat resilience in the CMA.

53. Activities related to Output 2.1.1:

2.1.1.1. Workshops (5) with groups of stakeholders to analyze the context, review results of analysis, and plan the development and content of the Heat Action Plan

2.1.1.2. Heat Action Plan for the CMA produced and disseminated

54. Outcome 2.2.: Government agencies and vulnerable populations have enhanced awareness of climate risks and are empowered to take early action to reduce climate-related impacts

55. Output 2.2.1: Climate risk communication materials and early action resources generated and awareness sessions delivered on climate risk for early action for targeted vulnerable groups (women, older persons, youth, outdoor workers, informal workers)

56. Key vulnerable communities will be actively engaged through training and awareness creation sessions to increase their understanding of climate risks and strengthen their resilience to extreme weather events. While a broad range of climate hazards and extremes will be covered, heat-related

impacts will be the central focus of these sessions.

57. Local community leaders, women's groups, and informal worker networks and businesses will receive tailored training sessions on identifying climate risks, effective response strategies, and practical measures to prepare for and adapt to climate extremes. Training will cover practical measures such as heat stress prevention, safe work practices for outdoor workers, and accessing resources such as cooling centers and shaded and/or cooler zones.

58. In addition, targeted infrastructure upgrades and facility improvements will be included to enhance safety and resilience. These sessions will employ a mix of participatory approaches, including interactive demonstrations, and scenario exercises to ensure that participants will learn to respond effectively to extreme events and employ appropriate and low-effort adaptation measures in their daily lives.

59. Activities related to Output 2.2.1:

2.2.1.1 Awareness creation workshops (15) with vulnerable groups, including tailored sessions for different vulnerable groups

2.2.1.2 Development of targeted awareness materials such as pamphlets and digital communications

2.2.1.3 Awareness creation sessions for businesses on protecting their employees and upgrading key infrastructure and facilities (e.g., outdoor workers, delivery personnel, etc.)

60. Output 2.2.2: Workshops and interactive training sessions delivered to school children and youth on climate risks, climate science, and urban resilience

61. This output will strengthen climate and health literacy among students and youth. Activities will focus on building youth leadership, ensuring that youth (both women and man) can participate equally, fostering gender-sensitive approaches, and equipping schools with practical tools to prepare for extreme heat and other climate-related hazards.

62. A youth-led adaptation awareness campaign will be designed and implemented in collaboration with teachers and youth organizations. The campaign will incorporate gender-responsive approaches to ensure that girls are equally represented and engaged, acknowledging their unique vulnerabilities and critical leadership roles in climate resilience. Key activities will include the creation of youth-developed communication materials (posters, social media reels/posts, art) to educate students on heat safe measures and extreme heat preparedness. Simulation exercises and drills will also be designed to identify safe shaded areas, set up cooling stations, and practice emergency actions for heat-related illnesses. At least one school in the CMA will be chosen to pilot this outreach campaign and test its effectiveness.

63. Activities related to Output 2.2.2:

2.2.2.1 Workshops (15) to empower and train leaders in youth organizations and schools to create awareness on climate risks, climate science, and urban resilience amongst their own institutions and peers

2.2.2.2 Student and youth-led development of awareness materials (social media campaigns, art, and hands-on activities)

2.2.2.3 Pilot simulations, exercises and drills (10) with youth organizations and schools along with resilient upgrades to outdoor and indoor learning spaces.

64. Component 3: Implementation of innovative pilot adaptation interventions selected through innovation challenges

65. Component 3 translates the analytical insights and decision support tools developed under Component 1 into on the ground adaptation actions. It focuses on testing, demonstrating, and refining innovative adaptation interventions that directly reduce climate risks for vulnerable communities in the CMA, while generating evidence for scaling and replication.

66. Through an open innovation challenge engaging various sectors and stakeholders, this component contributes to moving from risk identification to risk reduction and solutions, demonstrating how science-based decision-making can deliver tangible adaptation outcomes for vulnerable populations. The innovation challenge builds on UN-Habitat's established methodology for locally driven urban innovation, which has been applied across multiple regional and global programmes to identify, test, and scale inclusive climate solutions – most notably through its Climate Smart Cities Challenge. The approach combines participatory design, structured competitive selection, technical support, system demonstrators and deeper systemic transformation, as well as iterative learning to ensure that selected interventions are not only innovative, but also contextually appropriate, scalable, and aligned with local priorities and capacities.

67. The digital twin will have capabilities to test the compatibility of proposed interventions and evaluate their effectiveness under current and future climate conditions before being prioritized and implemented as pilot actions. This is a key distinguishing feature of this approach: the Digital Twin technology is integrated into the innovation cycle, thus enabling proposed solutions to be tested virtually prior to implementation. This immediately strengthens the design quality, while reducing risk, and enhancing scalability. Overall, combining the innovation challenge, Digital Twin based scenario testing, and community- and local authority-led pilot implementation, this component demonstrates how science-based participatory planning enhances adaptive capacity at local and institutional levels and builds a foundation for scaling successful interventions. This will support a transition toward resilient, inclusive, and climate adaptive urban development.

68. Contribution to resilience: This component delivers tangible risk reduction on the ground while generating evidence on what works, for whom, and at what cost, creating a pathway for scaling successful innovations. Together, the people-centred smart cities approach and the innovation challenge methodology ensure that technological innovation is directly linked to social inclusion and sustainability, enabling vulnerable communities to actively shape and benefit from climate adaptation solutions.

69. Outcome 3.1.: Targeted adaptation interventions tested and implemented, generating evidence for scalable and replicable climate resilience solutions in vulnerable communities.

70. Output 3.1.1: An innovation competition held to select and support scalable solutions for adaptation interventions

71. An innovation competition called the 'Climate Resilience Accelerator' will be held for a range of groups such as local authorities, universities, nonprofits, businesses, academia, women's cooperatives, youth councils, and urban informal settlement groups to propose innovative adaptation interventions to address the most urgent impacts of climate change identified by digital twin technology and the related analyses. This process will draw on UN-Habitat's tested "innovation accelerator" model, which has demonstrated success in mobilizing diverse actors, including communities, local and national governments, innovators and private sector partners, to co-create and implement adaptation solutions. The methodology integrates technical evaluation, community validation, and iterative refinement, ensuring that selected interventions are both scientifically robust and socially inclusive.

72. The launch of the innovation competition will also include complementary information sessions that disseminate results of the digital twin components and technical analyses that will inspire appropriate NbS and adaptation interventions for the CMA.

73. Funding will prioritize interventions aligned with Sri Lanka's climate policies, including the National Adaptation Plan (NAP), Nationally Determined Contributions (NDCs), and other government strategies, while rewarding approaches that demonstrate innovation, inclusivity, and potential for community resilience. This activity will be done in collaboration with a range of stakeholders including local authorities to support the localization SDG. All interventions will aim to have a 'Green People's Process,' an UN-Habitat led- approach that places poor urban communities and climate vulnerable

groups at the core of adaptation innovation design and actions, thereby ensuring inclusivity, equity, and genuine co-creation in adaptation solutions.

74. Type of Innovation:

75. Social innovation: Emphasizing co-creation and inclusive participation of vulnerable and traditionally marginalized communities in adaptation solutions.

Institutional innovation: Strengthening municipal and community governance and partnership frameworks to ensure sustainable local adaptation and mainstreaming of resilience into city planning processes.

76. Technological innovation: Promoting affordable, scalable technologies tailored to addressing climate vulnerabilities of the Colombo Metropolitan Area.

77. The innovation challenge will be held 12-18 months after the start of the project, once the digital twin components and technical analyses are near-complete. It will have a maximum implementation timeframe of 12 months and will be monitored by UN-Habitat. The criteria for selection will include innovation potential, adaptation impact, inclusivity, and scalability. Priority will be given to context specific innovative interventions, particularly NbS, that enhance resilience, are socially inclusive, technically feasible, and scalable across similar urban settings.

78. *Activities related to Output 3.1.1*

3.1.1.1 Launch of innovation challenge together with digital twin technology results

3.1.1.2 Promotional campaigns distributed at local authorities, universities, businesses, NGOs, and community groups

3.1.1.3 Hybrid information sessions (06) on the innovation challenge and digital twin technology results

79. *Output 3.1.2: Adaptation interventions identified and tested using the Digital Twin*

80. Through the use of the Digital Twin, a list of some targeted adaptation interventions will be identified and tested (for example, adding green spaces could reduce heat to varying extents in different parts of the city, as shown in the digital twin and related analyses). Using Digital Twin's spatial visualization and scenario-testing capabilities, stakeholders will explore how these interventions perform under current and projected climate conditions, with particular attention to extreme heat and flooding. The Digital Twin will also help assess potential co-benefits (e.g., reduced heat exposure, improved air quality, enhanced public spaces) and understand how interventions may affect or support vulnerable populations.

81. Pilot testing of select interventions will be conducted through both the Digital Twin and stakeholder consultations to reveal potential impacts and improve approaches (e.g., in disaster preparedness, land-use planning, or infrastructure management). It is likely that the digital twin will not be capable of simulating the effects of all proposed impacts, so the project will identify gaps for future research and digital twin development.

82. *Activities related to Output 3.1.2*

3.1.2.1 Selection of proposed interventions tested using digital twin technology

83. *Output 3.1.3: Pilot adaptation interventions identified/prioritized and implemented in vulnerable communities*

84. This output will focus on implementing a set of community-relevant pilot adaptation interventions in CMA's most vulnerable areas selected from the innovation challenge. Interventions will be co-designed with communities in their diversity, ensuring that women, older persons, young people can access leadership roles, to address priority risks - extreme heat, and flooding.

85. The innovation competition will have set of categories. It will include the following as the primary applicant with a range of partners: Local Authorities, Non-Governmental Organizations (NGOs),

Community-Based Organizations (CBOs), including women's and youth groups, Private sector entities and businesses including start-ups, Universities and other academic or research institutions

86. Diverse coalition models will be encouraged while requiring local legitimacy and financial capacity. Medium and small grants will be allocated for interventions through the competitions. It will include medium grants to 6 winners and small grants to 12 winners.

