Asian Disaster Preparedness Center

Support Services Department
Procurement Unit
SM Tower, 24th Floor, 979/66-70 Paholyothin Road,
Phayathai, Phayathai, Bangkok 10400 Thailand
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Terms of Reference (ToR)

Project: Urban Resilience Building and Nature (URBAN)

Title: Flood Hazard Mapping Expert

A. Purpose and Objectives:

ADPC is an autonomous international organization established for scientific, educational, developmental, and humanitarian purposes with a vision of safer communities and sustainable development through disaster risk reduction and climate resilience in Asia and the Pacific. Established in 1986 as a technical capacity building center, ADPC has grown and expanded its role to be for scientific, educational, developmental and humanitarian purposes. ADPC employs a wide range of professional expertise typically required for Disaster Risk Reduction (DRR) and Climate Resilience (CR) in an effective manner.

ADPC develops and implements cross-sectoral projects/programs on the strategic themes of risk governance, urban resilience, climate resilience, health risk management, preparedness for response and resilient recovery. Our strategic themes are complemented and underpinned by the cross-cutting themes of gender and diversity, regional and transboundary cooperation as well as poverty and livelihoods.

Through its work, ADPC supports the implementation of the Sendai Framework for Disaster Risk Reduction 2015–2030, the Sustainable Development Goals (SDGs), the New Urban Agenda, the United Nations Framework Convention on Climate Change, the agenda defined at the World Humanitarian Summit in 2016, and other relevant international frameworks.

For details, please refer to ADPC website at http://www.adpc.net/.

B. Department Introduction

The Risk Analytics and Climate Services Department is a multi-disciplinary team of experts committed to providing innovative, science-based solutions for actions to adapt to climate change and mitigate the impacts of disasters. The innovations include uses of geospatial technology, satellite data, numerical models, cloud computing, and artificial intelligence for assessing vulnerability and risk, generating climate data, developing early warning systems, forecasting possible climate impact, and informing anticipatory actions. These lead to risk-informed developments in the sectors such as agriculture, transportation, water resources, energy, communications and health.

The department also applies advanced geoinformatics and climate analytics to address water and food security issues by assessing water availability and water-use efficiency, groundwater monitoring, assessing drought risks, and optimizing agricultural productivity, hence ensuring sustainable water and food systems in vulnerable regions. The department promotes Nature-Based Solutions by leveraging ecosystem services

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such as wetland restoration, agroforestry, and green-gray infrastructure to reduce disaster risks and build climate resilience. Lastly, the department produces risk analytics and integrates them into urban plans and engineering designs of critical infrastructures, hence improving their resilience to disasters and climate change.
With a commitment to science-based approach, the department envisions empowering stakeholders to reduce risks, adapt to climate change, and build more resilient communities and ecosystems.

C. Statement of Intent

Asian Disaster Preparedness Center, in collaboration with International Union for Conservation of Nature and Natural Resources (IUCN), is implementing a six years project named "URBAN: Urban Resilience Building and Nature" in two provinces of Thailand (Chiang Rai and Surat Thani). The overall goal of the project is that the focal urban areas and wider landscapes in which they are embedded enjoy significantly enhanced social, economic and environmental resilience to climate change impacts through the wide scale adoption of nature-based solutions NbS. The project will make a significant contribution to climate change adaptation in up to 6 local administrative organizations in the selected provinces in Thailand.

As part of the project implementation, ADPC intends to hire a consultant on a lump-sum output-based contract to prepare flood hazard maps for select urban areas in the targeted provinces of Chiang Rai and Surat Thani considering future climate change impacts including increasing flood risks and sea-level rise where applicable.

