



TERMS OF REFERENCE

CONSULTANCY SERVICES FOR THE DEVELOPMENT OF STORM SURGE AND COASTAL INUNDATION RETURN PERIOD HAZARD MAPS AND OPERATIONAL PROBABILISTIC MODEL OUTPUTS FOR PALO, LEYTE

I. BACKGROUND

On November 14, 2019, the Green Climate Fund (GCF) approved the five (5)-year project titled "Multi-Hazard Impact-Based Forecasting and Early Warning System (MH-IBF-EWS) for the Philippines" under the Simplified Approval Process (SAP) scheme. The GCF is the world's largest dedicated fund helping developing countries act on climate change. By channeling climate finance to developing countries, the GCF plays a crucial role in serving the goals of the Paris Agreement on climate change, adopted in 2015.

The MH-IBF-EWS Project aims to increase resilience and enhance the livelihoods of the most vulnerable people and Barangays in the (4) Local Government Units (LGUs) of (1) Tuguegarao City, Cagayan; (2) Legazpi City, Albay; (3) Palo, Leyte; and (4) New Bataan, Davao de Oro. It will address the need for a more proactive and inclusive climate risk management in the Philippines anchored on a people-centered MH-IBF-EWS for flood, landslide, severe wind, and storm surge. The Project will thus catalyze a paradigm shift from traditional hazard-based to impact-based forecasting and early warning.

Briefly, Output 1 will generate a science-based understanding of the hazards, exposure, and vulnerability. Explicit in this approach is the need to shift from deterministic to probabilistic forecasting techniques that highlight not only the most likely impact but also reasonable worst-case scenarios, which are often the cause of avoidable disasters. Hence, under Output 1 (Activity 1.3 and Activity 1.5), the target is to generate probabilistic hazard maps for severe wind, storm surge, flood, and landslide for all project sites and to generate a localized flood, landslide, and storm surge model forecasts and a national severe wind model forecasts. At the local level, these activities done on each identified project site will ensure that the methodologies, technologies, and tools for analyzing, monitoring, and forecasting four hazards, i.e. severe wind, storm surge, flood, and rain-induced landslide will be localized and further calibrated.

As mentioned, one of the project sites included is Palo, Leyte which was selected for its exposure and vulnerability to two hydrometeorological hazards namely severe wind and storm surge. The latter being one of the major hazards associated with the massive destruction brought about by Typhoon Haiyan last 2013. Thus, expected in this project site is to develop an advanced early warning system that can produce coastal flood (i.e., a combination of storm surge, astronomical tide, wave set-up and run-up, rainfall, river discharge, and other significant factors critical in assessing the total water level height) forecasts during tropical cyclone events. The procurement of the company/firm will provide guidance on establishing a methodological framework for the development of storm surge and coastal inundation return period hazard maps as well as an operational



framework for establishing real-time probabilistic forecasts at the project site. In addition, the company/firm will provide or develop the necessary hydrodynamic storm surge and inundation models, and programs accompanied by comprehensive training and documentation. These training sessions are to be delivered in two 1-week in-person days and cover aspects such as model installation, configuration, data pre-processing, quality control, and model output post-processing. The company/firm will also guide how to utilize and process various data or formats (e.g. PAGASA WRF, GFS, ECMWF, etc.) as input in the models. The consulting firm must provide outputs appropriate for supporting the learning outcomes of the training. Thus, DOST-PAGASA intends to engage the services of the consulting company/firm that will capacitate the team in using the identified storm surge models and aid in fast-tracking the deliverables of the team specific to the mentioned project activities.

II. SCOPE OF WORK AND METHODOLOGY

The company/firm shall provide technical expertise that will include a series of workshops, consultation meetings, and remote support/assistance to key personnel of DOST-PAGASA. The following deliverables shall be submitted to DOST-PAGASA after each major development:

1. Comprehensive Workshops and Training Documentation

- The consulting company/firm will conduct two 1-week in-person workshops catering to at least 15 key DOST-PAGASA personnel. These workshops will serve as immersive learning experiences, equipping participants with the technical acumen required to effectively utilize the hydrodynamic modeling software, wave model, and coastal storm modeling system in the development of operational probabilistic storm surge forecasts and maps. Detailed documentation capturing the workshop content, training modules, and interactive sessions will be prepared and provided to DOST-PAGASA. This documentation will serve as a comprehensive reference for participants and stakeholders alike.

