

**EXPRESSION OF INTEREST**  
For

**Model Forecast Verification**

**Consulting Firm/Joint Venture:**

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.....

**Prime Consultant (in case of a JV):**

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.....

Employer:  
Government of Nepal  
Ministry of Population&Environment  
Department of Hydrology and Meteorology  
Naxal, Kathmandu

March 2017



**Government of Nepal**  
**Ministry of Population and Environment**  
**Department of Hydrology and Meteorology**

Naxal, Kathmandu

Notice No: 3/MFD/DHM/073-74

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**Expressions of Interest (EOI)**

1. The Government of Nepal, Department of Hydrology and Meteorology (DHM) invites EOI (Expressions of Interest) for the purpose of short listing the qualified, eligible and experienced Companies/firms and or their joint ventures for **Model Forecast Verification** works.
2. The budget to this purpose has been allocated by the Government of Nepal (GON) for the fiscal year 2073/074.
3. Experienced, eligible and interested Consulting Firms or companies are invited to submit their EOI, either alone or in joint venture with other firms with a certified copy of Consultancy/Company Registration Certificate, VAT and Tax Clearance (2072/73)/ Tax Return Submission receipt for the last fiscal year.
4. EOI documents could be obtained free of cost from DHM upon request during office hour on all government working days within the 15<sup>th</sup> day of the first date of publication of this notice or can also be downloaded from the website: <http://www.dhm.gov.np>. The instruction to the consultant, prescribed format, evaluation criteria, scope of the work and duration of the study and other details of the project are mentioned in the EOI. Only lead firm may obtained EOI form mentioning the names of all members of Association/JV and submitting Association/JV agreement.
5. Applications for EOI must be clearly marked **MODEL FORECAST VERIFICATION** and shall be submitted in sealed envelopes by companies or their joint venture received by the due date and within the specified time in the presence of the applicant or their authorized representatives. Absence of any applicant (or their authorized representative), however, shall not obstruct or prevent the opening of the EOI in any way, which must be delivered to the following address within the given time below.  
Last Date of EOI Submission:- 6/12/2073 & 12:00 noon  
Date of EOI opening :- 6/12/2073 & 01:30 pm
6. Certified evidences of the client reference indicating satisfactory completion of the projects along with the cost of consulting services in NRs and date of completion of the assignment only will be counted.
7. In case the day of submission of the EOI falls on a public holiday, it shall then be submitted on the following working day at same hour. Only the short-listed Consulting Firms shall be invited for RFP (Request for Proposal). During the RFP process, the consulting firm/companies will be selected in accordance with Quality and Cost Based Selection procedure (QCBS).
8. DHM reserves the right to shortlist any or reject all of the Firms without assigning any reasons whatsoever. Further information or clarification can be obtained from DHM during office hours.

Procurement Unit

Department of Hydrology and Meteorology

Naxal, Kathmandu

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Website: [www.dhm.gov.np](http://www.dhm.gov.np)

# MODEL FORECAST VERIFICATION

## 1. INFORMATION ON THE CONSULTING FIRM

Information shall be provided in the following format. No field shall be left vacant. In case of a joint venture, the same form shall be filled by each of the JV partners separately. The form shall be submitted in the time, date and venue as mentioned in the published notice.

### 1. General

Name of Firm	Address	Telephone	Email	Fax	JV Percent

Out of the above list, ..... will be the Prime Consultant.

### 2. Financial Capacity

Annual turnover over the last three years are as follows. The auditor's report/tax clearance certificates are attached.

Fiscal year	Turnover (Rs)

### 3. Overall Experience\*

Overall experiences of the firm in relevant work during last ten years are as follows (Work completion certificates are attached).

Name of Project	Project	Client	Contract amount (excluding VAT)	Year of completion	Description of work carried out

### 4. Specific Experience\*

Experiences of the firm in related field during last ten years are as follows. Work completion certificates are attached.

