

**'Expression of Interest'**  
**For**  
**Undertaking Study for Mapping Forest Areas Vulnerable to Climate Change in India**  
**Based on High Resolution Computer Model Based Projections**

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**Forest Survey of India**  
**Ministry of Environment, Forest & Climate Change**  
**Government of India**  
**Kaulagarh Road, P.O. - IPE**  
**Dehradun – 248 195**

**February: 2020**

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## 1. LETTER OF EOI INVITATION

**Forest Survey of India**  
**Ministry of Environment, Forest & Climate Change**  
**Government of India**  
**Kaulagarh Road, P.O. - IPE**  
**Dehradun – 248 195**

No. 27-357/2019-FI/

**Dated: 3<sup>rd</sup> February, 2020**

### **INVITATION OF EXPRESSION OF INTEREST (EOI):**

Forest Survey of India (FSI) under Ministry of Environment, Forest & Climate Change, Government of India; invites online electronic Expression of Interest (EOI) (e-EOI) under two-bid systems (Technical bid and Financial bid) from National Institutes, Central/State Institutes (established by Central / State Governments) such as Indian Universities, Indian Educational and Technical Institutions of National repute/importance, Research Laboratories (supported by National agencies such as ICAR, CSIR, MHRD etc.), Private Universities or any authorized person working in the above-mentioned categories of organizations; for performing following study:

**‘Undertaking Study for Mapping Forest Areas Vulnerable to Climate Change in India Based on High Resolution Computer Model Based Projections’.**

EOI document can be viewed and downloaded from FSI website [www.fsi.nic.in](http://www.fsi.nic.in) and <https://moefcc.euniwizard.com>

The bid for desired study is to be submitted **online only** on <https://moefcc.euniwizarde.com> up to the last date and time of submission of bids. Sale of hard copy of tender document is not applicable.

The offers, in the prescribed format, shall be submitted online at <https://moefcc.euniwizarde.com> as per the tender document. No quotations will be accepted in hard copy, fax, e-mail or any other such means. The intending bidders must be registered with e-tender website <https://moefcc.euniwizarde.com>. The tender document is also available on Ministry of Environment, Forest and Climate Change website: <http://envfor.nic.in/> for reference only but not for submission. Further details, if any, may be obtained from the technical team of Forest Survey of India, by email to [dgfsi@fsi.nic.in](mailto:dgfsi@fsi.nic.in)

Last date for submission of EOI is 15<sup>th</sup> February, 2020 up to 17:00 hrs.

Applicants meeting the qualification criteria may be invited for presentation or proposal before the selection committee of FSI. Financial bid will be opened only for the technically shortlisted candidates.

#### **Important Dates**

Sl. No.	Critical Events	Date	Time
1.	Publishing Date	3 <sup>rd</sup> February	
2.	Document Download Start Date	3 <sup>rd</sup> February	17:00 hrs
3.	Document Download End Date	15 <sup>th</sup> Feb 2020	17:00 hrs
4.	Document Submission Start Date	3 <sup>rd</sup> February	17:00 hrs
5.	Document Submission End Date	15 <sup>th</sup> Feb 2020	17:00 hrs
6.	Technical Bid Opening Date	17 <sup>th</sup> Feb 2020	11:00 hrs
7.	Price Bid Opening Date	Will be intimated later	-

