

# TERMS OF REFERENCE FOR CONSULTANCY SERVICES FOR REDD+ DEVELOPMENT OF REFERENCE EMISSIONS LEVELS AND MEASUREMENT, REPORTING AND VERIFICATION SYSTEM IN GHANA

## 1.0 Background and Context

Ghana's land area is 24 million ha. The natural landscape comprises four major ecological zones (Agyarko, 2007; Kortatsi & Jorgensen, 2001): tropical moist forest in the south and south west (the high forest zone; transitional zone in the middle belt between north and south; savannah woodlands in the north; and the Accra coastal plain. The greatest above-ground carbon stores are in the high Forest Zone ( HFZ).

The HFZ is zoned into forest reserves (both production and protection reserves, mostly gazetted in the 1920s and '30s) and off-reserve areas. Greater part of the HFZ is off-reserve, most of which is degraded in forestry terms (Fairhead and Leach, 1998), and is largely devoted agricultural production.

Despite the heavy historical dependence of the country on its forests, their exploitation is increasingly becoming unsustainable. The extent of deforestation and forest degradation is a matter of national concern, with major implications for national income and employment as well as environmental integrity and services, and for social welfare.

Ghana is currently experiencing an accelerated rate of deforestation which has to be reversed. The need for mitigation strategies to reverse the looming dangers associated with deforestation and forest degradation on such an unprecedented scale has therefore become more apparent. The Government of Ghana has therefore embarked on a national programme to protect and maintain its forests in an effort to reduce carbon emissions and at the same time attract resources to foster growth and development along a low carbon emission path.

Ghana is engaging in capacity building and preparation activities to develop emission reduction programs as a contribution to climate change mitigation, and to eventually receive payments through a financial mechanism for performance in the land use sector that simultaneously help reduce emissions of carbon and improve land management practices. The government has received grant support from the Forest Carbon Partnership Facility (FCPF) of the World Bank to support preparation activities.

In 2010, Ghana received approval from the Participants Committee of the FCPF to implement its REDD+ Readiness Preparation Proposal (R-PP) expected to span a period of three years, until 2013. The R-PP is a roadmap towards achieving REDD+ Readiness. It indicates what and how activities could be undertaken and what resources will be needed, with the objective to align development objectives of Ghana with the global need to combat climate change. The initiative will require the development of reference levels and

capacities for measurement, reporting and verification (MRV) of forest carbon stocks and changes.

Guidance and modalities for reference emissions level and MRV systems development are currently being developed in the context of the REDD+ negotiations under the UN climate change convention. Specifically, the Subsidiary Body for Scientific and Technological Advice (SBSTA) is currently developing guidance and modalities for following five areas:

- **Modalities for reference levels:**

Reference levels will play an important role in determining the environmental effectiveness of a REDD mechanism.

- **Modalities for forest monitoring systems:**

The development of forest monitoring systems will be essential for countries to measure their changes in carbon stocks or forest area during the implementation of REDD.

- **Guidance for information systems on safeguards:**

The guidance should be for how the safeguards are being addressed and respected throughout the implementation of REDD.

- **Modalities for MRV:**

To develop modalities for measuring, reporting and verifying emissions reductions resulting from REDD activities.

This creates a firm basis for embarking on activities to establish reference emission levels, emission factors, and the development a framework for measuring, reporting and verifying emissions reductions resulting from REDD activities. Also, a well-developed body of technical reference exists for country to structure and perform technical work on RL and MRV, notably guidelines and good practice guidance by the IPCC.

It is currently neither practical nor efficient to measure and report the stocks and changes for the whole terrestrial carbon reservoir with the level of detail and certainty to address all drivers and processes that have a carbon impact on the land. It is therefore expected that the REDD+ readiness activities in Ghana would be phased in a manner which builds incrementally on the level of detail by testing carbon measurement, accounting and MRV procedures, prior to the full implementation of REDD+.

## **2.0 Drivers of deforestation and Forest degradation**

The major driving forces are illegal logging, unsustainable farming, annual bushfires, surface mining and infrastructural development. Underlying these driving forces are forest policy challenges, population growth, weak institutional coordination, and lack of stakeholder

participation in forest management. Outside the Forest Reserves logging has been on the increase mainly due to lack of effective control. In recent times, logging activity has been intensified more in the semi-deciduous zones than in the evergreen forest due to greater densities of desirable timber species. These drier zones are now in critical conditions partly due to logging.

The area of land under agriculture increases every year due to the extensive system of farming being practiced in the country, which also involves cutting of vegetation. The traditional bush fallow system of cultivation involves slash and burn of forest and grassland. However, long fallows necessary for the forest to regenerate fully is only possible if population growth and pressure on the land are low. With increasing national population over the last two decades, demand pressure on land has been considerable. Demand for subsistence agricultural cultivation has been compounded by demand for cash crops like cocoa, oil-palm, and for urbanization and infrastructural development. The trend that the forest resources have been under persistent attacks by agriculture partially due to the absence of a national land use plan, contributed also to a decrease in forest area.

Open cast mining activities for gold and diamond, especially those by the small-scale operators and large-scale mining for bauxite, manganese and gold, also pose serious threat to forests in Ghana.