Name of Project	Project	Client	Contract amount (excluding VAT)	Year of completion	Description of work carried out

\* The firm/s shall produce certified evidences of the client reference indicating satisfactory completion of the mentioned projects along with the cost of consulting services in NRs and date of completion of the assignment are required for the consideration of that project for evaluation. Sublet works or assignment as a sub consultant shall not be considered for evaluation.

### 5. Human Resources

#### Human Resources in the company

Staff Member	Details	
	Permanent/part time	Name of personals

### 7. Other Resources

Other relevant resources available with us are as follows. The office layout, invoice/bill of equipment/vehicle/software/computer is attached.

Resource	Unit	Total Available	Engaged by Works on Hand
Office area	m2		
Telephone lines	line		
Photocopy, Printers	set		
High capacity Computer	set		
vehicles(Four wheel Drive)	no		

Authorized signature:

Seal:

Date:

## **ANNEX 1: INFORMATION TO THE CONSULTING FIRM**

### **General Information**

<b>Purpose of inviting the EOI:</b>	The main purpose shall short-list suitable consulting firms/companies for verification of weather model forecast products so that proposals could be invited from them only. However, the client may extend the short-list to include additional relevant consulting firms which are capable of giving the desired output.
<b>Format and Signing of Application:</b>	Applicant intending to file an application in response to this EOI should submit an “Application together with the duly completed EOI form providing all the information required therein after signing in by Authorized Representative of Consulting Firm or company (in case of Joint Venture, Authorized Representative of Lead Firm) with Company’s seal in every page of EOI forms.
<b>Minimum eligibility of the firm:</b>	Registered consulting firms/company registered at VAT office and tax clearance certificates.
<b>Deadline for submission of EOI:</b>	At or before 12 Noon (NST-Nepal Standard Time) within 6/12/2073
<b>Number of copies to be submitted:</b>	Two
<b>Joint Venture:</b>	A firm may apply to be short-listed alone or in joint venture with other firms. However once short-listed, JV partners are unchangeable.
<b>Duration of completion:</b>	Duration to complete the works will be 90 days from the signing of the contract agreement.
<b>Information from the Client:</b>	In due course of time, the shortlist shall be published on the Client’s notice board, at the website: <a href="http://www.dhm.gov.np">www.dhm.gov.np</a> . The client shall mail the short-list to each of the firms/JV submitting the EOI and initiate the process of RFP without waiting for the receipt from the firms that they have received the short-list.

**ANNEX 2: EVALUATION CRITERIA****(I) Eligibility Criteria (Pass / Fail)**

<i>S. No.</i>	<i>Eligibility Criteria</i>	<i>Requirement</i>	<i>Compliance</i>	<i>Remarks</i>
1.	Corporate Registration	Mandatory	Yes/ NO	Pass/Fail
2.	Tax Clearance (072-73)	Mandatory	Yes/ NO	Pass/Fail
3.	Vat Registration	Mandatory	Yes/ NO	Pass/Fail
4.	Minimum Years of Standing	The applicant or the Lead partner of J/V applicant must have minimum 5 years of standing.	Yes/ NO	Pass/Fail

