

**Government of India**  
**National Hydrology Project (NHP)**  
**Ministry of Water Resources, River Development & Ganga Rejuvenation**  
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**INTERNATIONAL COMPETITIVE BIDDING**

**REQUEST FOR EXPRESSION OF INTEREST (EOI)**

National Project Monitoring Unit, National Hydrology Project, Ministry of Water Resources, RD & GR invites Request for Expression of Interest (REOI) from reputed Indian/Global Institutions/Agencies/Firms, for providing consultancy services for “**Extended Hydrological Prediction (multi week forecast)**” with funding support from World Bank.

*The detailed REOI is available on the NHP’s website <http://www.nhp.mowr.gov.in> and <https://eprocure.gov.in/eprocure/app>.*

Detailed ‘Request for Expression of Interest’ along with documents confirming compliance should be submitted by prospective bidders on line at NIC e-procurement website i.e. <https://eprocure.gov.in/eprocure/app> from **11-01-2019 (11.00AM) to 04-02-2019 (10.30AM)**.

Senior Joint Commissioner-II

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**Government of India**  
**National Project Monitoring Unit (NPMU)**  
**National Hydrology Project (NHP)**  
**Ministry of Water Resources, River Development & Ganga Rejuvenation,**

***INTERNATIONAL COMPETITIVE BIDDING***

**Expression of Interest (EOI) for Consultancy Services**  
**for**  
**“EXTENDED HYDROLOGICAL PREDICTION (MULTI WEEK FORECAST)”**  
**for**  
**National Hydrology Project**

**....., 2019**

**2<sup>nd</sup> Floor, Rear Wing, MDSS Building,**  
**9, CGO Complex, New Delhi-110003.**  
**Tel: +91-11-24363417**  
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## CONSULTANCY FOR EXTENDED HYDROLOGICAL PREDICTION (MULTI WEEK FORECAST) UNDER NATIONAL HYDROLOGY PROJECT

No.

Date:.....

### **Expressions of Interest (EOI)**

The Government of India has applied for a loan from the World Bank under the National Hydrology Project (NHP) and intends to apply part of the loan proceeds to make payments under the contract for Extended Hydrological Prediction (multi week forecast).

NHP is countrywide project, with 49 Implementing agencies (IAs) including eight central agencies, 39 state-UT level agencies and two river basin organizations (RBO). The National Hydrology Project (NHP) is proposed to be an eight-year project starting from November, 2016. It aims for Integrated Water Resources Management to enable improved decisions in water resources planning and operations. This requires not just improved water information systems and Decision Support Systems, but also enhanced institutional capacity – both technical capacity and policy & planning capacity. The Project Development Objective of the project is proposed “**to improve the extent, quality, and accessibility of water resources information and to strengthen the capacity of targeted water resources management institutions in India**”.

Extended Hydrological Prediction (EHP) is the prediction of hydrological variables, most commonly the monthly/seasonal stream flow, for a period of time that exceeds the common short-term forecasts that are usually provided by most forecasting agencies within a time horizon of no longer than one week. While the short-term forecast is based on the observed hydrological and meteorological variables (e.g. precipitation, temperature, discharges, etc.) and optionally on their forecasts, the EHP may rely on other climatological drivers, and it often relies on stochastic or statistical techniques. The lead time of EHP thus may differ from weeks to months depending on the duration of the effect of the initial condition of the basin and the effect of other drivers used in EHP. Methods employed by EHP differ significantly for wet and dry seasons. The performance of precipitation forecast of Numerical Weather Prediction (NWP) declines with the lead time. The use of the deterministic forecast beyond the time at which their accuracy is worse than 50% does not make sense. Therefore, in meteorological forecasts the ensemble systems are often used for longer lead times, which are often referred to as the medium range forecasts.