**Brief Details of EOI:**

Sl. No.	Item	Description
(i)	Name of Study	<b>'Undertaking Study for Mapping Forest Areas Vulnerable to Climate Change in India Based on High Resolution Computer Model Based Projections'</b>
(ii)	Mode of EOI	e-EOI under two-bid system (Technical bid and Financial bid)
(iii)	EOI ID and Date	No. 27-357/2019-FI/ Dated: 3 <sup>rd</sup> February, 2020
(iv)	Cost of bidding document	The interested bidders will have to deposit the amount of 1000/- (non-refundable) towards tender fee through bharat kosh ( <a href="https://bharatkosh.gov.in">https://bharatkosh.gov.in</a> )
(vi)	EMD (Bid Security)	The original copy of the DD/ Bank Guarantee of Earnest Money Deposit (EMD) of ₹5,000/- (Rupees Five Thousand Only) in the form of Bank Guarantee or Demand Draft <b>With Minimum three months Validity</b> . The Demand Draft (DD) should be made in favour of Assistant Director (Accounts), Forest Survey of India, Kaulagarh Road ,PO - IPE, Dehradun – 248 195. <b>All Micro and Small Enterprises (MSEs) are exempted from EMD and tender fee. (Separate Certificate / Declaration from competent authority is necessary for MSEs to prove their status)</b> <b>The EMD will be returned to the non-qualified bidder(s) and for qualified bidder under contract the EMD will be returned after submission of the final project reports and relevant deliverables.</b>
(vi)	Completion Period / Schedule	i) Estimated Time of Project Completion: <b>(04) Four Months</b> ii) Allowable extension buffer time under special circumstances with approval of DG, FSI: <b>One Month</b>
(vii)	Required validity of Bid	Four months from the date of award of contract.
(viii)	Tender Inviting Authority	Director General, Forest Survey of India, Kaulagarh Road, P.O. - IPE, Dehradun, Uttarakhand – 248195
(ix)	EOI Processing Fee	Rs. 3360/- + GST (Non Refundable)
(x)	Registration Charges	Rs.2360/-(Non Refundable)
(xi)	Cost of bidding document	The interested bidders will have to deposit the amount of 1000/- (non-refundable) towards tender fee through bharat kosh ( <a href="https://bharatkosh.gov.in">https://bharatkosh.gov.in</a> )

**Note:** FSI reserves the rights to amend / cancel this EOI at any point time, without assigning any reason thereof.

Enclosed: EOI Document

Yours faithfully,

**DDG (FI), Forest Survey of India.  
For & on behalf of President of India**

## **2. BACKGROUND:**

The risk of large-scale climate change is one of the central issues facing the world. There is widespread consensus among the scientific community that the Earth is warming, that this warming is caused by human emissions of greenhouse gases (GHGs), and that the consequences of continued warming are likely to be severe. The Earth's average temperature has been increasing since the Industrial Revolution. Between 1880 and 2015, average global surface temperatures rose by 0.9°C (1.5°F). In 2016, the Earth experienced its third consecutive hottest year since recordkeeping began. There is broad consensus in the scientific community that this warming has been largely driven by increases in atmospheric GHGs, particularly carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O).

To combat this adverse effect of Global Climate Change, countries across the globe have committed to create a new international climate agreement by the conclusion of the U.N. Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP21) in Paris in December 2015. In preparation, countries have agreed to publicly outline what post-2020 climate actions they intend to take under a new international agreement, known as their Nationally Determined Contributions (NDCs). India too has submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC in October 2015 which, outlines the post-2020 climate actions the country intends to take under a new international agreement.

'Forest Survey of India', so far have studied various extensive work related to 'Forest Geo-Informatics', 'Tree and Forest Inventory', 'Forest Fire Monitoring', 'E-Green Watch' etc. Presently, there is a need to undergo detailed study of periodic climate change and its effect on forest cover.

Since, 'Forest Survey of India' carries out the biennial 'Forest Cover' change mapping for the entire country; therefore, its focus will also be concentrated on the country wide findings. Moreover, India being a vast country and having 23.34 % of recorded forest area; therefore, nurturing forest should be the major activity to fight against climate hazard. India is having vast land use and land covers like agriculture, forest, urban, desert, glaciers, hills and mountains, river plains, sea coasts etc. and each of them is having their unique climatic alteration pattern over the years. Therefore, country wide study will be the case of choice in these consequences.

## **3. AIMS & OBJECTIVES :**

The Objectives of this project are:

- i) To monitor and analyse the mean climate factors like temperature and precipitation for different forest ecosystems in India for the period of 1951 to 2019.
- ii) To develop high resolution (10 km X 10 km) climate projection model based on temperature and precipitation in forest area /forest cover using suitable model.
- iii) To identify the most vulnerable hot spots in terms of adverse climate change within the forest cover in India.
- iv) To generate climate change maps for different forest ecosystems in India.

