

Government of Nepal  
Ministry of Forests and Environment  
**REDD Implementation Centre**

**Terms of Reference (ToR) for Consultancy Services for  
Study of Emission due to Forest Fire  
(Budget head: 2.5.3.18)**

## **1. Background**

Nepal is one of the leading REDD+ countries under the World Bank's Forest Carbon Partnership Facility (FCPF) whose Emission Reduction Program Documents (ER-PDs) have been included into the Carbon Fund portfolio of the FCPF. Nepal completed implementation of the first phase of the REDD+ readiness project in 2015. Nepal's request for an additional readiness grant was approved by the 21<sup>st</sup> Participants Committee meeting of the FCPF in 2015. Nepal and the World Bank signed the grant agreement for additional readiness funding of USD 5.2 million in January 2017. During this second phase, Nepal is now implementing different programs and activities relating to REDD+ Readiness. Among other readiness activities, improvement of the national forest inventory and monitoring system for a robust and functional MRV system is one of the focused areas of the ongoing 2<sup>nd</sup> phase of REDD+ readiness. It is expected that Nepal will enter into implementation phase of the REDD+ in 2020 after negotiation and signing of the Emission Reduction Payment Agreement (ERPA) between the government of Nepal and the World Bank.

Nepal's Readiness Preparation Proposal (R-PP) for REDD+ has identified nine main drivers of deforestation and forest degradation. Forest fire has been categorized as one of the major drivers. Most of other studies and reports/documents including Emission Reduction Program Idea Notes and ER-PD have discussed and supported forest fire as one of the major drivers of deforestation and forest degradation in Nepal. However, none of the previous studies have provided any empirical evidence to support their claims. Therefore, there is a lack of information about the actual part of forest fire to the overall GHG emissions of the country.

Nepal has already submitted its national Forest Reference Level (FRL) to the UNFCCC for its review and technical assessment in the context of results-based payments for REDD+ in 2017. In the submission, emission contribution due to fuel-wood collection as driver of forest degradation has been included but contribution due to other drivers such as unsustainable harvesting, forest fires and grazing have not been included because reliable data were not available for these drivers. Therefore, it is now very important to conduct an empirical study to find out the actual contribution of forest fires, as one of the drivers of forest degradation, to the overall GHG emissions to include in the revised version of the FRL in coming years.

Under the second phase of REDD+ readiness, REDD IC is supporting an empirical study on contribution of forest fires to the overall GHG emissions of the country, which is critical to

update the national FRL in coming years and claiming the REDD+ results-based payments for the emission reduction credits generated from implementation of various REDD+ interventions. This TOR is developed for the service providers who are interested in this assignment to conduct the study on estimation of emissions resulting from forest fires in Nepal.

## **2. Objectives**

The overall objective of this study is assessment of emission resulting from forest fire. The specific objectives of the study are as follows:

- To calculate the burnt area using satellite imageries,
- To quantify the amount of combustible material from field studies,
- To identify the combustion factor for different forest types and for different fire types,
- To estimate the total emission resulting from forest fire in Terai Arc Landscape area and in Nepal.

## **3. Expected output**

Following outputs will be obtained after completion of this study:

- Total burnt area identified using satellite images and different indices, and burned area mapped,
- Amount of available mass of fuel calculated from field level plot from at least three forest types,
- Combustion factor calculated for at least three forest types and forest types (surface and canopy fires),
- Total emission from forest fire calculated and used in carbon accounting system.

## **4. Scope of the work**

REDD IC is seeking a qualified firm/consortium of firms to conduct study of emissions due to forest fire. The service provider for this assignment will work in close co-ordination with REDD IC and the fieldwork will focus on Terai region of Nepal. Following tasks need to be undertaken for successful completion of the assignment:

### **Desk review and analysis**

- Review and critical analysis of several published and unpublished literatures about forest fire and its contribution to the emissions in Nepal and around the globe.
- Review and analyze key documents such as Nepals' FRL, Emission Reduction program document and National Forest Inventory reports relating to forest fire and emissions.
- Review and analysis of other national and international study reports and policy documents on various aspects of forest management, REDD+, drivers of deforestation and forest degradation.

## **Consultation, field observation**

- Consultations with relevant stakeholders including government authorities (DoFSC, FRTC, REDD IC, Provincial Forest Directorate, DFO, Protected Areas office), forest user groups, civil society organizations and local communities are required.
- The consultants should visit and observe some of the forestry sites damaged from fire and/or potential fire prone areas in Terai region of the country to get more clear understanding of the causes of forest fire.