### **Objectives of consultancy:**

The consultant has to investigate the multi week forecasts basin by basin and comment on their usefulness and reliability for a particular river basin. The consultant is expected to review the existing similar forecasts around the world and summarize their success rate to date. Following this step, select the most successful approaches for further investigation and see if they are applicable to India. It should be noted that there are conservative seasonal flow forecasts algorithms for dry season flows that exist and that are based on sound scientific principles that may also be applicable in India. Those will be tested by the consultant on the selected river basins.

***The main objective of the consultancy is to develop tools for multi-week runoff forecast in the selected basins.*** Multi week forecasts for the monsoon periods should cover a period of up to four weeks from the date of issuing forecasts. The consultancy will include the following steps:

- i) Literature Review of the state of the art regarding multi week hydrologic forecasting

- around the world, including a review of the current practices by other agencies
- ii) Conceptual Approach and Methodology
    - a. Proposed methods to be tested for monsoon multi-week (monthly) flows
    - b. Proposed methods to be tested for non-monsoon multi-week (monthly) flows
  - iii) Historic data collection and processing (what data will be required, data availability, quality control, etc.)
  - iv) Model verification methodology and discussion of the verification results
  - v) Analyses and ranking of tested models regarding their robustness, reliability and accuracy
  - vi) Designing of the portal for the selected model such that its results can be uploaded to the database for further use as input into other models (this comes at the end after the final model selection was made and reliability determined as acceptable)
  - vii) Production of Final Documentation
  - viii) Training/Workshops for capacity building of central/state professionals

#### **DURATION:**

Total anticipated project duration is 66 months. Of those, the last 36 months are devoted to Technical Support after Implementation. The consultant should provide a separate cost estimate for Technical Support Services for a period of 36 months after model implementation and acceptance, to support the model operation and fine-tuning. This would include trouble-shooting (through telephone discussion and possibly visits by professionals in case of major problems) to guarantee downtime not greater than 24 hours after request is sent.

#### **SCOPE**

The EHP for river flow forecasting system, will be extended and calibrated into three designated basins of India, namely **i) Narmada, ii) Yamuna, iii) Cauvery** and implemented basin-wise for all the tributaries and their corresponding sub-basins. To ensure success of the project, consultants will be asked to select four representative locations in each of the above basins, develop multi-week flow forecasting models for both wet and dry season for the selected locations, and test them using other historic years that were not used in the initial model calibration. Multi-week flow forecast for other locations in the basin can then be approximated on the basis of interpolation between the selected control points where the forecasts had been previously developed.

The Broad scope of the study will consist but not limited to the above in brief. The final Terms of Reference and the scope of the study would be issued along with the Request for Proposals.

#### **IMPLEMENTATION ARRANGEMENT**

The Project Implementation plan of the Consultancy is broadly divided into the following phases:

**Phase I:** Extensive literature review on the existence and use of seasonal hydrologic forecasting models, with a special emphasis on the models that had been used in tropical climates applicable to the Indian climate.

**Phase II:** Input Data Development. This includes estimates of historic natural flows for the four sub-basins delineated in each basin by using the strategic control points that were previously selected in close consultation with the client, as well as collection of all climate data from IMD, as well the global climate indices for the period concurrent with the available natural flows

**Phase III:** Model Development for high flow season, testing and selection. It is up to the

consultant to propose the methodologies of their choice, however one of the methods should include the ensemble weather forecasts from IMD as its principal input. Comparison of the suggested hydrologic model based on the IMD ensemble inputs and at least two more alternative approaches proposed by the consultant shall be conducted on three selected river basins.

**Phase IV:** Model Development for low flow season, testing and verification on the selected river basins. Model selection and calibration will be done using partial historic series, while verification should be done by using the remaining years of record that were not used in the calibration.

**Phase V:** Analyses of model results. Consultants should conduct in-depth analyses of model results and prepare graphical and tabular presentations that include all evaluation statistics for all river basins

**Phase VI:** Development of a user-friendly model interface / dashboard that will link the model to eSWIS database and the accompanying documentation (User Manual) outlining all technical details related to the seasonal forecasted model developed in this project. The proposed interface is aimed to facilitate easy use of the model.