#### **4. EOI PROCESSING FEES :**

A non-refundable EOI processing fee of Rs, 3360/- + GST (Non Refundable), registration charges of Rs.2360/- (Non Refundable) and Rs. 1000/ - (Non Refundable) as cost of bidding document to be submitted online. Bid(s) received without the above processing fees shall liable to be rejected.

#### **5. WEBSITE AND DEADLINE FOR SUBMISSION OF PROPOSAL:**

The duly filled in EOI format needs to be submitted online through <https://moefcc.euniwizarde.com>, by **15<sup>th</sup> February 2020; 17:00 hrs (Last Date of Submission).**

**The Technical Bid of EOI will be opened on 17<sup>th</sup> February, 2020, 11:00 hrs at FSI Dehradun.**

**The date of Price Bid opening of EOI will be intimated later.**

#### **6. VALIDITY OF OFFER :**

The offer of this EOI shall be valid for a period of four months initially, which may be extended further as per the decision of DG, FSI.

#### **7. TERMS OF REFERENCE:**

The detailed terms of reference are enclosed at **Annexure – I.**

#### **8. INSTRUCTION TO PREPARE EOI :**

The expression of Interest is to be submitted in the manner prescribed below:

All the information details as mentioned below needs to be submitted online through:  
<https://moefcc.euniwizarde.com>

Both Technical and Price Bid to be submitted online only.

- a) Applicant's Expression of Interest as per Format-1.
- b) Organizational Contact Details as per Format-2.
- c) Experience of the organization as per Format-3.
- d) List of three (03) experts/ consultants on payroll as per Format-4.
- e) Financial strength of the organization as per Format-5.
- f) Additional information as per Format-6.
- g) Declaration of '**Power of Attorney in favour of Authorized Signatory with long and short signatures of Authorized person**' as per Format-7.
- h) Format of submitting 'Price Bid': Format – 8.
- i) ECS for, of bidder– Format - 9

The EMD of amount Rs. 5,000/- (Five thousand only) should be made in favour of Assistant Director (Accounts), Forest Survey of India, Kaulagarh Road ,PO - IPE, Dehradun – 248 195. This should reach physically by post within 12 February 2020 by 17: 00 hours, to the following address:**Director General, Forest Survey of India, Ministry of Environment, Forest & Climate Change, Government of India, Kaulagarh Road, P.O. – IPE, Dehradun-248195,**

#### **9. EVALUATION OF ELIGIBILITY CRITERIA:**

##### **a. Minimum Qualifying Criteria**

- i) Bidders should be an expert from National Institute or Central / State Institute (established by Central / State Governments) such as Indian Universities, Educational and Technical Institutions of National repute/importance, Research Laboratories (supported by National agencies such as ICAR, CSIR, MHRD etc.), Private Universities or authorized person working under the above-mentioned organizations and having established expertise in Climate Change Studies.
- ii) The Organization must have a research or engineering division working on climatic data model.

- iii) The authorized person of contact for project co-ordination should be an expert PhD scholar in climatic data modelling.

**9.b Desired Qualification of the Bidder on the basis of Experience and Educational Qualification of the Team Members to perform the project (Marking will be given by expert panel)**

Sl. No.	Description	Parameters	Marks	Compliance Score Sheet (Y/N/Partial)
1.	Having developed model for analysis of climatic data with statistical projection	> 3years experience of climatic data modelling	10	
		>1<=3years experience of climatic data modelling	5	
2.	Having developed model for analysis of climatic data with spatial projection or mapping	> 3years experience of climatic data modelling	10	
		>1<=3years experience of climatic data modelling	5	
3.	Having past exposure of successful completion of project related to climatic data model analysis	2 or more	10	
		1 (one only)	5	
4.	Any exposure in the field of applied forestry and climate change related project completion	2 or more	10	
		1 (one only)	5	
5.	Any exposure in the field of applied Remote Sensing and GIS related project completion	4 or more	10	
		Less than 4 up to 2	5	
6.	Number of Publications in International Journals	More than 20	15	
		Upto 20	10	
		Upto 10	5	
7.	The organization should have suitable laboratory/ computer infrastructure, Model based Software facilities to carry out the said study.	Yes	10	
		No	5	
8.	Presentation of 15-20 min each by the selected individual/ organization (Presentation in person/ Skype/ Video conferencing)		25	
<b>Total of Maximum Marks</b>			<b>100</b>	