## **Image analysis and field measurements**

- This assignment involves assessing the activity data i.e., total burn area during the reference period (2014 – 2018), and estimating the emission factor by using biomass available for combustion, the combustion factor and the emission factor. Total emission from forest fire is calculated using the equation provided by IPCC (2006):

$$L_{fire} = A * MB * Cf * Gef * 10^{-3}$$

Where,  $L_{fire}$  is the amount of greenhouse gas emissions from fire (t),  $A$  is the area burnt (ha),  $MB$  is the mass of fuel available for combustion (t/ha),  $Cf$  is the combustion factor, and  $Gef$  is the emission factor, (g/kg dry matter burnt).

- It may involve extracting satellite image composite in Google earth engine, calculating fire severity indices (e.g., normalized burn ratio (NBR), differences in NBR (dNBR) and Relativized dNBR (RdNBR)), comparing pre-fire and post-fire scenario, classifying severity level, mapping burned area and validating the map from field survey and/or administrative data. Throughout the 13 districts of Terai Arc Landscape, several field plots (representing at least three forest types including Sal forests, Terai mixed hardwood forests and Pinus forests; and two fire types – surface (ground) fire and canopy (crown) fire) will be established and the biomass available for combustion (including reduced biomass available for burning in areas that burned in multiple times/years), and proportion of fuel that is actually combusted (combustion factor) will be measured through field experiments. Emission factor for specific forest types can be used from IPCC (2006).
- The consultants should measure representative sample plots (a minimum of 180 plots of appropriate size) to calculate different variables for GHG emissions due to forest fire throughout Terai of Nepal.

## **National level workshop**

- The consultant should organize a national level workshop involving related stakeholders and experts to share the draft results and collect feedback for finalization of report. REDD IC will facilitate to identify the participants of the workshop (One day, approx. 30 persons, in Kathmandu).

## **5. Reporting and deliverables**

### **5.1 Inception report with detail action plan and timeframe**

Inception report with detail action plan, consultation plan and timeframe as well as methodology shall be submitted within two weeks of signing of the contract. This should be presented at the inception workshop. After incorporating all the feedbacks, suggestions and inputs from the participants of the workshop, the inception report must be finalized and submitted to the REDD IC within one week of the inception workshop. The selected firm and REDD IC will agree on the specific activities and accordingly detailed plan of action and deliverables. The work plan should be developed in close collaboration with REDD IC.

### **5.2 Intermediate reporting**

The firm shall submit monthly progress report within first week of following month from the start of the contract.

### **5.3 Draft report**

The consultant shall submit a draft report for comments and suggestions of the REDD IC. REDD IC will provide comments/suggestions within a week. The consultant will then improve the report based on the feedbacks. The draft report and the major findings will be shared during the national level workshop. The consultant should prepare the final report by incorporating comments and suggestions received from the national workshop.

### **5.4 Final report**

The firm shall submit two hard copies with a digital copy of final report after completion of the activities incorporating all the comments and suggestions from national level workshop. The firm should submit electronic copy of field data in excel sheet, photographs and other relevant documents to REDD IC.

## **6. Team composition and qualification of the firm and experts**

### **6.1 Qualification of the firms**

Firms legally registered within the concerned authorities with clear mission, vision and objectives and registered in national VAT system are eligible to apply. The firms should have relevant work experience in Forest fire and biomass study, REDD+, GHG assessment and /or related field in Nepal. The firm must have valid registration, Tax/VAT clearance, demonstrated annual transaction, audit report and renewal.

### **6.2 Team composition, responsibilities and qualification of the team members**

The assignment will be executed from a team of experts including a Team Leader cum Forestry Expert, a GIS/RS Expert, Statistician, field enumerators and assistant field enumerators. The firm needs to ensure that the proposed team composition possesses required qualification, skills

and experiences to deliver desired high-quality result. In addition to this, the firm can propose supporting staffs for field consultation and other activities as required.

#### **A. Team leader and forestry expert**

**Roles and responsibilities:** The team leader cum forestry expert will lead the team. The team leader will report to the chief of REDD IC and work in close coordination with the focal person designed at the REDD IC for this assignment. The team leader will:

- Study and analyze related published and unpublished literatures, policy documents, working documents, databases and develop a firm foundation for estimating historical emissions reference level from forest fires in Nepal.
- Estimate historical trend of deforestation and forest degradation caused by forest fires in Nepal.
- Estimate emissions from forest fires in TAL area and in Nepal.
- Develop a plan of actions with timeline of each of the actions in coordination with the REDD IC and other team members.
- Coordinate the team and make sure that all of the experts are preparing corresponding reports and harmonizing the efforts.
- Coordinate with REDD IC and other Government organizations at central, district and field level, and contact FUG and other stakeholders.
- Prepare inception report, intermediate reports, draft report, presentation for national workshop and final report with the help of other team members.

**Required qualification:** The team leader cum forestry expert must be Nepali national with following qualification and experiences:

- Hold at least master degree in forestry or relevant subject;
- At least 5 years professional experiences in forestry sector of Nepal including forest biomass, forest fire ecology and REDD+ process;
- Proficient in working with GIS and Google earth engine.
- Good understanding on drivers of deforestation and forest degradation, issues on climate change, carbon trading policies and related questions.
- A proven experience of leading a team is preferred.