2. Support Documentation

- Throughout the engagement, the consulting company/firm will extend support through various channels, including email correspondence and regular conference calls. Detailed records of these support interactions will be documented and presented to DOST-PAGASA. This documentation will showcase the responsiveness and dedication of the firm in addressing queries, concerns, and technical challenges encountered during the implementation phases.

3. User Guides and Model Framework Documentation

- In collaboration with the Storm Surge Hazard Component Team, the consulting company/firm will craft detailed user guides tailored to each model framework, ensuring clarity and ease of implementation. Regular reviews of model setups and configurations of the coastal storm modeling system will also be conducted and documented, reflecting the commitment to optimizing model performance. These resources will be instrumental in empowering DOST-PAGASA personnel to navigate the intricacies of the models independently.

4. Python Scripts and model Source Codes

- As a tangible outcome of the intervention, the consulting company/firm will share Python scripts meticulously designed for setting up models, pre-processing data, and post-processing of model outputs including figures and hazard maps free of charge. These scripts will enable DOST-PAGASA to efficiently carry out tasks related to storm surge and inundation modeling and analysis. Furthermore, the complete source code of the models implemented in Python will be made available, ensuring transparency and fostering further innovation.

5. Model Executables and Operational Configuration

- The consulting company/firm will provide fully functional model executables for both the hydrodynamic modeling software and wave models free of charge. These executables will be meticulously configured, optimized, and ready for use. Additionally, comprehensive guidance on pre-processing and quality control of input data, model performance verification, hardware requirements, and troubleshooting errors will be documented, facilitating a seamless transition towards operational use.

6. Methodological Framework and Workflow Documentation

- The core methodology underpinning operational storm surge probabilistic forecasting and the generation of return period maps, will be meticulously documented. The consulting company/firm will collaborate with DOST-PAGASA in identifying representative Tropical Cyclone events pivotal for generating accurate storm surge hazard maps. The culmination of this effort will be encapsulated in detailed documentation, promoting a thorough understanding of the processes involved.

Additionally,

1. Prior to project implementation and conduct of project activities, submit to DOST-PAGASA a Work and Financial Plan, which includes a list of personnel titles and positions to be occupied by researchers and experts identified by the Head of the Company/Firm;
2. Commit to providing DOST-PAGASA regular updates on the status of the Project, i.e. Monthly Progress Report;
3. Submit to DOST-PAGASA an Inception Report, preferably before any activities or fieldwork; and;
4. Implement the Project in close cooperation, collaboration, and partnership with other institutions/agencies and concerned individuals of the MH-IBF-EWS Project as may be necessary and appropriate.

III. EXPECTED OUTPUTS / TASKS AND RESPONSIBILITIES

The deliverables expected from the consultancy company/firm include the following:

Table 1. Expected Outputs

Deliverables	Remarks
Submission and acceptance of the Initial Inception Report and Signed Contract	<ul style="list-style-type: none">- The Company/Firm will prepare an initial inception report before signing a contract with the DOST-PAGASA. This will be shared with the Project Leader, Assistant Project Leader and assigned members of the AWG/TWG for review and acceptance. The report should contain a detailed work and financial plan for the activities covered in the Scope Work in Section II.- Contract signed by the head of the company/firm, head of the agency (DOST-PAGASA) and Project Leader, reviewed by assigned AWG/TWG heads and members.
- Submission and Acceptance of the Final Inception Report including a Technical Workshop Plan	<ul style="list-style-type: none">- Final inception report and a technical workshop plan for the technical workshops to be conducted. This will include the schedule, timeline, and topics included in the conduct of the workshop.
- Provision of comprehensive technical training, documentation, presentations, and post-training feedbacks - Documentation of support provided (e.g., through e-mail and conference calls)	<ul style="list-style-type: none">- Provide two 1-week in-person technical workshops to at least 15 DOST-PAGASA personnel and detailed documentation in the model framework and associated processes. The consulting Firm will prepare a documentation of the trainings done (i.e. use of hydrodynamic modeling software and wave model including its post-processing and use of coastal storm modeling system including its pre-processing of DOST-PAGASA meteorological datasets) within which the presentations and post-training feedbacks are included and discussed. The documentation will also include hardware and software requirements, including the installation and set-up of models to be used in the project.- Simultaneously, the consulting Company/Firm will provide support in setting-up models (through e-mail and weekly conference calls).
- Detailed user guides for each model framework shared - Python scripts for setting-up, pre-processing and post-processing of model datasets	<ul style="list-style-type: none">- Collaborate with the Storm Surge Hazard Component Team to build and run the model framework for the Palo, Leyte site. Conduct regular reviews of model set-ups and coastal storm modeling system configurations.- Share Python scripts for setting up models, post-processing and others. Share Python scripts to generate probabilistic flood maps and return period