87. Criteria for selection includes:

- a) A minimum of 70% of the funding will be allocated for projects that include nature-based solutions as the primary climate adaptation intervention, including hybrid solutions.
- b) Projects must demonstrate adherence to recognized good practices based on sound scientific and ecological principles, including collaboration with academic institutions and/or conservation organizations, as appropriate.
- c) Public-private partnerships and multi-stakeholder collaboration models are encouraged, particularly where they contribute to sustainability and scalability.
- d) The project portfolio will seek an appropriate balance between innovative approaches (approximately 70%) and proven, tested solutions (approximately 30%) informed by implementation feasibility and risk considerations.
- e) At least 50% of supported projects will prioritize areas serving vulnerable or at-risk communities, while remaining projects may focus on public spaces and pedestrians.

88. *(Selection criteria are indicative and will be reviewed and refined in consultation with the Technical Working Group during implementation)*

89. The project will prioritize appropriate solutions tailored to the CMA, drawing on both nature-based and complementary grey solutions. The exact mix and location of interventions will be finalized during the detailed design phase, informed by local stakeholder consultations, technical assessments, and guidance from the Technical Working Group. The sub-grant will need to demonstrate meaningful economic, social, and environmental benefits while avoiding or mitigating harm. Furthermore, approved subgrants will complete a proportionate safeguards and gender screening process prior to contracting, and moderate-risk proposals will be required to adopt tailored management measures, which will be monitored throughout implementation.

88. Indicative NbS may include: urban greening and tree audits/planting, green corridors and micro-parks, restoration of urban wetlands/mangroves, bioswales/rain gardens (channels designed to concentrate and convey stormwater runoff), permeable pavements and improved soil/ground layers.

89. Complementary Grey Solutions may include: cooling technologies (retrofitting with heat reflective paints, reflective surfaces), cool roofs, cooling centers and stations (containers retrofitted for shelter for outdoor workers/pedestrians, pop-up shaded areas in markets and transport hubs), flooding and drainage resilience

90. Each pilot will be monitored to evaluate its effectiveness, usability, maintenance needs, and potential for city-wide scaling.

91. *Activities related to Output 3.1.3:*

3.1.3.1 Selection and awarding of projects

3.1.3.2 Implementation of interventions

3.1.3.3 Monitoring and evaluation of adaptation interventions

92. The three components form an integrated package, Component 1 provides the evidence base, Component 2 turns evidence into planning and awareness, and Component 3 tests and demonstrates real adaptation solutions.

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

93. This project introduces several interconnected innovations that are new in the Sri Lankan urban context.

- a) Pioneering use of Climate Digital Twin technology for urban adaptation is the first such application in Sri Lanka. Adapted from proven NASA/Columbia University initiatives in New York City, and UNITAC's digital twin methodology, the Digital Twin will enable dynamic simulation and testing of adaptation scenarios (for heat and UHI), moving beyond static maps to interactive, forward looking decision support.
- b) Locally driven Innovation Challenge is a competitive grant mechanism that crowdsources innovative, context specific adaptation solutions from diverse local actors, with priority given to nature based and hybrid solutions. This fosters social, institutional, and technological innovation while ensuring community ownership. UN-Habitat's innovation challenge methodology will be applied to design and roll out the challenge process with local partners.
- c) Catalytic knowledge transfer and private sector engagement is a structured technology and capacity handover (including a Sustainability and Handover Plan) combined with incentives for private sector co-investment in adaptation.
- d) Deeper institutional innovation through UN-Habitat's people-centred smart cities and innovation challenge methodologies, which ensure that digital tools and adaptation interventions are co-created, inclusive, and scalable across different urban contexts.

94. These innovations address critical gaps such as lack of localized urban climate intelligence and limited science based, scalable NbS implementation in Sri Lankan cities.

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.

95. The project is explicitly designed for scaling and replication. Successful Digital Twin components and methodologies will be documented, handed over to local institutions (Department of Meteorology, University of Moratuwa), and supported through capacity building and a formal Sustainability and Handover Plan. The innovation challenge will generate a portfolio of tested pilots with clear performance data (generated via the Digital Twin). Lessons learned, guidelines, and evidence will be disseminated through workshops, policy briefs, and cross-city learning events to enable replication in other Sri Lankan cities and similar urban contexts in the region. Integration of the Heat Action Plan and Digital Twin outputs into official urban planning processes will ensure institutional uptake and long-term mainstreaming. This scalability is further supported by UN-Habitat's modular and open-source digital twin architecture developed through UNITAC, enabling rapid adaptation of the digital twin framework to other cities with varying data availability, technical capacity, and governance structures.

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 and Gender Policy of the Adaptation Fund.

96. The project will deliver tangible economic, social, and environmental benefits, with a strong focus on the most vulnerable communities in the CMA, particularly residents of informal settlements, outdoor workers, women, children, the older persons, and persons with disabilities.

Table 02: Economic, social, and environmental benefits

Type of Benefit	Baseline Situation	With the Programme	After the Programme (Long-Term Impact)
Economic	Frequent work disruption of household	Reduced illness, and thus care requirements,	Increased economic resilience of vulnerable

	income due to heat stress and flooding, high healthcare and asset repair costs, increased unpaid care requirements preventing women from accessing paid work outside of the home.	improved productivity and working conditions, pilot adaptation investments generate local income opportunities	households, reduced climate related income shocks, improved economic growth
	Reactive infrastructure spending, lack of investment efficiency, limited data driven prioritization in investments	Digital twin supports targeted, risk informed investment planning	Institutionalized evidence based adaptation planning across metropolitan authorities
Social	High exposure to heat related illness and vector-borne diseases, inadequate cooling and drainage	Improved thermal comfort, inclusive infrastructure upgrades	Sustained reduction in climate related health burdens, especially for women, older persons, and children
	Limited participation of women and marginalized groups in adaptation planning	Equal participation in consultations, training, and innovation processes; gender responsive design	Strengthened agency of women and marginalized groups in urban climate governance
	Schools disrupted during extreme heat and flood events, temporary displacements	Reduced disruptions in schools	Improved educational continuity and long-term human capital outcomes
Environmental	limited green cover, degraded wetlands in urban areas	Implementation of nature-based solutions and ecosystem restoration	Enhanced biodiversity, improved microclimate regulation, and long-term ecosystem resilience
	Increasing frequency of extreme heat and urban flooding	Localized reduction of UHI intensity and improved stormwater management	Scalable model for metropolitan wide climate adaptation

97. Over 50% of Colombo city's residents live in informal settlements, where exposure to heat and flooding is highest. The project explicitly prioritizes these areas and groups. Women, who often bear disproportionate care responsibilities and have higher exposure to heat while working indoors or outdoors, will benefit from targeted training, cooling solutions, and participation in innovation processes. Gender responsive design will ensure equal opportunities for women to lead and benefit from pilot interventions and decision making. All activities will apply gender lens, in full compliance with the Adaptation Fund Gender Policy.

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.

98. The project is designed to be highly cost-effective by prioritizing data driven decision making, preventing maladaptation, and leveraging NbS and hybrid approaches that deliver multiple benefits at lower long-term costs compared to traditional grey infrastructure.

Logical Explanation of the Selected Approach

99. The core innovation of a Climate Digital Twin allows stakeholders to identify high risk areas, prioritize interventions, and simulate the performance of adaptation options before any physical implementation. This significantly reduces the risk of investing in ineffective or maladaptive measures. By testing scenarios virtually (e.g. the cooling effect of new green spaces or permeable surfaces), the project ensures that the limited budget is directed toward the most impactful solutions.

100. The innovation challenge further enhances cost effectiveness by competitively selecting locally proposed pilots, encouraging innovation, community ownership, and potential co-financing from private sector or local authorities.

Table 03: Cost effectiveness criteria comparison with alternative actions

Proposed Action	Cost Effectiveness Criteria	Alternative Action	Why Alternative is Less Cost Effective
Development of Digital Twin for climate risk analysis	One-time investment (~USD 200k-300k within project allocation) enables continuous, scalable climate risk modelling, integrating heat, flood, and vulnerability layers. Reduces need for repeated standalone studies (~USD 100 K–150K per cycle).	Traditional standalone climate risk assessments conducted periodically	Requires repeated studies, lacks integration, limited scenario testing, higher long term analytical costs
Capacity Building and Technology Transfer	Strengthens national, local university, Department of Meteorology and municipal capacity, reducing reliance on external consultants (~USD 130K)	Outsourcing climate planning to consultants for each project cycle	Recurring consultancy costs over time exceed USD 750K+ with no institutional learning or data continuity, resulting in long-term dependency.
Innovation Challenge with Pilot Testing	Small-scale testing reduces financial risk, competitive selection improves efficiency, potential co-financing leverage. Uses small-to-medium grants (~USD 100K–300K per intervention cluster) to test solutions before scaling, reducing failure risk and improving targeting efficiency	Large scale infrastructure deployment without pilot testing	Higher financial risk, potential design failure, limited flexibility to adjust interventions
Risk Informed Planning Before Capital Investment	Reduces future repair/reconstruction costs, improves investment targeting	Reactive post-disaster reconstruction	Higher long-term costs due to repeated damage and rebuilding cycles
Nature Based and Hybrid Green Grey Solutions	Lower capital and maintenance costs, multiple co-benefits (health, biodiversity, cooling, flood control), long-term ecosystem services	Large-scale grey infrastructure (concrete drainage expansion, hard flood barriers)	High upfront capital cost, high maintenance, limited co-benefits, risk of ecological degradation
Embedding Adaptation into Existing Planning Systems	Uses existing administrative systems (Local authorities/ Met Dep/ Uni) + Digital Twin integration (~USD 60K-100K) setup efficiency gain), avoiding duplication of institutional structures and reducing administrative overhead	Creation of standalone project management structures	Requires recurring administrative costs (~USD 150K–200K annually), weak integration into planning systems, and low post-project sustainability.