D. Scope of Work

The scope of work covers the hydrological and hydraulic modeling (**in an open source modelling environment**) of targeted areas along the two river basins of the provinces – Kok river basin in Chiang Rai and Tapi river basin in Surat Thani provinces. The hydraulic modeling for Surat Thani will explicitly incorporate sea level rise effects. Given that the Kok River Basin is transboundary, potential upstream influences from Myanmar may need to be considered in hydrological modeling. The hydrological modeling shall use secondary data available publicly or as obtained from the relevant government departments. The work will include data collection, hydrological and hydraulic modeling, data analysis, and development of flood hazard maps for short term (2040s), medium term (2060s) and long term (2080s) scenarios using pre-selected IPCC CMIP6 AR6 models suitable for Thailand. These outputs of the hydrologist will provide inputs to the project team's overall goal of carrying out flood risk assessments under future climate scenarios for a resilient urban sector mainstreaming NbS. The specific responsibilities and tasks are detailed in subsections below:

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E. Expected Outputs:

The consultant will be responsible for delivering the following Outputs:

1. Inception report detailing the approach, methodology and the work plan to achieve the stated objectives. It shall also identify data requirements, availability and sources, models and modeling procedures for the study. The report should contain
   - Analysis of the river basins, including watershed characteristics, drainage patterns, hydrological response, transboundary influences (for Kok River Basin), and historical flood events.
   - Identification of key data sources, including precipitation, river discharge, water level, land cover, soil type, digital elevation models (DEM), coastal surges, sea level rise projections and hydraulic infrastructure data.
   - Work plan with timelines for different modeling tasks and expected deliverables.
2. Flood hazard maps (**in raster format**) using highest feasible resolution, at least a 10m DEM (or the best publicly available resolution) detailing flood depth, velocity, extent and time duration (if feasible) for the baseline (present) and future periods (2040s, 2060s and 2080s) under two climate scenarios (SSP2-4.5 and SSP5-8.5).
   - **For Surat Thani**, maps shall explicitly integrate projected sea level rise impacts into the hydraulic model boundary conditions to assess coastal flood hazards.
   - **For Chiang Rai**, the hydrological model shall account for upstream inflows from Myanmar, ensuring transboundary effects on the Kok River Basin are considered in flood hazard mapping.
3. Technical report on flood hazard assessment including details of hydrological and hydraulic flood modeling, calibration and validation results leading to future simulations and flood hazard mapping for different scenarios future timelines. The report shall also include a summary of key findings and recommendations.
   - Hydrological model setup, calibration, and validation results (including statistical performance metrics such as NSE, RMSE, R^2).
   - Coupled 1D/2D hydraulic model setup, including boundary conditions, key assumptions, and calibration/validation results.
   - Analysis of flood extent, depth, and velocity in target urban areas in different scenarios.

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F. Responsibilities and Tasks:

The Consultant will be responsible for the following tasks and duties:

1. Data Collection, Review and Preparation
    a. Gather and analyze historical hydrometeorological data, river discharge, land cover and land use, soil type, sea level rise, coastal surges, DEM information (30 m resolution or less) to enable hydrological modeling of the overall targeted river basins;
    b. Compile major hydraulic infrastructure data, river geometry and characteristics, drainage parameters, water gates, pumping stations, and their locations and their associated operational rules essential for hydraulic modeling and basin assessments.
2. Hydrological Modeling
    a. Establish a hydrological modeling framework incorporating future climate change scenarios (AR6 SSP2-4.5 and SSP5-8.5) for models stated by ADPC suitable for Thailand.
    b. Set up, calibrate, and validate hydrological models for Kok River Basin (Chiang Rai) and Tapi River Basin (Surat Thani) and then simulate historical and future projections of river discharge and flood hazards including flood depth, extent and duration for different models and scenarios.
    c. The flood modeling work for Surat Thani urban regions along the Tapi River shall prepare coastal flood hazards integrating projected sea-level rises.
    d. Similarly, the hydrological/hydraulic models of the Kok River Basin in Chiang Rai shall include upstream inflows from Myanmar in boundary conditions.
    e. Obtain flow parameters outputs at key river locations to be used as boundary conditions for hydraulic modeling.
3. Hydraulic Modeling
    a. Develop a coupled 1D/2D hydraulic model to simulate flood depth, velocity, and extent under different scenarios.
    b. Use input flow parameters obtained from hydrological modeling and channel parameters from secondary data sources (government and municipal stakeholders).
4. Flood Hazard Mapping and Analysis
    a. Generate flood hazard maps (depth, velocity, and extent) for historical and future periods (2040s, 2060s, and 2080s) under SSP2-4.5 and SSP5-8.5 scenarios.
5. Technical Report and Model Documentation
    a. Document the methodology, modeling approach, assumptions, and limitations in a final technical report.