Deliverables	Remarks
<ul style="list-style-type: none"> - Python source code and model executables for tropical cyclone, storm surge, coastal flood and wave models 	<p>flood maps for long-term planning for the project site. Share the coastal storm modeling system source code (Python).</p> <ul style="list-style-type: none"> - Provide the hydrodynamic modeling software and wave model executables.
<ul style="list-style-type: none"> - Configured operational model for the provision of Probabilistic storm surge forecasts - Schematic workflow for generating storm surge return period maps and probabilistic forecast 	<ul style="list-style-type: none"> - Provide guidance on pre-processing and quality control of input data such as topography, bathymetry and geomorphological data. Provide Guidance in conducting model performance verification. Provide guidance on hardware requirements. - Provide documentation on the methodological framework for the development of operational storm surge probabilistic forecasting and the generation of return period maps. Provide support in deriving representative weather events for generating storm surge flood risk maps. Provide proper turn-over of materials upon completion.

IV. GOVERNANCE AND ACCOUNTABILITY

The DOST-PAGASA shall directly supervise and accept the output/s of the Company/Firm. Based on Table 1, outputs shall be submitted to the DOST-PAGASA. Comments shall be provided within two weeks; otherwise, the output is deemed approved. In addition, at different points during the project implementation, the Company/Firm is expected to liaise/interact/collaborate/meet with other relevant stakeholders of the MH-IBF-EWS Project.

Quarterly progress reports shall be submitted to DOST-PAGASA however, the Company/Firm is expected to provide monthly updates in a form of meeting and/or reports for monitoring purposes.

V. TEAM COMPOSITION AND REQUIREMENTS

A local company/firm with extensive experience in providing advisory services in a government setting with local or international partners with technical expertise in storm surge and inundation modeling. The aforementioned requirements shall be manifested by the following:

Advisory service requirements

1. Must be operational for at least two (2) years and have a physical office in the Philippines.
2. Must have prior consulting experience for at least (2) years in the area of disaster risk reduction management projects.
3. Must have at least two (2) years' experience with government projects involving processes and realities of government rules, regulations, and procedures.

Additionally, required background and experience for the consultancy company/firm are as follows:

- Legal status (Platinum PhilGEPS, Mayor's Permit, Certificate of Registration, etc.) recognized by the Philippine government, enabling the organization to procure consulting firms;
- Has previous projects, researches, or engagements with national agencies and/or state universities locally or internationally;
- Expertise in partnering with companies involved in science and technology, research, specialized software and data products;
- Ability to plan, collaborate and execute training development activities;
- Excellent communication, diplomacy and interpersonal skills;

The team composition shall be composed of the following personnel:

Designation and Number of Personnel	Qualifications	Task / Responsibility
1 Project Manager	<ul style="list-style-type: none">• At least 5 years of experience in project management• Proven track record in successful project implementation• Relevant academic qualifications and professional certifications	<ul style="list-style-type: none">• Contract Management.• Ensure timely delivery of required outputs.• Technical guidance in the use of local data sets.• Packaging of outputs for submission to client (i.e. Inception Report, Technical Workshop Plan, Technical Training Documentation, Support Documentation, Detailed User Guides, etc.)

1 Coastal Modeling Specialist	<ul style="list-style-type: none"> • Preferably but not limited to 10 years experience with storm surge and flood modeling and forecasting projects • Extensive experience applying storm surge modeling system, hydrodynamic modeling software, wave model and other relevant models for operational use 	<ul style="list-style-type: none"> • Preparation of Inception Report and Technical Workshop Plan. • Preparation of workshop materials. • Conduct of in-person technical training. • Provide online technical workshops. • Prepare user manuals. • Assist in model set-up and configurations. • Provide python scripts, software and executables. • Provide general technical guidelines. • Provide support in weekly conference calls. • Provide email support or through issues on Github. • Review of outputs for submission to client.
1 Coastal Modeling Advisor	<ul style="list-style-type: none"> • Demonstrated expertise in developing operational storm surge modeling and forecasting systems • At least 3 years work experience in hydrodynamic modeling and coastal research 	
1 Probabilistic Modeling Specialist	<ul style="list-style-type: none"> • Knowledge of generating probabilistic forecasts, hazard maps and flood inundation mapping • At least 5 years of experience in the field of hydrological and risk assessments • Has engaged in various projects and research in hydrology and coastal water systems 	
2 Environmental Specialist	<ul style="list-style-type: none"> • At least 3 years of research and project engagement in environmental impact assessment • Engagement with DRR trainings or workshops 	<ul style="list-style-type: none"> • Workshop preparation and planning. • Technical training documentation. • Collection of post-training feedback. • Monitoring of issues, feedback and closure. • Assist in model set-up for Palo area. • Data collection.