Sustainability Perspective

101. Cost-effectiveness extends beyond the project lifetime through:

- a) A Digital Twin Sustainability and Handover Plan that assigns clear institutional responsibility and trains local staff for ongoing maintenance and updates.
- b) Embedding outputs (Heat Action Plan, guidelines, tested pilots) into official urban planning processes, ensuring continued use without additional project funding.
- c) Emphasis on NbS, which typically have lower maintenance costs and generate long term ecosystem services.

102. Although the project focuses on the CMA, its design supports regional scalability and replication.

- a) The modular Digital Twin methodology and knowledge products (guidelines, training materials) can be adapted for other major Sri Lankan cities or similar coastal urban areas in the region with minimal additional investment.
- b) Lessons from the innovation challenge and pilot evaluations will create a replicable model for locally driven adaptation accelerators.
- c) Capacity built among national institutions and universities will enable future expansion to other hazards and geographic areas at reduced marginal cost.

103. By combining advanced but transferable technology with locally led innovation and strong institutional handover, the project maximizes adaptation outcomes per dollar invested while minimizing long term dependency on external funding.

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.

104. The project is fully aligned with Sri Lanka's key national climate change and urban development policies and strategies. It directly supports the country's priorities for building resilience in urban areas, particularly in human settlements, infrastructure, health, and disaster risk reduction.

Table 04: Alignment with national/ sub-national Policy / Strategy

Policy / Strategy	Key Alignment with the Project
National Adaptation Plan (NAP) (2016–2025)	Supports urban settlements, health, and capacity development priorities through localized projections, Heat Action Plan, and NbS for vulnerable groups.
NDC 3.0 (2026–2035)	Advances urban adaptation, technology transfer, capacity building, and NbS, with strong focus on vulnerable populations (women, informal settlements, outdoor workers).
National Policy on Climate Change (2023)	Contributes to urban resilience, NbS, and climate resilient planning and investment.
National Physical Plan / Western Region and Colombo Metropolitan Development Frameworks	Supports risk sensitive landuse planning, climate resilient urban development, and strengthened metropolitan governance through spatial analysis and localized climate risk information.
National Disaster Management Policy	Strengthens early action and preparedness for extreme heat and flooding.

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.

105. The project will fully comply with all relevant national technical standards and regulations of Sri Lanka, while adhering strictly to the Adaptation Fund's Environmental and Social Policy (ESP) and Gender Policy. All project activities, particularly the pilot adaptation interventions, will meet the following key national standards and requirements:

Table 05: Relevant national technical standards for the project / programme

Expected Output / Intervention	Relevant National Rules	Standards & AF ESP Principle(s)	Compliance Procedures & Authorizing Offices
Digital Twin Platform development and Climate Data Systems	• Ceylon National Geospatial Data Infrastructure (CNGDI) framework • Survey Department of Sri Lanka geospatial data guidelines • Data Protection Act, No. 9 of 2022 • UDA spatial planning regulations	Compliance with the Law, Access and Equity, Marginalized and Vulnerable Groups, Climate Change	Coordination with the Survey Department of Sri Lanka and relevant national data custodians, stakeholder validation workshops, environmental and social risk screening in accordance with the Adaptation Fund ESP.
Urban Heat and Flood Risk Assessments	• Disaster Management Act No. 13 of 2005 • National Disaster Management Plan (2023–2030) • National Environmental Act No. 47 of 1980 • Data Protection Act No. 9 of 2022	Climate Change, Public Health, Access and Equity, Marginalized and Vulnerable Groups	Risk assessments will utilize nationally recognized hazard datasets and be validated in coordination with the Disaster Management Centre (DMC). Environmental and social screening will be conducted in accordance with the Adaptation Fund ESP.
Community Engagement, Capacity Building and Protection of Vulnerable Groups	• Constitution of Sri Lanka – Fundamental Rights provisions • Data Protection Act No. 9 of 2022	Gender Equity and Women’s Empowerment, Core Labour Rights, Human Rights, Access and Equity, Marginalized and Vulnerable Groups	Consultations will be documented and validated in coordination with relevant Local Authorities and sectoral agencies where applicable. Environmental and social risk screening in accordance with the Adaptation Fund ESP.
Comprehensive Heat Action Plan	• Ministry of Health public health guidelines and protocols for heat-related risks • Disaster Management Act No. 13 of 2005 • National Disaster Management Plan (2023–2030)	Public Health, Gender Equity and Women’s Empowerment, Human Rights, Access and Equity	Multi-agency technical review (MoH, DMC, Local Authorities); inclusive stakeholder engagement; ESP screening
Pilot Climate-Resilient Infrastructure (green-grey measures, drainage, cooling, urban greening)	• National Environmental Act No. 47 of 1980 and EIA/IEE Regulations • UDA zoning and building approval regulations • National Building Research Institute (NBRI) hazard safety standards • Sri Lanka Standards Institution (SLSI) technical standards for infrastructure and construction	Protection of Natural Habitats, Biodiversity Conservation, Pollution Prevention and Resource Efficiency, Lands and Soil Conservation, Public Health	EIA/IEE as required (CEA), UDA and Local Authority approvals; NBRI clearance, ESMP implementation, certified supervision

106. The activities do not involve involuntary resettlement, impacts on Indigenous Peoples, or large scale conversion of natural habitats. All pilot interventions will undergo proportionate environmental and social screening prior to approval and implementation.

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

107. This project does not duplicate ongoing or planned projects financed by other funding sources. Instead, the proposed project has been designed to be complementary, addressing critical gaps in urban climate risk information, urban heat and flooding, management, and integrated adaptation planning in the CMA.

Table 06: Project / programme with other funding sources

Project Name	Thematic Area	Donor & Budget (USD)	Status	Duplication / Complementarity
Resilient Settlements for the Urban Poor – Sri Lanka Component (RISE-UP)	Urban resilience, Multilayered Vulnerability Assessment, climate finance capacity	US\$175,000 (UN-Habitat) Multi-Country Projects	Ongoing	Complementary: Focuses on capacity building, MVA, and financing; does not duplicate digital twin risk analytics or heat/flood prioritization.
Climate Service for Overheating Risk, Colombo (COSMA)	Urban heat risk, heat mapping, early warning	Research-funded, Natural Environment Research Council (UKRI / NERC)	Ongoing	Complementary: Provides heat risk data
Safe and Resilient Water Supply for Western Cities – Climate Resilience in Ambatale Water Scheme	Climate resilience of infrastructure & water safety.	US\$469,232 (CDRI/UN-Habitat & Govt of India)	Ongoing	Complementary: to broader urban risk analysis of heat/floods
Climate-Health Integration – Ministry of Health / DHIS2	Public health & climate data integration	Government of SL/ Health systems initiative	Ongoing	Complementary: Integrates climate & health data
Sri Lanka Early Warning Systems – Meteorology / DMC	Early warning for extreme weather	Government / National budget	Ongoing	Complementary: Provides hazard alerts
ADAPT4R Regional Project – Sri Lanka & India	Climate adaptation for rural vulnerable communities	US\$13.99 million (Adaptation Fund & WFP)	Ongoing	Complementary: Rural focus
Enhancing Interregional Knowledge Exchange on Urban Resilience	Urban sustainability, climate resilient development	US\$176,000 (UNPDF)	Ongoing	Complementary: Focused on knowledge exchange & financing capacity for urban resilience

I. Describe the learning and knowledge management component to capture and disseminate lessons learned.

108. Learning and knowledge management are integral to the project and will be embedded across all three components to ensure lessons are systematically captured, documented, and widely shared for scaling and replication. The project will generate practical knowledge on:

- a) The application of Climate Digital Twin technology in a tropical urban context for heat and flood risk management.
- b) Effectiveness of nature based and hybrid solutions tested through the innovation challenge.
- c) Best practices for community led adaptation and inclusive innovation processes in densely populated metropolitan areas.

Table 07: Learning objectives and Indicators

Expected Concrete Output / Intervention	Learning Objectives (LO) & Indicators (I)	Knowledge Products
Component 1: Adoption of digital twin technology and tailored climate projections co-developed with stakeholders to identify vulnerabilities and adaptation needs and priorities		
Outcome 1.1: Strengthened capacity of vulnerable communities to respond to climate risks and identify and prioritize adaptation needs		
Output 1.1.1: Co-developed datasets with community and stakeholders for observed and projected climate hazards (flood, cyclones, UHI) for the CMA.	LO: Strengthened understanding of local climate hazards among stakeholders I: Number of stakeholders engaged, % demonstrating improved understanding (pre/post assessment)	Co-developed climate hazard datasets (flood, cyclone, UHI, projections)
Output 1.1.2: Digital twin components/replica of CMA using a GIS platform is developed for extreme heat and UHI (including future climate scenarios) to highlight exposure, vulnerability and adaptation needs and priorities.	LO: Strengthened technical capacity of institutions to use Digital Twin tools for heat and UHI analysis. I: number of climate scenarios modeled, km ² of vulnerability layers integrated. I: Digital Twin platform operational	Operational Digital Twin components for extreme heat and UHI (GIS-based). Heat and UHI scenario maps (current and future). Scenario visualization dashboards and user guidance materials.
Output 1.1.3: Integration of available flood datasets, including areas flooded by Cyclone Ditwah, into the Digital Twin components, setting up a foundation for future phased development of a flooding component.	LO: Improved capacity to analyze flood impacts and identify priority vulnerable areas. I: Number of flood hotspot maps produced, Number of validation sessions conducted.	Flood integrated Digital Twin layers (historical and event based, including Cyclone Ditwah).
Outcome 1.2: Strengthened capacity and knowledge resources for national, municipal, and local institutions to scale and replicate digital twin technology		
Output 1.2.1: Guidelines, user manuals, and knowledge materials developed and trainings provided to government institutions and stakeholders to support effective knowledge transfer and capacity building for the use of the climate digital twin .	LO: Strengthened institutional capacity to operate and interpret Digital Twin tools. I: Number of government institutions trained, Number of technical staff completing training.	Digital Twin user guidelines and technical manuals. Workshop reports.
Output 1.2.2: A Digital Twin Sustainability and Handover Plan developed including governance structure, data management protocols, technical maintenance procedures, and institutional arrangements for long-term operation and updating of the system.	LO: Strengthened long term institutional ownership and governance of the Digital Twin platform. I: Sustainability and Handover Plan formally endorsed, designated lead institution identified.	Digital Twin Sustainability and Handover Plan document.
Component 2: Strengthening urban climate planning and awareness for enhanced resilience		