#### **10. CONDITIONS FOR QUALIFYING IN EOI:**

- i) If any one of the point remains missing from 'Minimum Qualifying Criteria' (vide section 9.a) will liable to be disqualified. For those bidders the desired qualification will not be assessed.
- ii) For desired qualification (vide section 9.b), the bidder has to score a minimum qualifying marks of **60 out of total marks of 100**, to get its EOI for further necessary processing.
- iii) Organizations who qualify as per the eligibility conditions will be provided a brief about the Project (Monitor and Project the Effect of Climate Change on Forest Cover in India). The organizations must be required to make a presentation in front of the selection committee after show-casing their proposals, on a prior informed date after technical bid opening.
- iv) FSI will take up references and reserves the right to pay due heed to the Bidder's performance elsewhere and any past experience from FSI.
- v) Price Bid will be opened for the technically short listed agencies only after technical bid opening.
- vi) Bids will finally be ranked and awarded according to their combined technical (St) and financial (Sf) scores using the formula  $S = St \times T\% + Sf \times F\%$ . The weight (T%) given to the Technical Proposal is 70%. The weight (F%) given to the Financial Proposal is 30%.

#### **11. RESPONSE:**

- i) Bidders must ensure that their Bid response is submitted as per the formats attached with this document (**Formats 1 to 9**). Special comments on the objectives and scope of the service projected in the enquiry may also be submitted along with the offer.
- ii) The EMD of amount Rs. 5,000/- (Five thousand only) should be made in favour of Assistant Director (Accounts), Forest Survey of India, Kaulagarh Road ,PO - IPE, Dehradun – 248 195. This should reach physically by post within 14<sup>th</sup> February 2020 by 17: 00 hours, to the following address:

**Director General, Forest Survey of India, Ministry of Environment, Forest & Climate Change, Government of India, Kaulagarh Road, P.O. – IPE, Dehradun-248195,**

#### **12. CONFLICT OF INTEREST :**

- i) Where there is any indication that a conflict of interest exists or may arise, it shall be the responsibility of the Bidder to inform FSI, detailing the conflict in writing as an attachment to this Bid.
- ii) FSI will be the final arbiter in cases of potential conflicts of interest. Failure to notify FSI of any potential conflict of interest will invalidate any verbal or written agreement.
- iii) Conflict of Interest is where a person who is involved in the procurement has or may be perceived to have a personal interest in ensuring that a particular Bidder is successful. Actual and potential conflicts of interest must be declared by a person involved in a Bid process.

#### **13. CONDITION UNDER WHICH EOI IS ISSUED:**

The EOI is not an offer and is issued with no commitment. FSI reserves the right to withdraw or amend the clauses of EOI and or vary any part thereof at any stage without assigning any reason. FSI further reserves the right to disqualify any bidder, should it be so necessary at any stage.

#### **14. LAST DATE OF SUBMISSION OF EOI :**

The EOI (both Technical and Price Bid) should be submitted online through <https://moefcc.euniwizarde.com> by **15<sup>th</sup> February 2020**.

**The Technical bid of EOI will be opened on 17<sup>th</sup> February, 2020 at 1100 hrs. The date of Price Bid of shortlisted bidders will be intimated later.**



## **15. PAYMENT TO BIDDER:**

The 50 % payment will be made to the selected bidder after interim report submission and remaining 50 % payment will be made after final report submission, along with the relevant deliverables. Both payments will be done by ECS form only as mentioned in Format 9.

## **16. INSTRUCTION TO BIDDERS FOR E-EOI**

The Special Instructions (for e-Tendering) supplement "General Instructions to Bidders", as given in the Tender Document. Submission of online Bids is mandatory for this Tender.