VI. INSTITUTIONAL ARRANGEMENT

To undertake the tasks, procedures, and expected outputs, the winning Company/Firm shall be engaged for a period equivalent to twelve (12) months. Effectivity of the engagement will be upon signing of the contract and will be valid until all outputs have been delivered and accepted.

VII. PAYMENT SCHEDULE

The payments will be released based on the following schedule of payments:

Deliverables/ Outputs	Percentage*	Indicative Deadline
<ul style="list-style-type: none">- Submission and acceptance of the initial inception report and signed contract	15%	30 calendar days after NTP
<ul style="list-style-type: none">- Submission and acceptance of the final inception report including the technical workshop plan- Training plan including detailed topics, objectives, trainer information, and schedule of activities.- Methodological framework for generating storm surge and coastal flood hazard maps for return period and probabilistic forecasts.	15%	30 calendar days after acceptance of previous deliverable
Conduct of comprehensive training and submission and approval of the following: <ul style="list-style-type: none">- Training presentations- Detailed training manuals such as installation, configuration, simulation, analysis, and other related documents.	25%	100 days after acceptance of previous deliverable
Submission and acceptance of the following: <ul style="list-style-type: none">- Post-training feedback/report- Detailed user guides/documentation for each model framework including troubleshooting documentations shared.- Documentation of support provided (e.g. through email and conference calls).- Python scripts for setting up, pre- and post-processing of model datasets including updates based on the user needs.	30%	100 days after acceptance of previous deliverable

Deliverables/ Outputs	Percentage*	Indicative Deadline
<ul style="list-style-type: none"> - Source codes and scripts for storm surge and coastal flood models. - Model executables and licenses for hydrodynamic modeling software and wave model. 		
Submission and acceptance of configured and working operational model for the provision of the following: <ul style="list-style-type: none"> - return period storm surge and coastal flood hazard maps. - probabilistic storm surge forecasts. Submission and acceptance of the following: <ul style="list-style-type: none"> - Documentation of support provided (e.g. through email and conference calls). - Detailed troubleshooting guides for the provided models and scripts. 	15%	105 days after acceptance of previous deliverable

*The Government, as it considers fair and reasonable, may allow advance payment to the Company/Firm in the amount which will not exceed fifteen percent (15%) of the contract amount to cover the cost of mobilization, subject to the posting of an irrevocable standby letter of credit issued by an entity acceptable to the agency and of an amount equal to the advance payment (RA9184 IRR)

As indicated, monthly progress reports are expected from the Company/Firm for monitoring purposes. These shall be consolidated to form Quarterly Progress Reports. All reports must be approved and certified by the DOST-PAGASA prior to the release of payments.

VIII. BUDGET AND FINANCIAL PROPOSAL

The Company/Firm will need to submit a Financial Proposal taking in consideration the total agreement price should be inclusive of management and operation costs. Payment shall be disbursed based on the completion of identified project outputs in Section III and upon Acceptance of the deliverables by the DOST-PAGASA.

The Company/Firm shall submit a Technical and Financial Proposal (cost to conduct the activities based on the Scope of Work), which must contain the activities for the implementation of the Project and the corresponding budget.

The Company/Firm must submit their Financial Proposal supported by their Itemized Cost Estimates.

The following components must also be included in the Financial Proposal to be submitted to DOST-PAGASA:

- The approximate amount for the expenditure of the Company/Firm for the scope of work/methodology in Philippine Peso (PHP);
- Professional fees of key personnel inclusive of travel, living allowances, and corresponding level of effort and for twelve months;
- Cost of the conduct of the activities, including workshops, surveys, focused group discussions, etc. based on Deliverables/Scope of Work;
- Facilitation of payments under the Scope of Work (breakdown per activity);
- Cost for communications, materials, reproduction, transportation/travel, office supplies and others as may be relevant to the scope of work.