Outcome 2.1.: Local Authorities integrate climate analysis and digital twin-informed evidence into urban planning and policy processes.		
Output 2.1.1: Informed by the evidence generated under Outcome 1.1, an Urban Heat Action Plan developed (for CMA) with government agencies and stakeholders for integrating digital twin analytics into city planning and policy processes.	LO: Strengthened capacity of local authorities to integrate Digital Twin heat analytics into urban planning and policy processes. I: Urban Heat Action Plan endorsed. I: Stakeholder validation workshops conducted.	Urban Heat Action Plan (policy and technical document).
Outcome 2.2.: Government agencies and vulnerable populations have enhanced awareness of climate risks and are empowered to take early action to reduce climate-related impacts		
Output 2.2.1: Climate risk communication materials and early action resources generated and tailored for targeted vulnerable groups (women, older persons, youth, outdoor and informal workers).	LO: Improved knowledge of practical early action measures to reduce climate-related impacts. I: Number of communication materials produced, Number of beneficiaries reached (disaggregated by gender and age).	Communication materials (brochures, infographics, digital content, early action guides) Early action toolkits
Output 2.2.2: Workshops and interactive training sessions (15) delivered to school children and youth on climate risks, climate science, and urban resilience	LO: Strengthened youth engagement in urban resilience actions. LO: Enhanced climate literacy within schools. I: Number of youth and students reached (gender disaggregated). I: Number of schools participating	Training modules and presentations. Workshop reports
Component 3: Implementation of innovative pilot adaptation interventions selected through innovation challenges		
Outcome 3.1.: Targeted adaptation interventions tested and implemented, generating evidence for scalable and replicable climate resilience solutions in vulnerable communities.		
Output 3.1.1: An innovation competition held to select and support scalable solutions for adaptation interventions.	LO: Increased understanding of innovative adaptation solutions (NbS and hybrid). I: Number of proposals received; Number of participants (gender disaggregated).	Innovation challenge framework and selection criteria. Innovation competition report.
Output 3.1.2: Adaptation interventions identified and tested using Digital Twin components.	LO: Strengthened data-driven decision-making for scaling interventions. I: Number of interventions modeled, tested, scenario simulations completed.	Digital Twin simulation reports and scenario analyses report
Output 3.1.3: Pilot adaptation interventions identified/prioritized and implemented in vulnerable communities.	LO: Practical climate resilience solutions demonstrated in high-risk areas. I: Number of beneficiaries reached (gender disaggregated). I: Pre/post intervention impact Assessment	Pilot implementation reports. Monitoring and evaluation (M&E) report.

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.

109. The project was prepared through a consultative and participatory process in accordance with the ESP and Gender Policy of the Adaptation Fund. Consultations ensured that the views of national and local institutions, technical experts, and vulnerable communities, especially women, informal settlement residents, outdoor workers, and youth were incorporated into the project design.

Consultative Process

110. The project was prepared through a comprehensive consultative and participatory process in full accordance with the Adaptation Fund's ESP and Gender Policy. Consultations ensured that the views of national and local institutions, technical experts, and vulnerable communities, especially women, informal settlement residents, outdoor workers, the older persons, and youth were meaningfully incorporated into the project design.

111. A series of structured consultations were held between December 2025 and January 2026 with key stakeholders, including the Ministry of Environment, Department of Meteorology, Urban Development Authority, Ministry of Health, Ministry of Digital Economy, University of Moratuwa, National Expert Committee on Climate Change Adaptation (NECCC), and Colombo Municipal Council. Methods included bilateral meetings, multi stakeholder workshops, community mapping exercises, and field visits to underserved settlements. Special attention was paid to inclusive formats, language accessibility, and convenient timing to enable active participation of women and other vulnerable groups.



Figure 07. During the community mapping workshops on climate induced hazards in the Wattala Urban Area (29 August 2025) and in Colombo (2 September 2025), participants identified extreme heat as an emerging climate phenomenon that significantly affects their daily lives. They mapped areas which they experience as particularly hot and uncomfortable, highlighting locations and periods of heightened heat exposure.



Figure 08. Field consultation with women in an underserved settlement - Colombo (15 and 21 Sept 2025)



Figure 10. Community consultation with a home bound caregiving women’s group in Duwa Wayamba Settlement, Wattala. Participants identified heat as a key challenge requiring planning solutions (6 June 2026).

112. Feedback from these consultations directly shaped the project’s strong focus on extreme heat, the integration of Digital Twin technology, the design of the innovation challenge, the emphasis on nature-based solutions, and the targeting of highly exposed communities. All consultations followed the principles of free, prior, and informed participation. Stakeholders were provided with clear information on the project objectives, potential benefits, and risks, and were given opportunities to provide feedback that was incorporated into the final design. A grievance redress mechanism will be established at the start of implementation to ensure communities can raise any concerns throughout the project cycle.

113. Full details of all consultations, including participant lists and discussion points, are provided in Annexure 1.

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

114. The project draws on diverse perspectives on innovation by actively engaging multiple stakeholders throughout its design and planned implementation. This multi perspective approach ensures that innovation is not imposed from outside but co-created within the CMA’s specific urban, social, and climatic context.

Community and Vulnerable Group Perspectives

115. Vulnerable communities in informal settlements and underserved neighborhoods have contributed local knowledge on the day-to-day impacts of extreme heat and flooding. Through community mapping workshops and field consultations, residents, particularly women, outdoor workers, and youth, identified heat as an emerging critical risk affecting their health, livelihoods, and daily mobility. Their inputs shaped the project’s strong focus on people centred solutions, such as accessible cooling measures, shaded public spaces, and community led nature-based interventions. The “People’s Process” will continue to place poor urban communities at the centre of innovation design during the innovation challenge and pilot implementation.

Research and Technical Perspectives

116. International and national research organizations bring cutting edge technical expertise. Columbia University’s Center for Climate Systems Research and its collaboration with NASA provide proven experience in urban climate modeling and Digital Twin development (drawing from New York City initiatives). Locally, the University of Moratuwa contributes deep knowledge of Colombo’s urban systems, geospatial data, and engineering solutions. The Department of Meteorology and Urban Development Authority add national level climate data and planning expertise. This combination ensures that global best practices are adapted to Sri Lanka’s tropical urban realities.

Other Innovation Partners

107. The project also involves private sector and civil society organizations. The innovation challenge will further broaden perspectives by inviting proposals from local authorities, NGOs, women’s and youth

groups, startups, and academic institutions. This mechanism encourages social innovation (inclusive co-creation), institutional innovation (new governance models for adaptation), and technological innovation (affordable, scalable tools).

118. By integrating lived experiences of vulnerable communities, rigorous scientific approaches from research institutions, and practical innovation from diverse local actors, the project ensures that solutions are contextually relevant, socially equitable, and technically sound. This pluralistic approach to innovation is particularly important in Colombo, where rapid urbanization, high population density, and socioeconomic inequalities demand inclusive and locally owned adaptation strategies.

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

119. The fund requested from the Adaptation Fund constitutes the full cost of adaptation for this project. Longevity, effectiveness, and sustainability have been integrated from the planning stage. The project will enhance the resilience of the CMA to extreme heat, and flooding, thereby increasing adaptive capacity to future events. It directly aligns with Sri Lanka's NAP and NDC 3.0.

120. The financing will support strictly adaptation specific activities, including:

- a) Development of localized climate projections and a Climate Digital Twin for extreme heat, Urban Heat Island effects, and flooding.
- b) Integration of regional and specialized datasets, particularly those related to building materials and energy-use proxies, to enable high-resolution urban analysis and improve the Digital Twin's capacity as a decision-support system. Design of a Comprehensive Heat Action Plan informed by science.
- c) Implementation of an innovation challenge and pilot nature based and hybrid adaptation solutions in vulnerable areas.
- d) Targeted capacity building and institutional strengthening for climate resilient urban planning.

121. These elements have no non climate baseline alternative. A dedicated Heat Action Plan and Digital Twin enabled decision support would not be developed without the escalating threat of climate change. Similarly, integrating Cyclone Ditwah flood data into a dynamic decision support system is a direct adaptation response.

122. Unlike conventional development projects that focus on general infrastructure or post disaster recovery, Adaptation Fund resources will finance the additional costs of making investments climate resilient, including advanced digital technology and meaningful engagement with vulnerable groups.

123. The project smartly builds upon existing methodologies and tools developed in New York City (NASA/Columbia University), significantly reducing development costs by adapting proven approaches to the Colombo context rather than building them from scratch.

124. This targeted investment will deliver transformative adaptation outcomes and generate reusable tools, knowledge, and evidence for scaling across Sri Lanka at lower future cost.

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

125. Sustainability has been a central consideration from the earliest stages of project design. The project is structured to ensure that its key outcomes, particularly the Climate Digital Twin, the Heat Action Plan, tested naNbS, and strengthened institutional capacity, continue to deliver benefits well beyond the project lifetime.

126. Institutional Sustainability: The project aligns closely with national and sub-national priorities (NDC 3.0, NAP, National Physical Plan, and UDA frameworks). Outputs such as the Comprehensive Heat Action Plan and Digital Twin components will be formally integrated into official urban planning and policy processes. A dedicated Digital Twin Sustainability and handover plan will be developed in collaboration with key institutions. This plan will clearly define roles, responsibilities, data ownership,

governance arrangements, and procedures for regular updates and maintenance after project closure.

