

Terms of reference (ToRs) for modeling climate and hydrological risks associated with ecosystem functioning of Pong reservoir, Himachal Pradesh

Modeling climate and hydrological risks associated with ecosystem functioning of Pong reservoir, Himachal Pradesh	Project number/ cost centre: 16.9020.5.001.00
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0. List of abbreviations

AVB	General Terms and Conditions of Contract (AVB) for supplying services and work 2019
CDA	Chilika Development Authority
CV	Curriculum vitae
GIS	Geographic Information System
MoEFCC	Ministry of Environment, Forest and Climate Change
NCSCM	National Centre for Sustainable Coastal Management
NPCA	National Plan for Conservation of Aquatic Ecosystems
WISA	Wetlands International South Asia
RS	Remote Sensing
ToR	Terms of reference

1. Context

1.1 Project Background

Wetlands exist as transitional ecosystems at land and water interface which are represented by various types including lakes, marshes, reservoirs, mangroves, lagoons, estuaries etc. As highly productive ecosystems, wetlands are vital for hydrological cycle and support rich biological diversity. Globally, wetlands are threatened by reclamation and degradation through drainage and landfill, pollution, hydrological alteration, over-exploitation, and climate change resulting in loss of biodiversity and disruption in ecosystem benefits to the society.

Wetlands in India are integral to biodiversity conservation, water and food security, and climate protection. MoEFCC, in partnership with GIZ, is implementing a Technical Cooperation project “Wetlands management for biodiversity and climate protection” with funding support from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) under the International Climate Initiative (IKI). The goal of the project is to strengthen the institutional framework and enhance capacities for an ecosystem-based integrated management of wetlands of international importance (Ramsar sites) in India.

The project is implemented in close cooperation with the NPCA of the MoEFCC with an overall objective to establish an integrated management approach at four Ramsar sites (namely, Pong, Renuka, Bhitarkanika and Point Calimere). In order to facilitate project implementation, Wetland Research and Training Centre, Chilika Development Authority (CDA) has been identified as a resource centre in partnership with the respective State Wetlands Authorities and site level management institutions. Wetlands International South Asia (WISA) is the technical partner in project implementation.

Three main output areas define the implementation approach of the project:

- Integrated management planning for 4 pilot Ramsar sites based on biodiversity, ecosystem services and climate change risks.
- Capacity development of national, state and site level stakeholders for integrated wetland management.
- Development of a wetland monitoring system, including an instrument to track management effectiveness.

1.2 Context of the assignment

Water pollution and water scarcity are affecting India’s water resources and overexploitation, which has led to extensive loss of wetlands and associated ecosystem services. To maintain and improve the essential functioning of wetland ecosystems, an integrated management approach is required, based on insight into both river basins and nutrient loads and wetland ecosystems functioning. Pong reservoir is one such wetland ecosystem whose functioning needs to be assured through implementation of an integrated management plan.

Pong, built on the Beas River, is located in the Kangra district of Himachal Pradesh, India and principally provides irrigation water although, it also allows for electricity generation. In addition, Pong reservoir intercepts the Trans-Himalayan flyway. Pong was incorporated in the List of Wetlands of International Importance under the Ramsar Convention in the year 2002 based on the immense diversity of waterfowl it supports. Pong is a transitory habitat for migratory

waterfowl and is also an abode for the resident waterfowl which depend on it for resting, feeding and breeding purposes.

The reservoir inflow is highly influenced by both the monsoon rainfall and the melting glacier and seasonal snow from the Himalayas, consequently, its ability to satisfactorily perform its functions is susceptible to possible climate-change disturbances. Climate change is predicted to affect the hydrology of most regions through its influence on temperature, rainfall, evapotranspiration, etc., which may further the divergence between the planning and operational hydrological situations. There is an urgent need to investigate the effects of climate change on Pong reservoir to understand the effect of hydrological uncertainty of climate change predictions on the reservoir performance and how it affects the reliability and vulnerability in the coming future.

Also, Pong is severely affected by the anthropogenic pressures posing risks of habitat destruction within its catchment area attributable to large-scale unregulated development and land use conversion. Anthropogenic activities and changes in land use pattern in the upstream catchment also contribute to accelerated reservoir sedimentation. Accelerated soil erosion is favored by anthropogenic activities such as rapid population growth, deforestation, extensive agriculture and uncontrolled grazing principally in Pong's catchment. Pong is also vulnerable to some level of sediment deposition and inflow. In order to support and strengthen the existing management regime of Pong and to ensure ecosystem services delivery, land use land cover change within the catchment needs to be mapped along with the sedimentation estimation.