**Phase VII:** Documentation, troubleshooting and training. Consultants will be expected to document all steps undertaken in this project in the above process using both short monthly progress reports and more comprehensive bi-annual reports due every six months.

**Phase- VIII-**The consultant should also provide Technical Support Services for a period of 36 months after model implementation and acceptance, to support operation and fine-tuning.

National Project Monitoring Unit, National Hydrology Project, Ministry of Water Resources, RD & GR now invites eligible consultants to indicate their interest in providing the above required consultancy. Interested consultants must provide information indicating that they are qualified to perform the services (brochures, description of similar assignments, experience in similar conditions, availability of appropriate skills among staff, etc.) as per Performa attached from **Annexure-I to VII.**

**Consultants may associate with other firms/ consultants to meet the necessary qualification criteria or enhance their capability. The EOI submitted by consultants in association should clearly indicate the nature of the association if it is a joint venture or a sub-consultancy. In case of Joint venture, the name of the lead firm should be clearly stated and the JV should not have more than three members including the lead.**

The short-listing criteria, are as follows:

- a) The Firm / research institute must have been in business for at least the last ten years (Copy of the Certificate of Incorporation or Memorandum of Articles).
- b) Organization set-up, structure and availability of key professionals (Team leader/Senior Water Resources Expert, Deputy Team Leader /Meteorologist, Senior and Intermediate Hydrologic/meteorological modeler, Groundwater Specialist/modeler, IT Programmer/ Database specialist etc.) of required qualification with the firm i.e. Technical team and expertise available with the organization (attach short CVs for reference only).
- c) The firm / research institute must have successful experience of executing at least one similar project/s in last ten calendar years including 2018 (Enclose list of relevant assignments executed with customer name & address, contact details, order value and performance certificates). in the basin(s) /sub-basin(s) for an area of at least 50,000 Sq. Km encompassing the key components of EHP studies namely input data development and its validation, model development for high flow and low flow season, testing and verification on the selected river basins, analyses of model results, ground

- water modeling, development of user friendly model interface/dashboard for linking the model to eSWIS (online) data bases. The Firm / research institute must have experience of working with governments/ state owned enterprises.
- d) The firm(s) / research institutes, including the JV partners and sub-consultants, should have at least 40% of the key professionals, including Team Leader as permanent employees.
  - e) The Firm should have sound financial performance and resources i.e. the firm should have average Annual turnover (last five financial years) of more than USD 3.8 million. In case of JV, the lead member shall have more than USD 2.3 million of average annual turnover and other members shall be USD 1.00 million.
  - f) In case of Research Institute meeting the eligibility requirements intending to apply solely or as JV for these studies, the average annual turnover clause at (f) above would not be applicable. However, in case of JV with any private entities, the annual average turnover clause (f) above will be applicable to JV only either as lead partner or otherwise.

**The attention of interested Consultants is drawn to paragraph 1.9 of the World Bank's Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits & Grants by World Bank Borrowers dated January 2011 ("Consultant Guidelines"), revised Jul 2014, setting forth the World Bank's policy on conflict of interest.**

**A consultant will be selected in accordance with the Least Cost Selection (LCS) method set out in the Consultant Guidelines. Interested Consultants may obtain further information from the Contact Person (mentioned below) between 10 AM and 5 PM on all working days.**

Senior Joint Commissioner-II,  
National Project Monitoring Unit  
National Hydrology Project,  
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The bidders are required to follow the following instructions as detailed below:

**1. Instruction to bidders**

- i). e-EoI will be available on the NHP's website at URL <http://nhp.mowr.gov.in>. The prospective bidders are required to register on e-procurement website i.e. <https://eprocure.gov.in/eprocure/app> at no cost and prior to the submission of proposals. The bidders are also required to have a Digital Signature (DSC) from one of the Government of India authorized Certifying Authorities in order to submit a proposal on line at the web address indicated above (<https://eprocure.gov.in/eprocure/app>), The list of the authorized Certifying Authorities can be found on <http://www.cca.gov.in/cca/>
- ii). The prospective bidders are required to submit the bid online at NIC e-procurement website i.e. <https://eprocure.gov.in/eprocure/app> from **11-01-2019 (11.00AM) to 04-02-2019 (10.30AM)**.
- iii). Intending Bidders are advised to visit again NIC e-procurement web site URL <https://eprocure.gov.in/eprocure/app>. and NHP website <http://nhp.mowr.gov.in> at least 1 days prior to closing date of submission of tender for any corrigendum / amendment.

**Expression of Interest Form for Consulting Engineering Firm or Joint Venture (To be filled up by each of the constituent in case of a Joint Venture)**

1.

Consultant	Date of Establishment	Country	Type of organization			
			<i>Individual</i>	<i>Partnership</i>	<i>Corporation</i>	<i>Other</i>
<i>Name</i>						

2. *Corporate/registered Office / Business Address / Telephone Nos. / Cable Address/ E-mail address of consultant and its branch offices for Consultant (including members in case of JV)*
3. *Consultant's firm name and year of establishment (including that of members in case of JV)*
4. *Narrative description of Consultant firms if any (Use other sheet, if necessary)*
5. *Name of, not more than two (2) principals who may be contacted with title, telephone number/ fax number, E-mail address.*

## Financial Statement of the three financial Years

<b>Sr. No.</b>	<b>Particulars</b>		<b>2017-2018</b>	<b>2016-2017</b>	<b>2015-2016</b>	<b>2014-2015</b>	<b>2013-2014</b>
1.	Annual turnover from Consulting business	Lead member					
		other member(1)					
		other member(2)					
2	Net Profit.	Lead member					
		other member(1)					
		other member(2)					

**Notes:**

- i. Values should be duly certified by statutory body like Chartered Accountant or Independent Auditors who are competent to do so as recognized by the Government of India.
- ii. The amount shall be stated in Indian Rupees (INR).
- iii. For the purpose of short listing, conversion to Indian Rupees shall be based average of the buying and selling rates of Reserve Bank of India as on the Proposal submission date.
- iv. In case the exchange rate for any currency is not available as per the provision of this section, then Ministry of Water Resources, RD & GR reserves the right to use the rate available from an alternative source at its sole discretion.



## Organizational Strength

## 1. Staff strength of the Organization/s

S No.	Area of Expertise*	Total No. of Staff	No. with Doctoral Degree	No. with Post-graduate Degree	No. with Graduate Degree	No. of Permanent Employees	No. of years with the firm
i.	Senior Water Resource Expert						
ii.	Meteorology Expert						
iii.	Senior Hydrologic / Meteorological Modeler						
iv.	Intermediate Hydrologic Modeler (Surface Water)						
v.	Groundwater Specialist / Modeler						
vi.	IT Programmer / Database Specialist						

## \* Area of Expertise

Project Position	Minimum Qualifications and Experience
Senior Water Resources Expert	<p>Master degree in Water Resources/ hydrology/Hydraulic Engineering or related field.</p> <p>At least 15 years working experience in water resources.</p> <p>Preferably knowledge about hydrological modeling tools used in long term hydrologic forecasting.</p> <p>Should have handled at least two projects as a Team Leader/Deputy Team leader in international project in water resources.</p> <p>Should have been with bidding firm for the past 2 years</p>
Meteorologist	<p>Master degree in Meteorology /Water Resources Engineering / or Atmospheric sciences</p> <p>At least 10 years working experience in meteorological forecast/meteorological product (field observation, Doppler radar, Satellite products / combined products)</p> <p>Extensive knowledge of hydrological and hydrodynamic modeling tools</p> <p>Minimum 10 years of experience in meteorology with emphasis on the R &amp; D</p>