127. Technical and Knowledge Sustainability: Extensive capacity building and technology transfer activities are built into the design. Government officers, technical staff, and local universities will receive hands on training on the Digital Twin platform, scenario analysis, and interpretation of results, including UN-Habitat's people-centred smart cities approach, which is a core module for deploying and using digital tools that serve the communities. In addition, the use of any open, modular systems developed through, or with, UNITAC ensures that future upgrades, additional hazard layers, or integration with other national digital systems can be undertaken without major reinvestment, supporting long-term sustainability and cost-efficiency. Knowledge products, including (guidelines, manuals, and training modules) will be developed and disseminated. Columbia University's expertise will be transferred systematically through co-development and a Technical Working Group, enabling local institutions to independently operate and update the system.

125. Financial and Economic Sustainability: The project prioritizes nature based and hybrid solutions, which generally have lower long term maintenance costs and deliver multiple co-benefits (cooling, flood management, biodiversity, and health). The innovation challenge mechanism is designed to demonstrate successful models that can attract future funding from government budgets, private sector, and other development partners. By using the Digital Twin to prioritize high impact interventions, the project promotes more efficient use of limited resources.

126. Social and Environmental Sustainability: Community ownership is embedded through participatory co-design, the innovation challenge, and targeted training for vulnerable groups (especially women, youth, school children, and informal settlement residents). Successful pilots will be monitored and documented to provide evidence for wider replication. Nature based interventions will enhance ecosystem resilience, ensuring long term environmental benefits.

127. Through these deliberate design features, strong institutional anchoring, technology handover, capacity building, cost effective NbS, and community engagement, the project ensures that its outcomes will be sustained and scaled by national and local actors after the Adaptation Fund support ends.

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

128. The project has been screened as low-to-moderate risk overall in accordance with the Adaptation Fund's ESP and Gender Policy. No high-risk activities are foreseen. The main risks are moderate and manageable, primarily related to equitable access to benefits and minor environmental impacts from small scale pilot interventions.

129. Low or No Risk Areas

- a) No involuntary resettlement, land acquisition, or displacement.
- b) No impacts on Indigenous Peoples.
- c) No significant conversion or degradation of natural habitats.
- d) The project is expected to deliver net positive impacts on public health (reduced heat stress and flooding) and ecosystem resilience through nature-based solutions.

130. All physical pilot interventions will undergo detailed environmental and social screening prior to approval. An Environmental and Social Management Plan (ESMP) mitigation measures will be implemented throughout implementation to address any identified moderate risks. A grievance redress mechanism will be established and communicated to stakeholders.

131. The project design incorporates proactive measures, including participatory planning, gender mainstreaming, and safeguards screening, to avoid and minimize negative impacts while maximizing positive benefits for vulnerable communities.

Table 08: Overview of Key Environmental and Social 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		Low risk: The project will be implemented in compliance with all applicable national laws and regulations of Sri Lanka, including environmental regulations, planning guidelines, and relevant sectoral standards. No activities that contravene national legal requirements are anticipated. The proposed project is developed in close collaboration with the Government of Sri Lanka, local government agencies in the target area, and other key stakeholders ensuring strict compliance with relevant laws and regulations, thereby reducing the risk level associated with this ESP. Mitigation: Close coordination with local government agencies and relevant other agencies; conduct screening and obtain required approvals (IEE/EIA where needed) before implementation.
Access and Equity		Moderate risk: There is a potential risk of unequal access to project benefits if vulnerable groups are not adequately included. Mitigation: This will be managed through inclusive stakeholder engagement, and set criteria in selection, targeted outreach, and prioritization of climate-vulnerable communities in planning, awareness activities, and pilot interventions.
Marginalized and Vulnerable Groups		Moderate risk: The project targets housebound persons including women, persons with disabilities, infants, older persons, informal settlement residents, outdoor and informal workers, children and youth. Mitigation: Risks of exclusion will be mitigated through participatory consultations and tailored risk communication.

Human Rights		Low risk: Potential low risks related to unequal participation or inadequate protection of rights of vulnerable groups during consultations and pilot activities. Mitigation: Rights based approach applied throughout; free, prior and informed participation; grievance redress mechanism; continuous monitoring of human rights considerations. UN-Habitat strongly adopts a right-based approach in all projects where beneficiary rights are fully protected. During the project concept formulation, rights of all-project stakeholders including targeted communities have been considered in line with the country's constitution and other legal frameworks and United Nations principles including the right to equality and non-discrimination, access to information and freedom of expression. Therefore, this approach has very low negative effect on AF policies
Gender Equity and Women's Empowerment		Moderate risk: There is a risk that gender considerations may not be fully integrated without deliberate action. Mitigation: The project addresses this through gender responsive consultations, targeted awareness sessions, and inclusion of women's groups in innovation challenges and decision-making processes.
Core Labour Rights		Low risk: Minor risks related to working conditions during pilot construction or community works. Mitigation: Compliance with national and UN labour standards; prohibition of child and forced labour; safe working environments; labour management procedures for all contractors and implementing partners.
Indigenous Peoples	No Risk	The project area does not include recognized Indigenous Peoples as defined under the AF ESP. Therefore, no specific risks are anticipated.
Involuntary Resettlement		Low risk: The project does not involve land acquisition, displacement, or involuntary resettlement. Pilot interventions will be small scale and implemented on existing public or community agreed land. There is a low residual risk if pilot sites require temporary access or minor adjustments. Mitigation: All pilot interventions will be implemented on existing public or community-agreed land; screening will confirm no displacement; free, prior and informed consent from communities.
Protection of Natural Habitats		Low risk: Pilot interventions which include the NbS, and improve natural habitat, may interact with urban ecosystems. Mitigation: Activity screening, avoidance of critical habitats, preference for degraded urban spaces, and alignment with national environmental guidelines.

Conservation of Biological Diversity		Low risk: The project promotes urban greening, ecosystem restoration and ecosystem-based adaptation. It is expected to have positive impacts on biodiversity. Minor risks to biodiversity may arise during site works. Mitigation: Screening of all interventions, selection of native species, avoidance of invasive species, and compliance with national biodiversity conservation objectives.
Climate Change		Low risk: The project directly addresses climate change adaptation by reducing heat and flood risks and strengthening resilience of vulnerable urban communities. Mitigation: Use of climate projections and Digital Twin analysis to inform design; monitoring intervention performance under future climate scenarios.
Pollution Prevention and Resource Efficiency		Low risk: The project involves small scale, innovative pilot adaptation interventions in urban settings. Minor Risks related to waste generation, material use, or temporary resource consumption may occur during pilot activities Mitigation: Application of pollution prevention and resource efficiency measures; proper waste management plans for all pilot sites; preference for low-impact materials.
Public Health		Low risk: The project will not involve any activity that will negatively impact public health directly. Instead, the project delivers positive public health outcomes by reducing heat stress and flood exposure. Temporary risks during construction or community works (e.g., dust, noise, safety) may affect public health. Mitigation: Safe design standards, community awareness, occupational health and safety measures, and continuous monitoring during implementation
Physical and Cultural Heritage		Low risk: During the proposal preparation, it has been confirmed that the project does not involve activities in or near any known physical or cultural heritage sites and does not include any interventions that could put such sites at risk. A residual risk of encountering cultural or religious sites during implementation is noted and careful consideration will be given. Mitigation: Screening in consultation with relevant authorities and local communities (including religious institutions); Chance Finds Procedure will be applied.
Lands and Soil Conservation		Low risk: Project interventions (increasing water retention area, improving the permeability etc.) may involve minor land or soil disturbance. Mitigation: Minimization of soil disturbance, use of appropriate erosion control measures, and restoration of disturbed areas after works.

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

A. Record of endorsement on behalf of the government³

Mr K R Uduwawala Secretary Ministry of Environment, Sri Lanka	Date: 08.10.2026
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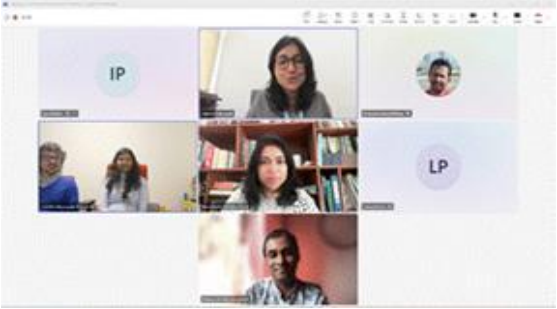
B. Implementing Entity certification

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, <u>commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund</u> and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
 Raf Tuts Director, Global Solutions Division UN-Habitat	
Date: (August, 7, 2026)	Tel.: +254-20-762-3736 Email: raf.tuts@un.org
Project Contact Person: Odicea Angelo Barrios, Programme Management Officer, Human Settlements, UN-Habitat Regional Office for Asia and the Pacific	
Tel.: (81-92) 724-7121 ; Email: odicea.angelobarrios1@un.org	

³⁶. 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.