Changes observed within the catchment sourced either from climate change or anthropogenic activities need further analysis so as to prioritize the risks faced by Pong and to identify the gaps in accordance with the existing management regime. Effective management strategies recognizing the associated climate, hydrological and anthropogenic vulnerabilities and associated risks within the catchment thus, need to be proposed.

1.3 Objectives and Scope of the Assignment

The overall objective of the assignment is to identify and predict the risks climate and land use land cover change pose to the overall hydrological functioning of Pong reservoir along with its impact on water inflows, quality, availability and seasonality in reservoir storage. Based on these assessments, trade-offs for different stakeholders should also be mapped and recommendations drawn for ecosystem-based integrated management of the wetland.

2. Tasks to be performed by the contractor

The project will employ the services of a consultant to carry out fieldwork, data collection and stakeholder consultations at Pong Reservoir.

The specific tasks of the consultant are as follows:

Objective 1: Hydrological characterization of Pong Reservoir

- Mapping reservoir inflows including direct and indirect catchment, hydraulic structures, water abstraction within catchment and drainage channels; water quantity and quality along with its availability for supply downstream

- Understanding the seasonal changes in flows received and identifying major factors that could affect the water supply downstream including land use land cover changes in the catchment.

Objective 2: Assessing sediment deposition and sediment yield of the reservoir

- Mapping change in reservoir capacity using remote sensing approach as a proxy for volume of sediments deposited within the reservoir during the period 1975-2018
- Modelling the sediment yield of the reservoir using hydrological models such as SWAT.

Objective 3: Impacts of climate and land use land cover change within the catchment on Pong Reservoir

- Identifying the potential impacts of climate change on water inflows, availability and reservoir operations.
- Mapping LULC change within the catchment and predict the impact of future changes on the water and nutrient exports especially w.r.t. agriculture expansion.
- Analyzing the impacts of these changes on the bank vegetation and wetland waterbird habitats.

Objective 4: Management measures to sustain/maintain hydrological functioning of Pong

- Propose management measures to address the risks of adverse change in the hydrological flows received by the reservoir.
- Identifying best practices from Indian as well as International context to ensure ecosystem functioning of Pong Reservoir under changing climatic and hydrologic conditions.
- Developing management scenarios for Pong reservoir along with implications of each of the scenarios.

Certain milestones, as laid out in the table below, are to be achieved by certain dates during the contract term, and at particular locations:

Milestone	Deadline (from the time of signing the contract)
Presentation and submission of inception report with detailed methodology, workplan and timeframe for execution	2 weeks
Status report on hydrological characterization of Pong reservoir, seasonal flow variations and trade-offs for different stakeholders	1.5 months
Interim progress report including details on progress made, including a factsheet on the hydrology of Pong reservoir, including results on characterization, sedimentation, climate and LULC Modeling	2 months
Presentation and submission of draft report on the hydrological assessment of Pong reservoir	4 months

Submission of final report after incorporation of suggestions given by stakeholders and project team	5 months
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The following report structure is proposed for the assignment.

- i. Executive summary highlighting the important findings of the assessment and key recommendations.
- ii. Introduction including a brief review of existing literature describing the hydrology of Pong reservoir identifying major influences and sources of change in hydrology.
- iii. Methodological framework for the assessment
- iv. Results and Discussion
 - Hydrological description of Pong reservoir including direct and indirect zone of influence/catchment
 - Changes in hydrological character of Pong reservoir and mapping the drivers of change and their impact in the current and future scenarios
 - Mapping changes in reservoir capacity during the period 1975-2018 along with potential sediment yield of the reservoir.
 - Impacts of climate change and LULC within the wetland catchment on the wetland and future changes predicted in the water and nutrient exports from the catchment
 - Measures to sustain/maintain hydrological functioning of Pong reservoir while developing suitable management scenarios.
- v. Conclusions
- vi. References
- vii. Annexes

Period of assignment: From 1 December 2019 until 30 April 2020.

3. Concept

In the bid, the bidder is required to show how the objectives defined in Chapter 0 are to be achieved, if applicable under consideration of further specific method-related requirements (technical-methodological concept). In addition, the bidder must describe the project management system for service provision.