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b. Describe the hydrological and hydraulic modeling setup, including data sources, calibration/validation results, and climate scenario-based simulations.
c. Present flood hazard maps and key findings in a structured format suitable for decision-making.
d. Provide technical recommendations for model improvement and future studies.
e. Present key findings to ADPC experts and national stakeholders (e.g., Department of Water Resources, Royal Irrigation Department, and local government agencies).

G. Working Principles: Consultant will report to the Program Lead, Climate Services, Risk Analytics and Climate Services Department and will work closely with and other specialists from Risk Analytics and Climate Services Department. Regular meetings with designated ADPC personnel (at least once a month) reviewing progress, identifying obstacles and designing the way forward is required.

H. Qualifications:

Consultant shall have the following qualifications

- The Consultant should have a minimum qualification of a Master's degree in Civil Engineering / Hydrology / River Engineering/ Water Resources Management and/or Water Resources Modelling or related subjects with courses on hydrology; PhD in Water Resources Engineering will be an added advantage.
- A minimum of 7 years working experience in flood modeling or monitoring with advanced techniques such as earth observation.
- Experience in public domain open-sourced hydrological models to estimate floods and on hydraulic models to analyze flood propagation through channels and urban areas.
- Clear understanding of floods and drainage simulating scenarios including extreme rainfall events, modeling work incorporating sea-level rise on coastal flood modeling and climate change projections is required.
- Experience in developing flood hazard maps; risk assessments and GIS-based flood hazard mapping is essential.
- Demonstrated strong interpersonal and motivational skills and sensitivity to the local environment as well as the ability to work with minimal supervision with experience in Southeast Asia and preferably Thailand will be an advantage.
- Excellent writing, presentation, and analytical skills.

I. Duty Station: Home-based

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J. Duration: 6 months

K. Itinerary: No overnight travel is envisaged. Any local travel required will be at the consultant's own expenses.

L. Condition of payment:
Payment will be made as per the payment schedule given below. All payments will be credited to the bank account provided by the consultant. The consultant shall not be entitled for any other payments in relation to this assignment unless prior approval from the approving authority is obtained for additional expenses. The consultant shall request for payments and shall bear the bank charges incurred during payments.

Sl. No.	Deliverable	Payment Terms	Percentage of Maximum amount
1	Prepare an inception report detailing the approach and methodology listing of the types of data to be collected, their sources, models to be used and the outputs to be generated. It shall also include a detailed workplan with timelines of various tasks required to complete the activity. **Deliverable-1**: Inception report. (First a draft is to be shared and finalized in 2 weeks in discussion with ADPC).	0.5 months after signing of the contract	10%
2	Collect necessary information, set up a suitable hydrological and hydrodynamic model, perform calibration/validation, generate flood maps for the history and for the future periods 2040s, 2060s and 2080s with SSP2-4.5 and SSP5-8.5 climate change scenarios in close collaboration with ADPC and government stakeholders. **Deliverable-2:** Submit all hydrological and hydraulic models (including setup files, calibration/validation results, and	5 months after signing of the contract	70%

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	configurations), along with flood hazard maps (raster format) showing flood depth, velocity, and extent for historical and future periods (2040s, 2060s, and 2080s) for stated models under SSP2-4.5 and SSP5-8.5 climate change scenarios.		
3	Prepare a technical report on flood hazard assessment / hydrological modeling / mapping study of selected urban areas of Chiang Rai and Surat Thani provinces. **Deliverable-3:** Submit a comprehensive technical report on flood hazard mapping, including hydrological and hydraulic modeling documentation, calibration/validation results, and flood hazard maps for Chiang Rai and Surat Thani. The submission must include all model setup files, configurations, and GIS-compatible outputs. (draft to be submitted 15 days earlier to allow stakeholder and ADPC for comments, revisions (if any) and finalize).	6 months after signing of contract	20%
		Total	**100%**

M. Selection Method

The candidate will be selected in accordance with ADPC's recruitment process and policy guidelines.

N. How to apply:

Interested Candidates can submit the completed ADPC application form, (downloadable from www.adpc.net), resume, copy of degrees/certificate(s) together with a cover letter, to: adpcjobs@adpc.net

Female candidates are especially encouraged to apply.

ADPC encourage diversity in its workplace and support an inclusive work environment.