Annexure 1: Key Stakeholders Consulted

Meeting details	Key Points Discussed
1. Ministry of Environment Date of Meeting: 15 th Dec 2025 Attendees: (2 Males, 3 Females) Mr. R.D.S. Jayathunaga (Additional Secretary - Environment Development, Ministry of Environment) Ms. Harshini Halangode (Country Programme Manager - CPM, UN-Habitat) Mr. M S M Aleem (National Project Manager) Ms. Isuru Prabha (Project Urban Planner) Ms. Manishka De Mel (Columbia University, USA) – Online)	• Acknowledged the timeliness of the proposal • Advised to discuss the proposal with respective stakeholders • Requested to submit the proposal to National Expert Committee on Climate Change Adaptation (NECCC-Adaptation) scheduled on 22nd Dec 2025 
Meteorology Department Sri Lanka Date of Meeting: 18 th Dec 2025 Attendees: (2 Males, 3 Females) Mr. Ajith Wijemannage (Director) Ms. Preethika Jayakodi (Deputy Director) Mr. M S M Aleem (National Project Manager) Ms. Isuru Prabha (Project Urban Planner) Ms Manishka De Mel (Columbia University, USA)	• Identified the need for digital solutions in adaptation and need for immediate attention of heat hazards • Agreed to share the available data • Mentioned about an ongoing heat related initiative which the project can be complemented 
Urban Development Authority Date of Meeting: 19 th Dec 2025 Attendees: (2 Males, 7 Females) Mr. Sugath Pathmasiri (Director, strategic Planning) Ms. Senani Somasekara (Director GIS) Ms. Sukhitha Ranasinhe (Assistant director Planning) Ms. Thamarasi (Assistant director (T/P) coordinator) Ms. Sardhya (DD GIS) Ms. Nethmi Wanigasinghe (Town planner URC) Mr. M S M Aleem (National Project Manager) Ms. Isuru Prabha (Project Urban Planner) Ms. Manishka De Mel (Columbia University, USA)	• Highlighted the need for technology to enhance planning and decision making • Requested clarification on the proposed roles and responsibilities, specifically for the UDA • Requested careful consideration of the costs involved, as advanced technologies may have implications for long term sustainability 

National Expert Committee on Climate Change Adaptation (NECCC–Adaptation) Committee members Date of Meeting: 22nd Dec 2025 Attendees: Mr. Laxman Perera (Adviser – UN Habitat) Mr. M S M Aleem (National Project Manager - Online) Ms. Isuru Prabha (Project Urban Planner) Ms. Tameez Bohoran (Architect – UN Habitat) Ms. Manishka De Mel (Columbia University, USA)	• The Committee noted that the proposal is timely. Members appreciated the focus on innovative approaches. • A soft copy of the proposal summary requested to be shared for review • The Ministry of Health requested a separate formal meeting with the UN-Habitat team. • The Department of Meteorology informed the Committee of an ongoing project on extreme heat and expressed willingness to support. • The Chair of the Committee emphasized the need to clearly and comprehensively articulate the proposed methodology to avoid duplication of efforts and potential implementation challenges. Recommended close collaboration with IT faculties at the University of Moratuwa, University of Colombo, and University of Peradeniya. • University of Moratuwa raised questions on data availability and stressed the importance of establishing a strong data foundation and technical capacity from the outset, given the advanced technologies proposed under the project.
Ministry of Digital Economy Date of Meeting: 23rd Dec 2025 Attendees: (3 Males, 3 Females) Dr. Hans Wijayasuriya (Chair of the Digital Economy Authority) Ms. Harshini Halangode (Country Programme Manager - CPM, UN-Habitat) Mr. Laxman Perera (Adviser – UN Habitat) Mr. M S M Aleem (National Project Manager - Online) Ms. Isuru Prabha (Project Urban Planner) Ms. Manishka De Mel (Columbia University, USA)	• The proposal was reviewed and need for digital solutions for climate change response was acknowledged • The complex technology of real time capabilities of the digital twin technology were discussed 
University of Moratuwa – (Online) Date of Meeting: 29th Dec 2025 Attendees: (4 Male, 3 Females) Dr. Amila Jayasinghe Dr. Chethika Abenayeke Dr. Chatura De Silva Ms. Harshini Halangode (Country Programme Manager - CPM, UN-Habitat) Mr. Laxman Perera (Adviser – UN Habitat) Mr. M S M Aleem (National Project Manager) Ms. Isuru Prabha (Project Urban Planner) Ms. Manishka De Mel (Columbia University, USA)	• Digital twin technology was mentioned as future of urban planning • Complexity of the urban environment and the development of digital twin technology was discussed • Considering the heat as an important first component was advised 
Ministry of Health Date of Meeting: 31st Dec 2025 Attendees: (2 Males, 4 Females) Dr. Anil Jasingha (Secretary, MOH) Dr. Inoka Surawera (Consultant Community Psychology) Ms. Harshini Halangode (Country Programme Manager - CPM, UN-Habitat) Mr. Laxman Perera (Adviser – UN Habitat) Ms. Isuru Prabha (Project Urban Planner) Ms. Manishka De Mel (Columbia University, USA)	• Need for heat data and solutions for health impacts due to heat was stressed. • Requested to keep the Ministry of Health as a strong partner for the project 

Biodiversity Sri Lanka (BSL) Date of Meeting: 1st Jan 2026 Attendees: (2 Males, 4 Females) Ms. Shiranee Yasaratne (Senior Technical Advisor) Mr. Anura Sathurusinghe (Forestry biodiversity expert) Mr. Chamitha De Alwis (Specialist in Diet-Ocean Interactions & Climate Impacts) Ms. Harshini Halangode (Country Programme Manager - CPM, UN-Habitat) Ms. Isuru Prabha (Project Urban Planner) Ms. Manishka De Mel (Columbia University, USA)	• The proposal was discussed and concluded to be timely and highly relevant and of interest to businesses. • BSL expressed their support for the successful implementation of the project. 
Ministry of Housing Construction and Water Supply Date of Meeting: 19th Jan 2026 Attendees: (8 Males, 5 Females) Dr. H.M. Susil Ranasinghe (Hon. Minister - Ministry of Housing Construction and Water Supply) Senior officials of the Ministry of Housing Construction and Water Supply Ms. Harshini Halangode (Country Programme Manager - CPM, UN-Habitat) Mr. Laxman Perera (Adviser – UN Habitat) Ms. Aziza Usoof (Deputy country programme manager) Mr. M S M Aleem (National Project manager)	• The proposal was discussed in detail, and the proposed components and anticipated project benefits were reviewed and deliberated. 
Colombo Municipal Council (CMC) Date of Meeting: 26th Jan 2026 Attendees: (1 Male, 4 Females) Ms. Vrañe Cally Balthazaar, Mayor CMC Mr. (Eng.) A.D.S. Rohana, Deputy Municipal Commissioner (Engineering services) Ms. Harshini Halangode (Country Programme Manager - CPM, UN-Habitat) Ms. Aziza Usoof (Deputy country programme manager) Ms. Isuru Prabha (Project Urban Planner)	• The CMC appreciated the proposal as timely and highly relevant, recognizing its potential benefits for communities in the area. • The Mayor contacted the Western Province Governor's Office and requested a meeting to discuss the proposal, as the CMA extends beyond the Colombo Municipal Council administrative boundary. • The Mayor and the CMC team expressed their availability and willingness to support the continuation of the project. 

Ministry of Transport, Highways and Urban Development

Date of Meeting: 15th July 2026

Attendees: (2 Males, 2 Females)

Ms. Tharani Anoja Gamage (Additional Secretary (Development), Ministry of Transport, Highways and Urban Development
Mr. Nishantha Prasad Ranaweera. (Director) Urban Development Authority.

Ms. Harshini Halangode (Country Programme Manager - CPM, UN-Habitat)

Mr. M S M Aleem (National Project Manager)

Ms. Isuru Prabha (Project Urban Planner)

- The UN-Habitat team briefed the project components and their relevance to the Ministry.
- The Ministry highlighted the timely requirement of this intervention for urban decision support systems.
- The Ministry agreed to take the lead role for the project and mentioned they will assess in-house capacities and establish a Project Management Unit.
- The Ministry confirmed the possibility of managing project funds internally and mobilizing them to other Executing Entities based on their roles in the project.



Annexure 2

Figure A1. Screenshot of the CoCo Cool Corridors Tool showing the least heat-exposure route between a start and end point.

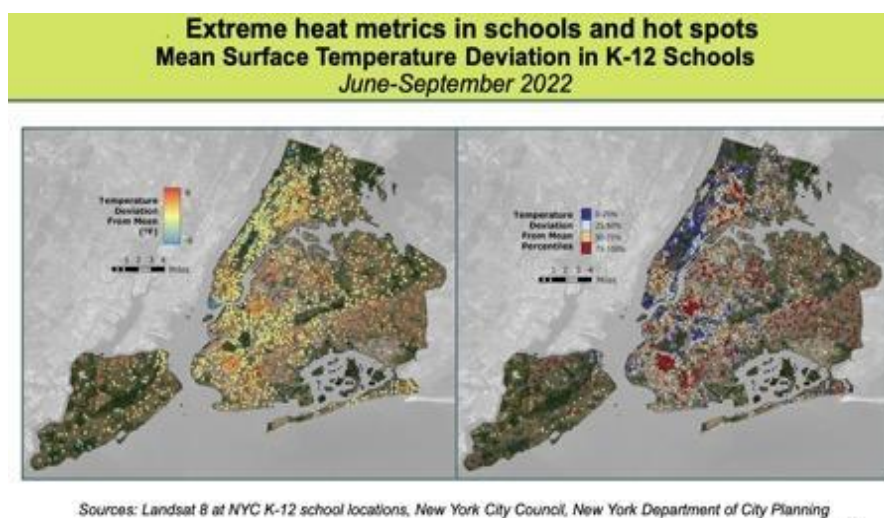


Although CoCo was developed specifically for New York City, its methodology and framework are adaptable to urban areas facing similar challenges – CoCo can also be expanded beyond city streets (imagine measuring heat experienced on different train lines)

Further applications of the CoCo Tool:

- Urban planners and policymakers can use CoCo to identify high-heat streets and prioritize cooling strategies, such as planting trees or implementing reflective surfaces
- Policymakers can use CoCo to estimate average pedestrian heat exposure on high-traffic routes (e.g. that which children who commute to school by foot experience)
- Public health officials can guide heat-sensitive populations to safer routes so that they can reach critical infrastructure during heat waves
- Pedestrians, such as runners or daily commuters, can plan personalized routes to minimize their heat exposure

Figure A2. Extreme heat metrics for K–12 schools, illustrating that these sites are hotspots of elevated urban temperatures.