**II) Ranking Criteria (Out of 100%)**

<b>Experience of Consultant (70 marks) <i>Work, completed during last 10 years</i></b>		<b>Office Set up and Logistics (10 marks)</b>	<b>Availability of Staff (10 marks)</b>	<b>Financial Turnover Last three years (10 marks)</b>
<p><b>Overall experience of Firm. (40 marks) 5 Projects</b></p> <p>Work experience of firm in</p> <ul style="list-style-type: none"> <li>• Application development related to hydrology, meteorology and climate.</li> <li>• Study related to Hydrology, Meteorology and Climate</li> <li>• etc</li> </ul> <p>(5x8=40 marks)</p>	<p><b>Work Experience in Specific Projects. (30 marks) 2 Projects</b></p> <p>Work Experience of firm in related field (Meteorological and Climate scientific studies or statistical analysis)</p> <p>(2x15=30 marks)</p>	<p><b>Office equipment, space, communication facilities, Vehicle and related Software (10 marks)</b></p> <p>1. Office equipment &amp; data visualization software -5 marks (equip-2, soft.-3 marks)</p> <p>2. Office Space -3 marks.</p> <p>3. Communication facilities -2 marks</p>	<p><b>Related Technical Human Resources (10 marks)</b></p> <p>1. Senior Meteorologist -1 number – 3 marks</p> <p>2. Meteorologist – 1 number – 3 marks</p> <p>3. Computer Programmer – 1 number – 3 marks</p> <p>4. Technical Assistant – 1 number – 1 mark</p>	<p><b>Financial Turnover of the consultant within last three years</b></p> <p>1. Less than one million - 4 marks</p> <p>2. Up to two million - 6 marks</p> <p>3. More than two million - 10 marks</p>

NOTE: The consultant should score more than 60 percent on the overall ranking criteria as mentioned above to qualify for short listing

## **Project Description:**

Weather systems in Nepal have so far been little researched by the atmospheric science community & weather observations is largely lacking and has severely handicapped computer models from making good forecasts in this region. All modern forecasting methods involve observation of current conditions, along with the combination of historical data, scientific methods and computer modelling (Gibilisco, 2006). Numerical weather prediction (NWP) is the forecasting of the weather based upon the solutions of mathematical equations by high speed computers. In this regard the WRF-EMS model is the state-of-the-art NWP model for atmospheric system. It is a complete, full-physics, state-of-the-science numerical weather prediction (NWP) package that incorporates dynamical cores from both the National Center for Atmospheric Research (NCAR) Advanced Research WRF (ARW) and the National Center for Environmental Predictions (NCEP) non-hydrostatic mesoscale model (NMM). This model, along with the necessary hardware was set up in Meteorological Forecasting Division (MFD) of Department of Hydrology and Meteorology in July 2015 with the support from Finnish Meteorological Institute (FMI) under FNEP2 project.

One of the greatest challenges of Numerical Weather Prediction is to improve quantitative precipitation forecasting (QPF) significantly (Yates et. al. 2006). The weather models have systematic errors or bias problems which are based on model physics, parameterization schemes, limited resolution of the model etc. These biases can be identified through different forecast verification methods so that it can be reduced using bias correction schemes. Thus the result is a forecast with less forecast error. This helps to save lives and reduce the loss of properties of general people.

The model is run in the nested mode with horizontal resolution of 12 and 4 km in outer and inner domain respectively. The model is run four times a day using GFS global model data at 00, 06, 12 and 18 UTC as the initial conditions. Both 12 km and 4 km simulations are run for the next three and half days (84 hours)

The verification of quantitative weather forecasts consists of the comparison of gridded model output with point observation. This proposed study intends to evaluate different aspects of model performance using a number of statistical scores. The details of the studies to be carried out are highlighted in its scope.

## **Objective**

The main objective of the work is to verify the model forecasts data against the corresponding observed data available in MFD/DHM and to identify the bias present in the model forecasts.

## **Scope of work**

The scope of the work include following tasks:

- Literature review on model forecasts verification methods practices and related papers.
- Organize a half day inception workshop at MFD/DHM
- Collect the input for the verification measures and feasible methodology for the study.
- Prepare data from the raw model forecast data provided by MFD for the available period.
- Verify the model forecasts for 24 hour daily accumulated rainfall and daily maximum and minimum temperature against the corresponding observed data.
- Verification should be done for binary forecasts (event detection for rainfall only) and continuous forecast for rainfall and maximum and minimum temperature.
- Organize a half day draft and final workshop at MFD/DHM
- Prepare a final report