Technical-methodological concept

Strategy: The bidder is required to consider the tasks to be performed with reference to the objectives of the services put out to tender (see Chapter 1). Following this, the bidder presents and justifies the strategy with which it intends to provide the services for which it is responsible (see Chapter 0).

The bidder is required to present the actors relevant for the services for which it is responsible and describe the **cooperation** with them.

The bidder is required to present and explain its approach to **steering** the measures with the project partners.

The bidder is required to describe the key **processes** for the services for which it is responsible and create a schedule that describes how the services according to Chapter 0 are to be provided. In particular, the bidder is required to describe the necessary work steps and, if applicable, take account of the milestones and contributions of other actors in accordance with Chapter 0.

The bidder is required to describe its contribution to knowledge management for the partner and GIZ and promote scaling-up effects (**learning and innovation**).

Other specific requirements

The methodology for the assignment is proposed to include field-based assessments and collation of data from secondary sources such as BBMB, Fisheries Department, Academic institutions, NGOs and open source platforms including WRIS, etc. and scientific research publications.

The assignment execution should follow the feedback mechanism with continuous discussion and engagement of the contractor with GIZ and Forest Department, Himachal Pradesh to review and provide suggestions. For this purpose, the contractor would be available for discussions and meetings in Delhi/Himachal Pradesh or over skype/telephone as and when required.

Project management of the contractor

The bidder is required to explain its approach for coordination with the GIZ project.

- The contractor is responsible for selecting, preparing, training and steering the experts (international and national, short and long term) assigned to perform the advisory tasks.
- The contractor makes available equipment and supplies (consumables) and assumes the associated operating and administrative costs.
- The contractor manages costs and expenditures, accounting processes and invoicing in line with the requirements of GIZ.
The contractor reports regularly to GIZ in accordance with the AVB of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH from 2019

In derogation from GIZ AVB, the contractor makes contributions to reports to GIZ's commissioning party instead of submitting its own reports.

The bidder is required to draw up a **personnel assignment plan** with explanatory notes that lists all the experts proposed in the bid; the plan includes information on assignment dates (duration and expert days) and locations of the individual members of the team complete with the allocation of work steps as set out in the schedule.

Eligibility Criteria for firms

The qualifying criteria for the firms/institutions/organisations applying for this is given as follows:

- Should be registered in India;
- Should have annual turnover of at least Euro 40,000;
- Should have present staff strength of at least 5 persons;

- Should have implemented reference project with a minimum value commission of Euro 5,000;
- Should have implemented at least one reference project in the field of hydrological and climate risks assessment of large wetlands or reservoirs;
- Should have implemented at least one reference project in Himalayan states of India in the last three years
- Should have demonstrated experience of applying climate models and scenarios for hydrological assessment
- More than 5 years' experience in hydro-ecological assessment of wetlands/large reservoirs
- Should have experience in implementing assignments on water resource management
- Experience of implementing assignments with multi-disciplinary teams of experts
- 5 years' experience in implementing assignments in Western Himalayan states, especially Himachal Pradesh
- Experience in implementing development projects
- Sub-contracting the assignment or its parts to other agencies is not permitted.

Technical backstopping

The bidder is required to describe its backstopping concept. The following services are part of the standard backstopping package, which (like ancillary personnel costs) must be factored into the fee schedules of the staff listed in the bid in accordance with section 5 of the AVB:

- Service-delivery control
- Managing adaptations to changing conditions
- Ensuring the flow of information between GIZ and field staff
- Contractor's responsibility for seconded personnel
- Process-oriented technical-conceptual steering of the consultancy inputs
- Securing the administrative conclusion of the project
- Ensuring compliance with reporting requirements
- Providing specialist support for the on-site team by staff at company headquarters
- Sharing the lessons learned by the contractor and leveraging the value of lessons learned on site

4. Personnel concept

The bidder is required to provide personnel who are suited to filling the positions described, on the basis of their CVs (see Chapter 7), the range of tasks involved and the required qualifications.

The below specified qualifications represent the requirements to reach the maximum number of points.