Sources: Landsat 8 at NYC K-12 school locations, New York City Council, New York Department of City Planning

Annexure 3: Gender action plan

Outputs	Activities	Indicator
Outcome 1.1: Strengthened capacity of vulnerable communities to respond to climate risks and identify and prioritize adaptation needs		
Output 1.1.1: Co-developed datasets with community and stakeholders for observed and projected climate hazards (flood, cyclones, UHI) for the CMA.	1.1.1.1 Co-development workshops (02) with stakeholders including community (02) that ensure the community in their diversity can participate and engage	Number of women, female community representatives participated
	1.1.1.2 Analysis of observed data & climate projections (flood, cyclones, UHI)	Number of Gender sensitive exposure layers produced for vulnerable population categories
	1.1.1.3 Urban Heat Island analysis	Number of maps reflect high risk locations affecting women outdoor workers and caregivers
Output 1.1.2: Digital twin components/replica of CMA using a GIS platform is developed for extreme heat and UHI (including future climate scenarios) to highlight exposure, vulnerability and adaptation needs and priorities.	1.1.2.1 Collection of publicly available datasets.	Number of gender relevant infrastructure datasets integrated
	1.1.2.2 Development of digital twin components related to extreme heat and flood	Number of Gender disaggregated exposure analysis completed
	1.1.2.3. User-friendly interactive online visualization tool	Number of women users participated during usability validation
Output 1.1.3: Integration of available flood datasets, including areas flooded by Cyclone Ditwah, into the Digital Twin components, setting up a foundation for future phased development of a flooding component.	1.1.3.1 Collection of publicly available datasets on extreme rainfall and flooding events	Number of flood exposure datasets covering vulnerable GN divisions affected by Cyclone Ditwah integrated
	1.1.3.2 Flood datasets incorporated into digital twin components	Number of data sets integrated on priority vulnerable communities
Outcome 1.2.: Strengthened capacity and practical tools for national, municipal, and local institutions to scale and replicate digital twin technology		
Output 1.2.1: Guidelines, user manuals, and knowledge materials developed, and trainings provided to government institutions and stakeholders to support effective knowledge transfer and capacity building for the use of the climate digital twin.	1.2.1.1 Establish Technical Working Group and schedule periodic meetings	Number of female technical participants
	1.2.1.2 Document on data and methods and disseminate publication to key stakeholder	Number of gender responsive technical guidance notes produced
	1.2.1.3 Conduct capacity building workshops on the development and application of digital twin platforms include results interpretation and decision-making	Number of government officers trained including women officers

Output 1.2.2: A Digital Twin Sustainability and Handover Plan developed including governance structure, data management protocols, technical maintenance procedures, and institutional arrangements for long-term operation and updating of the system	1.2.2.1 Develop digital twin sustainability and handover plan held with technical partners and relevant stakeholders	Number of female participants
	1.2.2.2 Identify the agency responsible for ongoing management and ensure staff are trained for independent operation and updates.	Number of local authority officers including female technical officers which the sustainability plan shared
	1.2.2.3 Digital twin sustainability and handover plan presented and disseminated at workshop with key stakeholders	Number of female representatives
Outcome 2.1.: Local Authorities integrate climate analysis and digital twin-informed evidence into urban planning and policy processes.		
Output 2.1.1: Informed by the evidence generated under Outcome 1.1, an Urban Heat Action Plan developed (for CMA) with government agencies and stakeholders for integrating digital twin analytics into city planning and policy processes.	2.1.1.1 Workshops with groups of stakeholders to analyze the context, review results of analysis, and plan the development and content of the Heat Action Plan	Number of female participants
	2.1.1.2 Heat Action Plan for the CMA produced and disseminated	Number of gender responsive cooling priority interventions incorporated
Outcome 2.2: Government agencies and vulnerable populations have enhanced awareness of climate risks and are empowered to take early action to reduce climate-related impacts		
Output 2.2.1: Climate risk communication materials and early action resources generated and tailored for targeted vulnerable groups (women, older persons, youth, outdoor and informal workers).	2.2.1.1. Awareness workshops with vulnerable groups, including tailored sessions for different vulnerable groups	Number of female participants
	2.2.1.2 Development of targeted awareness materials such as pamphlets and digital communications	Number of targeted communication products developed for women outdoor workers, caregivers, older women, informal workers
	2.2.1.3 Awareness creation sessions for businesses on protecting their employees and upgrading key infrastructure and facilities (e.g., outdoor workers, delivery personnel, etc.)	Number of workplaces employing women workers participated
Output 2.2.2: Workshops and interactive training sessions delivered to school children and youth on climate risks, climate science, and urban resilience	2.2.2.1 Workshops to empower and train leaders in youth organizations and schools to create awareness on climate risks, climate science, and urban resilience amongst their own institutions and peers	Number of female participants
	2.2.2.2 Student and youth-led development of awareness materials (social media campaigns, art, and hands-on activities)	Number of female participants
	2.2.2.3 Pilot simulations, exercises and drills with youth organizations and schools along with resilient upgrades to outdoor and indoor learning spaces.	Number of female participants
Outcome 3.1: Targeted adaptation interventions tested and implemented, generating evidence for scalable and replicable climate resilience solutions in vulnerable communities.		

Output 3.1.1: An innovation competition held to select and support scalable solutions for adaptation interventions.	3.1.1.1 Launch of innovation challenge together with digital twin technology results	Number of women led teams targeted
	3.1.1.2 Promotional campaigns distributed at local authorities, universities, businesses, NGOs, and community groups	Number of sessions targeting women innovators conducted
	3.1.1.3 Hybrid information sessions on the innovation challenge and digital twin technology results	Number of female participants
Output 3.1.2: Adaptation interventions identified and tested using Digital Twin.	3.1.2.1 Selection of proposed interventions tested using digital twin technology	Number of interventions tested, demonstrate benefits for women and vulnerable worker groups
Output 3.1.3: Pilot adaptation interventions identified/prioritized and implemented in vulnerable communities	3.1.3.1 Selection and awarding of projects	Number of awarded pilots benefits for women and vulnerable worker groups
	3.1.3.2 Implementation of interventions	Number of women benefited
	3.1.3.3 Monitoring and evaluation of adaptation interventions	Percentage of gender disaggregated monitoring conducted across pilot intervention beneficiaries

Annexure 4: Key financial risk mitigation measures

Risk Category	Specific Risk	Likelihood / Impact	Mitigation Measures
Financial	Delays in fund disbursement to the executing entity	Medium/ Medium	Development of a detailed financial management plan with defined roles, responsibilities, and timelines.
/ Technology	Stakeholders may not fully use or apply project outputs, limiting impact.	Low/ Low	Involve stakeholders such as relevant LA, Municipality, UDA early and provide training to ensure outputs are understood and effectively applied. Develop user friendly outputs and align them with existing decision-making processes to encourage consistent use.
	Accessibility and the quality of the data	Medium / Medium	Use multiple verified data sources, integrate UN-Habitat MVA and national datasets identify the target areas where the data is available, use open source data
	Technology adaptation challenges (Digital Twin deployment)	Medium / High	Initial establishment of Technical Committee, Phased implementation; capacity building workshops, engaging local universities for continues learning, local IT support
	Low engagement from communities or municipal authorities	Low / Medium	Continuous stakeholder consultations, co-creation of interventions, awareness. On-going UN-Habitat project “RISE-Up” engages with stakeholders who are eager to implement climate adaptation interventions.
	Frequency of update	Medium / Low	University of Moratuwa as the dedicated EE will update the system with adequate data
Implementation	Delay in piloting the interventions and/or low quality pilot projects	Medium / Medium	Select potential partners through the competitive process. Develop a proactive detail implementation plan together with capacity building component; monitor accordingly

Annexure 5: Budgeted M&E Plan

Type of M&E Activity	Responsible Parties	Budget (USD)	Time Frame
Project inception meeting, inception and Inception Report	Project Manager (PM) and Monitoring and Reporting Manager (M&RM), Project executing entity (CU), University of Morauwa (UoM)/National and Municipal Partners	3,000	Within first three months of project start up
Project Steering Committee meetings	Project Manager (PM), Project executing entity (CU) , UoM,National and Municipal Partners	6,000	Bi-annual
Technical Working Group meetings	Project Manager (PM), UoM,CCSR–Columbia University, UoM	6,000	Quarterly
Quarterly internal monitoring and progress reporting	Monitoring & Evaluation Associate (M&EA) and Gender & Environment Advisor (G&EA)	3000	End of each quarter
Digital Twin–enabled monitoring of risks and pilot interventions	Project Manager (PM), CCSR–CU, UoM	3,000	Throughout project
Annual Project Progress Reports (APR/PPR) to Adaptation Fund	National Project Manager (NPM), Monitoring and Reporting Manager (M&RM)	2,000	Annually
Compliance with ESP & Gender Policy	Monitoring & Reporting Manager (M&RM) and Gender & Environment Advisor (G&EA)	4,000	Annually, mid evaluation, as well as upon receipt of grievances and complainants
Field monitoring visits to pilot sites and vulnerable communities (verification of outputs, safeguards, community feedback)	Project Manager (PM), Country Programme Manager (CPM), Programme Management Officer (PMO), Gender and Environmental Advisor (G&EA), and Monitoring and Reporting Manager (M&RM), CCSR–CU, UoM	3,000	Throughout project
Final Evaluation	External consultant and Monitoring and Reporting Manager (M&RM)	10,000	At the end of project
Total Estimated M&E Budget		40,000	