For conducting electronic tendering, MOEFCC is using the portal <https://moefcc.euniwizarde.com> of M/s ITI Ltd, a Government of India Undertaking.

### **1.0 Tender Bidding Methodology:**

The offer should be submitted through e-tendering mode in the website <https://moefcc.euniwizarde.com> as a single bid document containing two e-bids viz. Technical and Financial Bid. The Bid will be uploaded along with all signed and scanned documents those are required for particular EOI.

### **2.0 Broad outline of activities from Bidders prospective:**

- (i) Procure a Digital Signing Certificate (DSC).
- (ii) Register on e-wizard portal.
- (iii) View Notice Inviting Tender (NIT) on e-wizard portal.
- (iv) Download official copy of Tender Documents from e-wizard portal.
- (v) Bid-Submission on e-wizard portal.
- (vi) Attend Public Online Tender Opening Event (TOE) on e-wizard portal
- (vii) Consideration of Financial-part (Only for Technical Responsive bidders).

For participating in this tender online, the following instructions need to be read carefully. These instructions are supplemented with more detailed guidelines on the relevant screens of the e-wizard portal.

### **3.0 Digital Certificates:**

It is mandatory for all the bidders to have class-III Digital Signature Certificate – Signing + Encryption (in the name of person who will sign the Bid) from any of the licensed Certifying Agency (Bidders can see the list of licensed CA's from the link [www.cca.gov.in](http://www.cca.gov.in)) to participate in e-tendering.

### **4.0 Registration:**

To participate in the e-tendering submission, it is mandatory for applicants to get registered their firm/company in e-tendering portal of ITI. <https://moefcc.euniwizarde.com> to have user ID & password from M/s ITI Ltd., the Annual registration charges for vendors/bidders are Rs.2000/+18%GST-per annum. The procedure for the registration is as under:

Go to the website <https://moefcc.euniwizarde.com> In the home page, click on "Registration"

2) In the Vendor Registration form, vendor has to fill up the all mandatory applicant details. After submission of registration form, you will get the verification link on your registered mail id, after verification you log in your account with your user id and password and complete the all activity related to registration etc. Document uploading, paid registration fee, after completion of registration payment, you need to send your acknowledgement copy on our help desk mail id [ewizardhelpdesk@gmail.com](mailto:ewizardhelpdesk@gmail.com) for activation of your account.

## **Procedure for online EOI submission through portal**

### **SEARCHING FOR TENDER DOCUMENTS:**

There are various search options built in the e-tender Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, Item/work id, Title, Date, etc. Once the bidders had selected the tenders in which they are interested, bidder can pay the processing fee Rs.3000/- excluding GST@18%(NOT REFUNDABLE) by net-banking / Debit / Credit card then you may download the required documents / tender schedules, Bid documents etc. Once you pay both fees, tenders will be moved to the respective "Register" Tab. This would enable the e-tender Portal to intimate the bidders through e-mail in case there is any corrigendum issued to the tender document.

**Please feel free to contact ITI Helpdesk (as given below) for any query related to e-tendering.**

1. Helpdesk landline No: 011-49606060
2. Mr. Amrendra Kumar (90155315108), Mr. Varun Tomer (9205898229)

## 17. FORMATS FOR SUBMISSION

### **FORMAT – 1: - APPLICANT’S EXPRESSION OF INTEREST (To be Submitted Online)**

To,  
Director General,  
Forest Survey of India  
Ministry of Environment, Forest & Climate Change  
Government of India  
Kaulagarh Road, P.O. - IPE  
Dehradun – 248 195

### **Sub: Submission of Expression of Interest for ‘Undertaking Study for Mapping Forest Areas Vulnerable to Climate Change in India Based on High Resolution Computer Model Based Projections’**

Dear Sir,

In response to the Invitation for Expressions of Interest (EOI) published on xx.xx.xxxx for the above purpose, we would like to express interest to carry out the above proposed task. As instructed, we attach 2 sets of the following documents in separately sealed envelopes and one soft copy:

1. Organizational Details (Format-2)
2. Experience in related fields (Format-3)
3. List of experts / consultants on payroll at least 3 (Format-4)
4. Financial strength of the organization (Format-5)
5. Additional information (Format-6)
6. Declaration (Format-7)

Sincerely Yours,  
Signature of the applicant  
[Full name of applicant]  
Stamp.....  
Date:

Encl.: As above.