**Detail work which should be carried out but not limiting to that outlined below:**

- Sufficient work should be carried out for Literature review to get the appropriate verification measures and methodology adopted.
- Basic or required data should be collected as required with the consultation with MFD/DHM.
- Binary forecast verification should be carried out for rainfall forecast only whereas continuous forecast verification should be carried out for 24 hour accumulated rainfall as well as daily maximum and minimum temperature for 5 synoptic stations: Dhankuta, Kathmandu, Pokhara, Surkhet and Dipayal.
- Binary forecast verification measures should include Hit Rate (HR), False Alarm Ratio (FAR), Threat Score (TS), Equitable Threat Score (ETS), Heidke Skill Score (HSS), Percent Correct (PC), Bias Score (BIAS), etc.
- Continuous forecast verification measures should include Mean Error (ME), Mean Absolute Error (MAE), Mean Square Error (MSE), Skill Score (SS) etc.
- Verification of the model forecast is to be done for only one initial condition for Day 1, Day 2 and Day 3 model forecasts.
- Three half day workshops should be organized at MFD/DHM during the study period. At first, an inception workshop should be organized within two weeks after the assignment. The input/suggestion as received from the workshop should be incorporated in the inception report. Similarly, another workshop should be organized after the completion of the draft report. The input or comments or suggestion from this workshop should be incorporated in the draft report. Then final workshop should be organized before the submission of the final report.
- To check the quality of the observed data provided.

**Knowledge or technology transfer**

The draft and final report should be presented in MFD/DHM for review and approval. All the algorithms/scripts used for calculation should be provided to MFD/DHM.

**Manpower**

The following technical experts and assistants are envisaged for the completion of the study.

**Input of professionals:**

S.N.	Professionals	Number	Tentative Days required
1	Senior Meteorologist	1	45
2	Meteorologist	1	55
3	Computer Programmer	1	10
4	Technical Assistant	1	50

**Timeline**

The duration of the study is 3 months effective from date of consultancy agreement.

**Schedule of Implementation**

The time schedule for the completion of the report is as follows:

<b>S.N.</b>	<b>Description</b>	<b>No. of Reports to be Submitted</b>	<b>Due date for submission after effective date of contract agreement</b>
1.	Inception report	2 Copies	15 days after the date of agreement
2.	Draft report	2 Copies	2 months after the date of agreement
3	Final report submission	3 Copies	Within 3 months after the date of agreement.

The draft report and final report should be presented to Meteorologists and others.

### **Schedule of Payment**

Schedule of Payment for this work will be as follows:

<b>S.N.</b>	<b>Description</b>	<b>% of Contract Amount</b>
1.	Submission and approval of Inception Report	20 %
2.	Submission and approval of Draft Report	30%
3.	Submission and approval of Final Report	50%

### **Output of the Study**

DHM expects the following outputs from the consultant.

Inception report: Two copies

Draft report: Two copies

Final report: Three copies

Digital copies of all the reports listed above as well as algorithms/scripts used for calculations.

### **Deliverables**

1. Two copies of inception report shall be prepared and submitted to MFD no later than 14 days after the signing of the contract agreement. This report shall contain the finalized work program and a general approach and methodology that the consultant proposes to conduct the work. MFD will review the inception reports submitted by the consultant and will send its comments, if any, to the consultant. A presentation also be given by the consultant at MFD at the time about the tools the consultant plans to use and the methodologies the consultant would be following.
2. Two copies of draft report shall be prepared and submitted to MFD no later than 60 days after signing the contract agreement. The draft report of study shall include details as formulated in the scope of the work.
3. Three copies of final report shall be prepared and submitted to MFD within 90 days of the signing of the contract by the consultant. A presentation shall be given by the consultant at the time of submission of final report at MFD to the technical staffs of MFD along with any other professionals MFD deems

necessary to invite. The presentation shall include the methodology implemented by the consultant and the tools that the consultant used to complete the work. It should also contain a slide show of images depicting the various stages of study. The consultant should prepare and submit the final report by incorporating all the comments and suggestions, if any, from MFD/DHM.

**Data, Local Services, and Facilities to be provided by the client:**

All the necessary meteorological data and model forecast data for the study will be provided by the MFD/DHM