Annexure 6: Alignment to the Adaptation fund result framework

Project Objective(s)	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
Strengthen evidence-based identification of climate risks, vulnerabilities, and adaptation priorities to support science-based decision making	- Number of climate risk datasets (extreme heat, UHI, extreme rainfall/flood) developed and used in planning - Number of institutions that adopt Digital Twin/ decision-support tools in planning process - Number of vulnerable people benefiting with reduced risks for heat and flood from climate risk-informed planning and adaptation interventions - Number of planning or investment processes informed by climate risk analysis and Digital Twin outputs	Outcome 1: Reduced exposure to climate-related hazards and threats Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	Indicator 1: Number of people using improved climate-related hazard and threat information Indicator 2: Number of institutions with strengthened capacity to understand and better address climate risks and resilience	
Enhance adaptive capacity, awareness, and early action among vulnerable populations	- Number of tailored climate risk communication materials developed and disseminated - Number of awareness & early action sessions delivered to vulnerable groups (women, older persons, outdoor workers, informal settlement residents, youth) - Number of people reached	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at the local level Outcome 1 (secondary linkage): Reduced exposure to climate-related hazards and threats	Indicator 3: Percentage of targeted population aware of predicted adverse impacts and appropriate responses	
Enable innovative and scalable adaptation through pilot interventions and knowledge transfer	- Number of pilot adaptation interventions (NbS and hybrid) identified tested and implemented - Number of innovation products (guidelines, tools, training) developed and transferred	Outcome 8: Support the development and diffusion of innovative adaptation practices, tools and technologies Outcome 2: Strengthened institutional capacity to reduce risks	Indicator 8: Innovative adaptation practices are rolled out, scaled up, encouraged and/or accelerated Indicator 2.1.1: Institutions supported to strengthen capacity to address climate risks and resilience	

Project Outcome(s)	Project Outcome Indicator(s)	Fund Output	Fund Output Indicator	Grant Amount (USD)
Outcome 1.1.: Strengthened capacity of vulnerable communities, including women and girls, to respond to climate risks and identify and prioritize adaptation needs	- Number of vulnerable people with improved capacity to identify climate risks and adaptation options - Percentage of targeted communities reporting improved preparedness for climate extremes	Output 1.1: Risk and vulnerability assessments conducted and updated	Indicator 1.1: Number of risk and vulnerability assessments conducted or updated using climate information	
Outcome 1.2.: Strengthened capacity and knowledge resources for national, municipal, and local institutions to scale and replicate digital twin technology	- Number of institutions with improved technical capacity to apply Digital Twin tools - Digital Twin Sustainability and Handover Plan adopted	Output 4: Institutional and technical capacity strengthened to support climate-resilient decision-making	Indicator 3.5 Number of institutions with increased capacity to plan, implement, monitor, and report for climate adaptation	
Outcome 2.1.: Local Authorities integrate climate analysis and digital twin-informed evidence into urban planning and policy processes.	-Number of urban plans, strategies, or investment decisions informed by climate analysis and Digital Twin outputs	Output 2.1: Capacity-building activities implemented	3.1 Number of policies/plans developed and strengthened that will mainstream climate resilience	
Outcome 2.2.: Government agencies and vulnerable populations have enhanced awareness of climate risks and are empowered to take early action to reduce climate-related impacts	- Percentage of targeted population demonstrating increased awareness of climate risks and adaptation response	Output 3.1: Targeted population groups participating in adaptation and risk reduction awareness activities	Indicator 3.1.1: People participating in activities to improve awareness of climate risks and how to address them	
Outcome 3.1.: Targeted adaptation interventions tested and implemented, generating evidence for inclusive and gender-responsive, scalable and replicable climate resilience solutions in vulnerable communities.	- Number of pilot adaptation interventions implemented - Evidence generated on effectiveness and scalability of interventions	Output 8: Innovative adaptation practices and technologies piloted and promoted	Indicator 8.1.2: Innovations piloted that demonstrate local innovation participation and/or local innovation benefit	



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சுற்றுடல் அமைச்சு
Ministry of Environment

"සොබාදාම පියස", අංක 416/ජ/1, රොබට් ගුනවර්දන මාවත, බත්තරමුල්ල, ශ්‍රී ලංකාව.
"சோபாதம் பியச", இல. 416/ජ/1, ரொபர்ட் குணவர்தன மாவத்தை, பத்தரமுல்லை, இலங்கை.
"Sobadam Piyasa", No. 416/C/1, Robert Gunawardana Mawatha, Battaramulla, Sri Lanka.
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මගේ අංකය
எனது இல
My No } ENV/CC/04/04/02/08/171

ඔබේ අංකය
உமது இல
Your No }

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திகதி
Date } 10 Aug..2026

The Chairman
The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat

Letter of Endorsement by the Government of Sri Lanka
Large Innovation Project- Single Country
Climate Digital Twin for Innovative Nature-based Solutions and Adaptation Interventions in the Colombo Metropolitan Area

In my capacity as the designated authority for the Adaptation Fund in Sri Lanka, I confirm that the above-mentioned project is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of risks posed by climate change in Sri Lanka.

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 country office of the United Nations Human Settlements Programme (UN-Habitat) in Sri Lanka.

K. R. Uduwawala
Secretary

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"මේ මහපොළව සහ ගහකොළ මිනිසාට මෙන්ම අනෙක් සියලුම සත්වයානුන්ට ද මිනිසාට සරන සිටුවාමුත් ද සියලු සතුන්ට ද එකසේ අයිතිය"
"இப் பூமியும், மரஞ் செடி கொடிகளும் மனிதனுக்குப் போன்றோ வானில் பறந்து திரியும் பறவைகளுக்கும், பூமியில் வாழும் உயிரினங்களுக்கும், அனைத்து விலங்குகளுக்கும் ஒருமித்துச் சொந்தமானது"
"This great earth and the flora on it equally belong to the man and the birds flying in the sky, the quadrupeds and all creatures living on earth"



Revised PFG Submission Form¹ (additions in red)

Project Formulation Grant (PFG)

Submission Date:

Adaptation Fund Project ID:

Country/ies: Sri Lanka

Title of Project/Programme: Climate Digital Twin for Innovative Nature-based Solutions and Adaptation Interventions in the Colombo Metropolitan Area

Type of IE (NIE/RIE/MIE): Multilateral Implementing Entity

Implementing Entity: United Nations Human Settlement Programme: (UN-Habitat)

Executing Entity/ies: Ministry of Transport, Highways and Urban Development, Western Provincial Council, Department of Meteorology, Urban Development Authority (UDA), Community Based Organizations (CBOs), Columbia University, and University of Moratuwa

A. Project Preparation Timeframe

Start date of PFG	15th Dec 2026
Completion date of PFG	30 May 2027

B. Proposed Project Preparation Activities (\$)

List of Proposed Project Preparation Activities	Output of the PFG Activities	US\$ Amount	Budget note ²
Community-informed exposure mapping & consultations	Stakeholder and Focus group discussions, Interactive maps identifying hotspots and vulnerable areas (informal settlements, outdoor worker zones) based on local knowledge	15,000	Local consultations. Identifies high-risk areas to improve Digital Twin risk modeling and defines the community role in the "People's Process. Includes 4 co-development workshops, 8 focus group discussions, stakeholder consultations, and preparation of community hotspot maps.
Gender and Environmental/Social Risk Analyses	Conduct analyses and develop Environmental and Social Management Plan (ESMP)	10,000	Gender/Social risk analysis. Mandatory for Adaptation Fund compliance, focusing on

¹ As presented in AFB/PPRC.33/40 Annex 1.

² The proposal should include a detailed budget with budget notes indicating the break-down of costs at the activity level. It should also include a budget on the Implementing Entity management fee use.

	and Gender Action Plan (GAP)		vulnerable groups like outdoor workers and house-bound women. Includes 1 Gender Analysis, 1 Environmental and Social Management Plan (ESMP), and 1 Gender Action Plan (GAP)
Review of existing studies and scientific knowledge base	Literature review, identification of knowledge gaps	10,000	Literature review to understand current status and identify key knowledge gaps.
Analysis of major extreme heat events	The analysis will examine three extreme heat events in the Colombo Metropolitan Area using station, gridded, and remotely sensed datasets to evaluate temperature, humidity, wet-bulb heat stress, and assess urban heat island effects and hotspots.	7,500	Technical analysis of extreme heat exposure and urban heat island effects to strengthen Digital Twin risk modeling, identify persistent hotspots, and support evidence-based climate adaptation planning.
Collection of datasets, technical data evaluation	Collection of datasets (climate, hydrological, GIS, land use, infrastructure), evaluation of datasets	15,000	Data-related analyses. Required to ensure data availability and quality for climate analyses
Integration and analyses of urban systems data for Digital Twin development	Collection, cleaning, and organization of urban systems data into a usable dataset for Digital Twin development; preparation of information on urban characteristics, identification of high-risk zones and critical hotspots, metadata documentation, identification of NbS opportunities (wetlands, green corridors, retention areas)	20,000	Support for structured data preparation and compilation of urban systems information for Digital Twin development, including collation of existing datasets, processing of urban characteristics, hotspot identification, and identification of Nature-based Solutions (NbS) opportunities using available data sources.
Identification of project indicators and development of M&E plan	M&E framework with specific indicators for urban heat resilience and technical system performance	10,000	Development of project indicators. Provides tools for results tracking and accountability at the community level.
Institutional framework & Sustainability Planning (SOPs)	Standard Operating Procedures (SOPs) and a sustainability plan defining roles for the University of Moratuwa & Met Dept	10,000	Capacity assessments. Establishes how the Digital Twin will be maintained, updated with new climate data, and governed after project closure. Includes 6 Technical Working Group meetings, preparation of SOPs,

			institutional arrangements, and Sustainability Plan.
Travel and coordination support for field engagement	Logistics for technical and social teams to engage with CMA, local authorities and vulnerable communities	15,500	Travel for experts/stakeholders. Supports travel for 4 workshops, 8 focus group discussions, technical meetings, and field verification visits.
Technical support for proposal development	Full Adaptation Fund project proposal package for the Climate Digital Twin, implementation framework, institutional arrangements, and user-oriented decision-support tools and SOPs	22,000	Proposal development support to transform the concept into a fully developed, investment-ready Adaptation Fund project document.
Management fee- 8.5%		11,475	
Total Project Formulation Grant		146,475	

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

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	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Raf Tuts		7 August 2026	Odicea Angelo Barrios	(81-92) 724-7121	odicea.angelobarrios1@un.org