Forest fire has been the immediate cause of most forest degradation in the country over the last few years. According to data gathered over the years, every year about 30% of the forest areas are destroyed by fire. Bushfires occur annually in the dry season usually from November to May.

The work to be performed on RL and MRV in Ghana has to build directly on these drivers and the associated losses of forest and forest degradation.

### **3.0 Terms of Reference**

In close consultation with the national REDD+ Secretariat and key national and international stakeholders, the Consultant will carry out the following tasks:

1. Review the existing national land use and land cover classification scheme, the accuracy of existing land-use assessments, and of carbon stock and inventory data;
2. Develop reference levels for emissions associated with the key drivers of deforestation and forest degradation; the used methods and approaches follow established international protocols
3. Develop methods and approaches for establishing a national MRV; following good international practice and established techniques.

#### 4. Develop a detailed plan to establish sustained MRV capacities within Ghana

Ghana has a pool of skill set in the area of Forest inventory, GIS and Remote Sensing; hence the successful candidate will be expected to utilize these skills as far as practical in the execution of the activities, to maximize local capacity-building and also to minimize costs, particularly for labour intensive tasks in which they can be appropriately trained. A strong focus of the assignment is towards building the capacity of the REDD Secretariat as well as and other relevant stakeholders involved in REDD+ implementation in Ghana. Thus, preference will be given to proposals that include elements of using and further developing remote sensing and carbon modelling capability.

### 3.1 Objective

The main objective of the assignment is to support Ghana in the development of REDD+ reference levels and systems for measurement, reporting and verification (MRV) of REDD+ impact using suitable approaches based on careful analyses of forest inventory, remote sensing and other monitoring capacities and historical data, and thereby strengthen national capacities.

### 3.2 Scope of Work

#### **3.2.1 Review the existing national land use and land cover classification scheme, the accuracy of existing land-use assessments, and of carbon stock and inventory data;**

Ghana has adopted  $\geq 15\%$  canopy cover to define its forests. It may seem advantageous to define forest at this threshold, because doing so would ensure that most lands that contain tree cover will be classified as forest and will thus be eligible for REDD+ incentives either through reduced degradation, reduced deforestation, or enhancement of carbon stocks. However, additional analysis may reveal that it makes sense to base reference scenarios on the specific conditions pertinent to each zone. Thus, defining forests differently in different zones (e.g., high forest zone vs. transition zone) would have to be investigated, along with their associated impact on monitoring costs.

The on-going Forest Preservation Program (FPP), funded by JICA is in the process of producing wall-to-wall baseline map of Ghana for the years 1990 – 2000 – 2010, comprising seven (7) land cover classes in conformity with IPCC guidelines.

The Katoomba Group has also produced a national biomass map for the years 2008/2009 in collaboration with Nature Conservation Research Centre (NCRC), NASA, Oxford University, and Ghana's Forestry Commission. This map is based on data from a range of satellite imagery, including radar from ALOS-PALSAR, optical imagery from MODIS, and Lidar estimates of canopy height from GLAS. The satellite imagery was calibrated with ground-based field measurements, including data from past forest inventory programs.

In 2000, the World Bank funded the production of a land cover/land use map of Ghana at the scale of 1:250,000 using satellite imagery. This mapping exercise was based on visual interpretation of Landsat images acquired in 1999-2000. Classification scheme developed for the exercise is in Appendix 1.

Specifically the consultant shall:

1. Review the current national definition for forest and recommend appropriate definition(s) that capture(s) all relevant attributes present within all ecological zones in Ghana, and provide(s) the most optimum reference for implementing REDD+ policies and results-based compensation for such activities.
2. Review the existing national land use and land cover classification scheme, used for the national 2000 land use land cover mapping exercise, based on visual interpretation of Landsat TM, ETM+ images, and recommend a land use and land cover classification scheme, given national circumstances, and consistent with IPCC land use classification guidelines.

### **3.2.2 Develop methods and approaches for establishing reference levels**

The overall objective for establishing reference levels will be to develop reference scenarios based on historical emissions, and projections of emissions and removals of CO<sub>2</sub> into the future in the absence of REDD+ incentives, considering national circumstances. The reference scenarios will be developed in a way that lends consistency with the MRV system, so that emissions and removals that are monitored over time can be compared directly to the emissions and removals in the reference scenario.