IX. CRITERIA FOR THE EVALUATION OF THE PROPOSAL

The Technical Proposal will be evaluated using the Quality Based Evaluation (QBE) as determined by the DOST-PAGASA Bids and Awards Committee (BAC). Nevertheless, the QBE implies that all proposals have the same maximum overall price (which cannot exceed the known fixed budget amount), focusing the selection on the quality of the Company/Firm's proposed approach and methodology.

XI. CONFIDENTIALITY AND PROPRIETARY INTERESTS

The Company/Firm needs to apply standard ethical principles during the assignment. Some of these must deal with confidentiality of interviewee statements when necessary, refraining from making judgmental remarks about stakeholders.

The incumbent will not disclose any proprietary or confidential information related to the service during the term or after the termination of the assignment without prior written consent by the contracting authority. Proprietary interests in all materials and documents prepared by the contract holder under this assignment will become and remain properties of the MH-IBF-EWS Project under DOST-PAGASA.

Annex A. Criteria for Quality Based Evaluation

The DOST-PAGASA shall evaluate the Technical Proposal of the Companies/Firms using Quality Based Evaluation (QBE) with a minimum required Technical Score (S_t) of 70%, using the following criteria and scoring system:

Shortlisting Criteria				Points Obtainable
Section 1. Company/Firm experience specific to the requirement				30
1.1	At least two (2) years of track record with prior consulting experience for at least two (2) years in the area of disaster risk reduction and management.			10
	a.	At least two years of relevant experience	10	
	b.	One year of relevant experience	8	
	c.	Less than one year of relevant experience	6	
1.2	At least two (2) years of experience working with government projects involving processes and realities of government rules, regulations, and procedures especially in the field concerning science, technology and disaster management projects.			10
	a.	At least two years of relevant experience	10	
	b.	One year of relevant experience	8	
	c.	Less than one year of relevant experience	6	
1.3	Completed at least one (1) major project related to developing multi-hazard and disaster risk management		10	10
Section 2. The proposed methodological approach and work plan				20
2.1	Overall Methodology and Approach. Clear and comprehensive yet concise articulation of the proposed methodology is consistent with <i>Section II. Scope of Work and Methodology</i> , with sound and viable strategies for meeting the key results.		10	10
2.2	Work Plan well-specified work plan on how to deliver the outputs and results in <i>Section III. Expected Outputs / Tasks and Responsibilities</i> , with the proposed timelines and milestones strategically defined and consistent with the project timeline.		10	10

Section 3. Management Structure and Key Personnel				50
3.1	Project Manager			10
	(5) years experience in leading development projects and developing tools and carrying out integrated solutions related to climate and disaster risk analysis and assessment including development of hazard maps			
	a.	At least five years of relevant experience	10	
	b.	Four years of relevant experience	8	
	c.	Three years of relevant experience	6	
3.2	Coastal Modeling Specialist			10
	Preferably with PhD in hydrology, meteorology, disaster risk management or related field; Strong understanding of hydrodynamics and at least three (10) years experience on hydrodynamic and coastal flood modeling			
	a.	At least ten years of relevant experience	10	
	b.	Eight years of relevant experience	8	
	c.	Five years of relevant experience	6	
3.3	Coastal Modeling Advisor			10
	3 years experience and relevant research in hydrodynamic modeling, coastal flooding and wave modeling.			
	a.	At least three years of relevant experience	10	
	b.	Two years of relevant experience	8	
	c.	One year of relevant experience	6	
3.4	Probabilistic Modeling Specialist			10
	5 years experience in probabilistic modeling focused in hydrology and integrated risk assessment.			
	a.	At least 5 years of relevant experience	10	
	b.	Three years of relevant experience	8	
	c.	One year of relevant experience	6	
3.5	Environmental Specialists			10
	At least 3 years work experience in environmental impact assessment, disaster risk reduction or similar fields.			
	a.	At least 3 years of relevant experience	10	
	b.	Two years of relevant experience	8	
	c.	One year of relevant experience	6	

Total Points Obtainable	100
Passing Score	70

Annex B. Suggested Financial Evaluation

The DOST-PAGASA may evaluate the Financial Proposal of the Companies/Firms using the suggested Financial Breakdown Evaluation below:

Particulars	Percentage Allotment of Total ABC (Suggested)
Professional Services	max of 70%*
Operational Expenses (includes workshop/training expenses, travel expenses, etc.)	25% - 30%
Miscellaneous Expenses	5% - 10%
Total	100%

*The maximum percentage allotment for the Professional Services shall be set at 70%, and the percentage allotments for the remaining expenses may be adjusted accordingly such that the total percentage shall sum up to one hundred percent (100%).