Note: This is to be furnished on the letter head of the organization.

**FORMAT – 2 (To be Submitted Online)**

Sl. No.	Organizational Contact Details	
1.	Name of Organization	
2.	Main areas of business	
3.	Type of Organization Firm/ Company/ partnership firm registered under the Indian Companies Act, 1956/ the partnership Act, 1932	
4.	Whether the firm has been blacklisted by any Central Govt. / State Govt./PSU/ Govt. Bodies / Autonomous? If yes, details thereof.	
5.	Address of registered office with telephone no. & fax	
6.	Address of offices in i) National Capital Region of Delhi ii) All other State/UT's	
7.	Contact Person with telephone no. & e-mail ID	

Enclose: -

1. Copy of Certificate of Incorporation.
2. Copy of Article of Association in respect of 3 above.
3. Undertaking in respect of 4 above.

Signature of the applicant  
Full name of the applicant  
Stamp & Date

**FORMAT – 3 (To be Submitted Online)**

<b>Experience in Related Fields</b>				
Overview of the past experience of the Organization in all aspects related to the Climatic Modelling and Projection				
<b>Sl. No.</b>	<b>Items</b>	<b>Number of Assignments during last 5 years</b>	<b>Order Value of each assignment in INR (Enclose copy of each order)</b>	<b>Mention the name of Client-Organization (Enclosed completion certificates)</b>
<b>1</b>	Experience of assignments of similar nature			
<b>1.1</b>	Experience in carrying out similar assignments in Government			
<b>1.2</b>	Experience in carrying out Similar assignments in Public sector.			
Decision of Evaluating Committee in ascertaining “similar nature” and “similar assignment” will be final.				
<p>Signature of the applicant Full name of applicant Stamp &amp; Date</p>				

**FORMAT – 4 (To be Submitted Online)**

<b>List of experts/consultants on payroll ( at least 3 )</b>				
<b>Sl. No.</b>	<b>Name</b>	<b>Designation</b>	<b>Qualification</b>	<b>Relevant Experience</b>
1.				
2.				
3.				
4.				
5.				
6.				

Signature of the applicant

Full name of applicant

Stamp & Date

**FORMAT – 5 (To be Submitted Online)**

<b>Financial Strength of the Organization (in last 3 Years)</b>					
<b>Sl. No.</b>	<b>Financial Year</b>	<b>Whether profitable Yes/NO</b>	<b>Annual net profit (in Crores INR)</b>	<b>Overall annual turnover (in Crores INR)</b>	<b>Annual turnover from only Consultancy services rendered in India (in Crores INR)</b>
<b>1.</b>	2016-17				
<b>2.</b>	2017-18				
<b>3.</b>	2018-19				
<b>Note: Please enclose auditor's certificate in support of your claim.</b>					

Signature of the applicant

Full name of applicant

Stamp & Date

**FORMAT – 6 (To be Submitted Online)**

<b>Additional Information</b>			
<b>1. List all enclosures related to the previous sections.</b>			
	Sl. No.	Description	No. of Pages
<b>2. Additional information to support the eligibility as per Section 9 (Not more than 2 pages).</b>			
<p>Signature of the applicant</p> <p>Full name of applicant</p> <p>Stamp &amp; Date</p>			



**FORMAT -7 (To be Submitted Online)**

**Declaration**

We hereby confirm that we are interested in competing for the Consultancy Services to undertake the task related to execution of the project namely: '**Undertaking Study for Mapping Forest Areas Vulnerable to Climate Change in India Based on High Resolution Computer Model Based Projections**', under the scheme of Ministry of Environment, Forest and Climate Change, Govt. of India.

All the information provided herewith is genuine and accurate.