#### **B. GIS/RS expert**

**Responsibilities:** The GIS/RS expert will report to the team leader. She/he will work under the guidance of the team leader in close collaboration and consultation with REDD IC. She/he will specifically be responsible to:

- Access, review and analyze forest fire related databases, maps and other documents describing occurrence, nature and extent of damage (deforestation and forest degradation) from forest fires,
- Identify key parameters to produce spatial data layers related to this assignment,
- Produce spatial maps showing forest fires prone areas and/or forests damaged by forest fires, and risk of deforestation and forest degradation because of forest fires,
- Prepare composite satellite images, perform image analyses and prepare necessary maps,
- Participate in consultation meetings with local people as necessary,
- Support team leader in preparing final report incorporating spatial maps.

**Required qualifications:** The GIS expert must be Nepali national possessing the following qualification and experiences:

- Hold at least bachelor degree in geo-information or Remote Sensing or GIS,
- Have at least five years professional working experience in spatial data (both images and classified maps) analysis and mapping including image classification, production of thematic maps;
- Experience in analyzing and interpreting remote sensing data, forest types maps and other related spatial information,
- Capable of designing and developing database and GIS, land use change and forestry analysis, GIS based forest information system, web-based GIS, integration of GPS data into GIS,
- Having good understanding of forest fire ecology in Nepal,
- Good understanding on key parameters of forest management and mapping requirements for forest fires.

### **C. Statistician**

**Responsibilities:** The statistician will help the team leader in his works and responsible for the data analysis of field inventory, sampling design and estimation of emissions due to forest fire.

**Required qualification:** The statistician must have minimum qualification and experience as below:

- Hold at least Bachelor's degree in statistics and/or biometry with specialization on forest biometry or related field,
- Have at least three years working professional experience in forestry sector including REDD+ process and Forest Inventory/ sampling, biomass/carbon estimation,
- Good understanding of drivers of forest degradation, climate change, REDD+, biomass, carbon estimation and GHG emissions and related issues.

### **D. Field enumerators (Three persons)**

**Responsibilities:** Field enumerators will help the team leader in his/her works and responsible for sample design, field consultation and data collection in the field.

**Required qualifications:** Field enumerators must have minimum qualification and experience as below:

- Have minimum BSc degree in forestry or natural resource management;
- Have at least two years of professional experience in field surveys, data collection, data compilation, data entry in the database, and data analysis.
- Understanding of all types of forest management regimes implemented in Nepal, REDD+ process and progress and carbon assessment.
- Training on forest inventory, carbon assessment will be preferred.

#### **E. Assistant Field Enumerators (Three persons)**

**Responsibilities:** Assistant field enumerators will help the team leader in his/her works and responsible for data collection in the field.

**Required qualifications:** Assistant field enumerators must have minimum qualification and experience as below:

- Have minimum Intermediate degree in forestry or natural resource management,
- Have at least two years of experience in field surveys, data collection, data compilation, data entry,
- Understanding on all types of forest management regimes implemented in Nepal, REDD+ process and progress and carbon assessment is desirable,
- Training on forest inventory, carbon assessment will be preferred.

#### **7. Inputs to the firm**

- REDD IC will provide access to background documents especially various study reports developed from the REDD IC during the readiness phase to carry out the assignment,
- REDD IC will support for necessary communication for consultation process at all levels,
- REDD IC will support the firm to coordinate and attend the national level and field level consultations process as and when necessary,
- Monitor or make arrangements for monitoring the consultant's work,
- REDD IC and the World Bank will provide regular input and suggestions to the consultant(s).

#### **8. Selection process and criteria**

Selection process of the firm/s will be based on Quality and Cost Based Selection (QCBS) method in accordance with The World Bank Procurement Regulations for IPF Borrowers, July 2016 Revised November 2017 and August 2018.

## **9. Work schedule**

The assignment is expected to start from 15<sup>th</sup> of March 2020 and should be completed by 15<sup>th</sup> June 2020.

## **10. Application Procedure**

Eligible firm/consortium of the firms should submit “Expression of Interest (EoI)” in a sealed envelope with the following documents:

- Letter of EoI,
- Profile of the firm showing the general and specific experience of the firm,
- Copy of registration and renewal certificates,
- Copy of the VAT registration,
- Copy of annual audit report for last three years and tax clearance certificate,
- CVs of potential experts,
- Letter from partnering firm/institution if joint venture is proposed.

The shortlisted firms will be requested to submit the full proposal along with following documents:

- Full technical proposal for the assignment in a sealed envelope. The proposal should include commitment letters from the proposed experts along with duly signed CVs;
- Detail financial proposal for the assignment in a separately sealed envelope.

### **Contact Information**

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