Team leader

Tasks of the team leader

- Overall responsibility for the advisory packages of the contractor (quality and deadlines)

- Coordinating and ensuring communication with GIZ, partners and others involved in the project
- Develop suitable methodology for the assignment along with other experts.
- Personnel management, in particular identifying the need for short-term assignments within the available budget, as well as planning and steering assignments and supporting local and international short-term experts
- Regular reporting in accordance with deadlines

Qualifications of the team leader

- Education/training (2.1.1): University qualification (Master's)/Ph.D. in Hydrology or related areas from a reputed Indian / international institute
- Language (2.1.2): Good business language skills in English.
- General professional experience (2.1.3): 10-15 years of professional experience in conducting hydrological assessments and water resources management;
- Specific professional experience (2.1.4): 5 years in wetlands hydrological and climate assessments especially for large reservoirs;
- Leadership/management experience (2.1.5): Experience in managing projects of similar nature
- Regional experience (2.2.6): 5 years of experience in projects in Himalayan region

Technical Expert 1

Tasks of expert 1

- Develop suitable methodology for the assignment and assist the Team Leader in the following tasks.
- Conduct and oversee field assessments including hydrological assessments, hydraulic modelling, risk assessment, climate modeling, use of RS-GIS in hydrological assessment and modelling and LULC mapping, groundwater modelling, etc.
- Data analysis
- Report Preparation

Qualifications of expert 1

- Education/training (2.2.1): Master's degree in hydrology or water resources management/hydro-ecology or any other related field
- Language (2.2.2): English
- General professional experience (2.2.3): 5 years of experience in conducting hydrological assessments, hydraulic modelling, catchment studies, etc.
- Specific professional experience (2.2.4): Well-versed with wetlands ecology, hydrology and remote sensing and GIS based water resources management.
- Regional experience (2.2.6): Experience of wetlands in Himachal Pradesh is desirable

Soft skills of team members

In addition to their specialist qualifications, the following qualifications are required of team members:

- Team skills
- Initiative
- Communication skills
- Sociocultural competence
- Efficient, partner- and client-focused working methods
- Interdisciplinary thinking

Short-term expert pool with minimum 2, maximum 5 members

Tasks of the short-term expert pool

- Data collation and analyses
- Field assessment
- Data analysis

Qualifications of the short-term expert pool

- Education/training (2.6.1): 2 experts with Master's in Hydrology/Water resources management/Climate science/Remote Sensing
- Language (2.6.2): 2 technical experts with very good language skills in English and Hindi
- General professional experience (2.6.3): 2 technical experts with at least 2 years of experience in hydrological assessments of reservoirs
- Specific professional experience (2.6.4): hydrological and hydraulic modeling and RS data based hydrological parameters assimilation and ecologically sustainable water management.
- Regional experience (2.6.5): 2 experts with at least 2 years of field experience in Himachal Pradesh

The bidder must provide a clear overview of all proposed short-term experts and their individual qualifications.

5. Costing requirements

Assignment of personnel

Team Leader: Up to 60 expert days

Technical Expert 1: Up to 80 expert days

Technical Executives pool: Up to 120 expert days

Travel

The bidder is required to calculate the travel by the specified experts and the experts it has proposed based on the places of performance stipulated in Chapter 0 and list the expenses separately by daily allowance, accommodation expenses, flight costs and other travel expenses.

6. Inputs of GIZ or other actors

GIZ and/or State Forest Department, Himachal Pradesh are expected to make the following available:

- Necessary communication to government department to facilitate the tasks outlined in the project
- Conceptual inputs as and when needed

7. Requirements on the format of the bid

The structure of the bid must correspond to the structure of the ToRs. In particular, the detailed structure of the concept (Chapter 3) is to be organised in accordance with the positively weighted criteria in the assessment grid (not with zero). It must be legible (font size 11 or larger) and clearly formulated. The bid is drawn up in English (language).

The core proposal/bid shall not exceed 30 pages (excluding CVs, Annexures and details of reference projects).

The CVs of the personnel proposed in accordance with Chapter 4 of the ToRs must be submitted using the format specified in the terms and conditions for application. The individual CV of each expert shall not exceed 2 pages. The CVs must clearly show the position and job the proposed person held in the reference project and for how long. The CVs shall be submitted in English (language).

If one of the maximum page lengths is exceeded, the content appearing after the cut-off point will not be included in the assessment.

As the contract to be concluded is a contract for works, please offer a fixed lump sum price that covers all applicable costs (fees, travel expenses etc.). The price bid will be evaluated based on the specified lump sum price. For our internal costing and any further commissions, please also provide the daily rate which the prices are based on. A breakdown of days is not required.