Authorized Person's Signature.

Name and Designation:

Date of Signature:

**Note: The declaration is to be furnished on the letter head of the organization.**

**FORMAT – 8 (To be Submitted Online)**

**EOI Inviting Authority:** Director General, Forest Survey of India, Kaulagarh Road, P.O IPE,  
Dehradun – 248 195

**Description of the Project:**

Undertaking Study for Mapping Forest Areas Vulnerable to Climate Change in India Based on High Resolution Computer Model Based Projections

**EOI Specification No:** \_\_\_\_\_ **Dated:** \_\_\_\_/\_\_\_\_/2020

**Name of the Bidder Organization / Bidding Organization:**

\_\_\_\_\_

\_\_\_\_\_

**PRICE SCHEDULE**

**(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this EOI. Bidders are allowed to enter the Bidder Name and Values only)**

<b>Sl. No.</b>	<b>Project</b>	<b>Total Amount (in Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>
1	Undertaking Study for Mapping Forest Areas Vulnerable to Climate Change in India Based on High Resolution Computer Model Based Projections	
<b>Total in Figures (Rs.)</b>		
<b>Total in Words (Rs.)</b>		

Note:

1. All applicable taxes & duties including GST, other levies and charges etc. should be mentioned clearly.
2. It is hereby confirmed that, except as otherwise stipulated in the tender Specification and statutory variations permitted as per the contract, the above unit rates and other charges as mentioned in this schedule, will remain firm till the subject supplies are completed. Further, it is confirmed that no other charges would be payable by FSI, in connection with our execution of the resultant Purchase Order.
3. The "Contract Price" shall mean the total price mentioned in column 3.



## ANNEXURE I

### Undertaking Study for Mapping Forest Areas Vulnerable to Climate Change in India Based on High Resolution Computer Model Based Projections

#### TERM OF REFERENCE

##### 1. Background:

The risk of large-scale climate change is one of the central issues facing the world. There is widespread consensus among the scientific community that the Earth is warming, that this warming is caused by human emissions of greenhouse gases (GHGs), and that the consequences of continued warming are likely to be severe. The Earth's average temperature has been increasing since the Industrial Revolution. Between 1880 and 2015, average global surface temperatures rose by 0.9°C (1.5°F). In 2016, the Earth experienced its third consecutive hottest year since recordkeeping began. There is broad consensus in the scientific community that this warming has been largely driven by increases in atmospheric GHGs, particularly carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O).

To combat this adverse effect of Global Climate Change, countries across the globe have committed to create a new international climate agreement by the conclusion of the U.N. Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP21) in Paris in December 2015. In preparation, countries have agreed to publicly outline what post-2020 climate actions they intend to take under a new international agreement, known as their Intended Nationally Determined Contributions (INDCs). India too has submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC in October 2015 which outlines the post-2020 climate actions the country intends to take under a new international agreement.

One of the salient features, as outlined in India's NDC is to create an additional carbon sink of 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent through additional forest and tree cover by 2030. Therefore, to combat the ill of climate, there is need to decrease the carbon emission by removing excess atmospheric carbon through different ways of plantation and forest rejuvenation.

Recommendation of extensive plantation is easier rather to identify a suitable land for doing the same in the present scenario of exponential decrease of land: man ratio. A detailed study in this regard has already been performed by 'Forest Survey of India' with several plausible approaches to identify land and thereby estimating the carbon sequestration raise using various scenarios.

Rapid urbanization and respective industrialization is also the need of the hour, but the inadvertent way of doing the same create imbalances in forest ecosystem. Therefore, these generate adverse climatic condition of the place in the long run. On contrary the degraded climatic condition like prolonged adverse temperature and erratic rainfall make the forest vulnerable to wildfire, pest manifestations, wide spreading of invasive species, increased soil erosion for higher rainfall zone and drought for scanty rainfall zone. Therefore, climate is also a key factor in regeneration of forest ecosystem.