	work in weather forecast and climate change modeling. Full knowledge and understanding of the global climate indices and their use in seasonal prediction of climate variables. Publications and previous research in this the climate forecast field are highly desirable, as is familiarity with statistical inferential models.
Senior Hydrologic / Meteorologic Modeler	Graduate degree in Hydrology, Meteorology, Water Resources engineering, and/or Applied Mathematics and Inferential Statistics. At least 10 years working experience in long term hydrologic modeling and early warning systems Extensive knowledge of hydrological and meteorological modeling tools with good experience of rainfall- run-off modeling Proven experience in inferential statistics
Intermediate Hydrologic Modeler (Surface Water)	Relevant academic degree in Hydrology, Meteorology, Applied Mathematics, Computer Science and/ or Water Resources engineering. At least 5 years of working experience in hydrologic modeling, preferably on seasonal forecast modeling and early warning systems Extensive knowledge of hydrological and hydrodynamic modeling tools with very good experience with statistical inferential models
Groundwater Specialist / Modeler	Master's Degree in hydrogeology geology or other relevant field Minimum 10 years of work experience
IT Programmer / Database Specialist	Graduate in Engineering in Computer Science/IT/Engineering/MCA Minimum 7 years of experience in the development and maintenance of software application in science and engineering, web design and management Extensive experience in scripting using Java or other similar related tools Experience in statistical inferential model development and application would be an asset
Technical / Administrative Support Staff	University graduates. Good communication skills, computer literacy, capable of providing logistical and administrative support to a mixed team of international and national consultants. The team should include at a minimum an office manager, a communications specialist, an administrator, secretary

**Office Logistics and Software Availability**

- a) Office space in sq. m. and ownership status
- b) List of Hydro-Metrological along with Modelling Software available

Name of Software	Whether Web Enabled?	Number of Concurrent Users	Cost of Purchase In Rs.	Year of Purchase	Utility and Functions of the Software

Details of Experience

Sr. No	Projects Name / Year	Type of services rendered including' (A, B, C, D, E)	Cost of the assignment of category 'A' Rs. in Cr.	Cost of the assignment of category 'B' Rs. in Cr.	Cost of the assignment of category 'C' Rs. in Cr.	Cost of the assignment of category 'D' Rs. in Cr.	Cost of the assignment of category 'E' Rs. in Cr	Client (With complete address, contact person, telephone No. Fax No and E mail address)	Fee in INR (Applicant's share in case of JV/ Consortium)	Completion certificate from client (Reference page no)	Duration in months	Funding Agency	Sole / JV/ Consortium (if JV-state Lead /Partner with share)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1													
2													

- A. Long term (more than 10 days) forecasting of hydrological events/stream flow
- B. Hydrological analysis and modelling, validation and filtering of hydro-meteorological data sets
- C. Meteorological forecasting, analysis, indices based forecasting and modeling including ensemble forecast
- D. Dashboards for hydro-meteorological applications
- E. Capacity building and trainings in the field of hydro-metrological analysis, forecasting etc.

**Note:** Only those assignments shall be considered for which consultant has provided services as lead member in case that work is done by a JV/ Consortium. Each assignment shall be supported by following details:

Name of Overall assignment : .....

Location of Overall assignment : .....

Owner's Name and Address : .....

Completion (Actual/Estimated vis-à-vis Stipulated): .....

Description of assignment: .....

Description of Services provided by the firm: .....

Authorized Signatory

Name of the client:

**Employer's References**

**Undertaking**

I certify that the information in the above Expression of Interest forms is true to the best of my knowledge. I also understand that any misleading or wrong information will disqualified this application straightaway.

*President/Managing Director*

or

*Authorized Signatory of Applicant*