'Forest Survey of India', so far have studied various extensive work related to 'Forest Geo-Informatics', 'Tree and Forest Inventory', 'Forest Fire Monitoring', 'E-Green Watch' etc. Presently, there is a need to undergo detailed study of periodic climate change and its effect on forest cover.

Since, 'Forest Survey of India' carries out the biennial 'Forest Cover' change mapping for the entire country; therefore, its focus will also be concentrated on the country wide findings. Moreover, India being a vast country and having 23.34 % of recorded forest area; therefore, nurturing forest should be the major activity to fight against climate hazard. India is having vast land use and land covers like agriculture, forest, urban, desert, glaciers, hills and mountains, river plains, sea coasts etc. and each of them is having their unique climatic alteration pattern over the years. Therefore, country wide study will be the case of choice in these consequences.

## **2. Objectives:**

The Objectives of this project is:

- i) To monitor and analyse the mean climate factors like temperature and precipitation for different forest ecosystems in India for the period of 1951 to 2018.
- ii) To develop high resolution (10 km X 10 km) climate projection model based on temperature and precipitation in forest area /forest cover using suitable model.
- iii) To identify the most vulnerable hot spots in terms of adverse climate change within the forest cover in India.
- iv) To generate climate change maps for different forest ecosystems in India.

## **3. Methodology:**

### **i) Data Collection and Processing:**

The necessary climatic data (Precipitation and Temperature) will be collected. The earlier dated data of coarser resolution will be suitably up scaled to higher resolution data by proper interpolation technique. During interpolation the effect of topography and any sudden elevation change will also be taken care of.

### **ii) Development of High Resolution Climate Projection:**

The major limitations in future climate projection from GCMs is their spatial resolution mismatch, therefore in appropriate cases and to understand forest ecosystem down scaling will also be done. The climate projections will be done in three different scenarios with respect to future probable temperature (max. and min.) as well as precipitation.

### **iii) Analysis of Climate Changes:**

The climate (temperature and precipitation) change parameters are to spatially distributed and statistically analysed its variability with relevant tests of significance with respective hypothesis and most suitable test statistic.

### **iv) Climate Change Hotspots**

The climate change hotspots within India should be located spatially with the help of analytical data available from statistical climate based inferences.

### **v) Superimposing Forest Cover Maps :**

The periodic forest cover maps (i.e. notified forest area) will be overlapped with the spatially distributed layer of climate change hotspots to ensure building of strong future plan to contest against the ill effect of climate change.

#### 4. Time Schedule :

Sl. No.	Works to be done by 'Selected Bidder' or 'Consultant'	Schedule time	Cumulative Time
1.	Collection of Climatic Data	15 days	1 Month
2.	Statistical and Spatial Analysis and Projection from acquired Climatic Data using suitable model	1 Month	1.5 Month
3.	Sharing the spatially distributed layer to FSI	1.5 Month	2 Months
4.	<ul style="list-style-type: none"><li>Overlying and analyse the data mutually with FSI</li><li>Analysis of the climate change prone most vulnerable hotspots within notified forest area with FSI (the 'Principal Project Partner').</li></ul>	2 Months	2.5 Months
5.	Submission of Draft report by the consultant to FSI Correction recommended	2.5 Months	3 Months
6.	Preparation of compiled project report by both the Project Partners and submission to the concerned Ministry	3 Months	4 Months

**Note:**

**The time starts from the date of issue of project execution order to selected consultant i.e. the 'Selected Bidder'.**

#### 5. Deliverables from Consultants :

- i) The necessary climatic data (Precipitation, Temperature etc.) over last 50 years of India.
- ii) The Statistical Model used by the consultant to project or estimate the probable climate features up to next 20 years with detailed description and training to the FSI technical team.
- iii) The Geo-Spatial Model used by the consultant to identify the climatic projection in various parts of India in the next 20 years.
- iv) To identify the 'Climatically Vulnerable Hotspots' across India, which could well be projected for next 20 years.
- v) Relevant analytical data, findings, significant report to be handed over to FSI both in both editable softcopy and hardcopy format.
- vi) Proper handover and respective training to FSI technical team is required from the consultant at FSI premises, Dehradun.

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