This aspect shall focus on exploring various methods and approaches to establish reference levels specific to Ghana's national circumstance and to provide guidance for the establishment of a national reference level. In executing this activity the consultant shall pay attention to (i) land cover change; (ii) forest carbon density and deforestation; and (iii) forest degradation. Moreover, the assessment should include the six land-use categories as described by the Good Practice Guidance of the Intergovernmental Panel on Climate Change namely: forests converted to other lands (covering deforestation); other lands converted to forest (covering expansion of forest carbon stocks by afforestation or reforestation); and forests remaining as forest (covering forest degradation, sustainable management of forests, and conservation of forest carbon stocks)

Specifically the consultant shall:

3. Plan a national carbon stock inventory system by expanding permanent sample plots (PSP) to areas not covered by the existing system of sampling;

4. Examine the appropriateness of various methodologies and approaches such as compensated reductions; adjusted reference levels; stock flow approach; combined incentives among others to establish reference levels;
5. Determine and recommend approaches and methodologies most suitable to Ghana's national circumstance taking the full scope of REDD+ into consideration to establish its national RL;
6. Develop historical trend reference scenarios and models to reflect future development plans for Ghana;
7. Develop guidelines and/or criteria for the establishment of RLs in keeping with UNFCCC discussions to:
  - a. Contribute to the mitigation of climate change
  - b. Use historical emissions and removals for national baselines
  - c. Ensure overall environmental integrity
  - d. Adjusted as required by national circumstances to improve accuracy

The Forest Preservation Program (FPP), funded by JICA has produced a wall-to-wall baseline map of Ghana for the years 1990 – 2000 – 2010, comprising 7 land cover classes, in conformity with IPCC guidelines. In addition, LIDAR data over an area of more than 800 km<sup>2</sup> is available, together with substantial work on allometric functions. This data base may be useful for a first stratification. Additionally, the following data exist on forest inventory:

- 1986-92 Survey: Established 600 permanent sample plots (PSPs) in High Forest Reserves; these covered all trees and all species  $\geq 10\text{cm}$  DBH. Some subplots were also established which covered trees down to 2cm DBH. Local volume equations were also developed. These data meet the criteria for using the BEF approach but they are now more than 20 years old and the whereabouts of the detailed plot data is unknown. Thus this data set has limited use for the historic reference emissions/removals.
- 1995-97: The first National Inventory in High Forest Reserves conducted a timber cruise within High Forest Areas. 2,000-3,000 sample areas were visited and DBH of commercially valuable timber species only was measured. This survey forms the basis of most of the management prescriptions within the Forestry Commission.

It is expected that the above listed tasks shall also provide the following:

- Quantification of historic emissions/removals from deforestation, degradation, and enhancement of carbon stocks for the period 1990-2000-2010 at a national scale using the IPCC framework;
- Development of future trajectories of emissions/removals over different time periods and under different economic and development scenarios. This will take

into consideration such factors as GDP, population growth, agricultural expansion, forest industry growth, sectoral development plans, specific investment programs, and/or adjustment coefficients otherwise derived from such factors and data;

- Emission factors for deforestation, forest degradation, and enhancement of carbon stocks using available Tier 2 level of data for the estimation;
- Error budget and uncertainties of emission/removal factors;
- Additional indicators of changes in forest carbon stocks, particularly in relation to degradation from charcoal production and timber production. This should include estimates of the amount of charcoal produced and its relation to the quantity of live woody biomass harvested, quantity of timber produced per ha in different areas of Ghana's HFZ, trends in changes in crop production that could be explained by increase in area of land under cultivation; and
- Enhanced capacity of counterpart staff in place for consistent and continuous acquisition and analysis of key data for Tier 2, including international reporting using IPCC framework.

### **3.2.3 Develop methods and approaches for establishing a national MRV;**

The UNFCCC SBSTA negotiation text<sup>1</sup> refers to the need to establish monitoring systems that use an appropriate combination of remote sensing and ground-based forest carbon inventory approaches with a focus on estimating anthropogenic forest-related greenhouse gas emissions by sources, removals by sinks, forest carbon stocks and forest area changes. It is agreed that the IPCC Good Practice Guidelines on Land Use Land Use Change and Forestry (LULUCF) provide suitable and agreed methods and procedures to estimate and report on carbon stock changes for deforestation, forest degradation, forest conservation, reforestation, and afforestation. All MRV activities and estimates should follow the five IPCC reporting principles and should particularly be transparent, comparable, consistent, as accurate and complete as possible, and should reduce uncertainties, as far as national capabilities and capacities permit. It is further indicated that these monitoring systems and their results will be open to independent review.

According to the UNREDD program, the following is a set of key considerations for developing national MRV systems:

- i. Monitor What Matters
- ii. Warrant Multi-stakeholder process
- iii. Ensure Quality, Reporting and Verification compliance
- iv. Guarantee Availability and Accessibility of data and Methods
- v. Support Investment and Sharing of Benefits
- vi. Strengthen Institutional, Technical, Legal and Policy Development Capacities

These considerations clearly point at the need for country-specific and country-driven solutions for developing capacities and partnerships that certainly go beyond technical MRV considerations and include a participatory process and the exploration of co-benefits and synergies.

**a) Monitoring**

Monitoring deforestation and forest degradation is an important part of the MRV framework as well as the interim process of reporting on REDD+ Performance indicators. The use of satellite images on successive occasions (e.g. by hot spot detection) is an important element for assessing deforestation and forest degradation activities between reporting periods to identify and mitigate unwanted developments (e.g. illegal logging). The AMESD/MESA fire data, which is available free-of-charge, should be integrated into the monitoring approach. The monitoring time intervals should be dependent on the national and/or regional degradation and deforestation activities (dynamics).

**b) Reporting**

The main principles of transparency, consistency, comparability, completeness and accuracy will be the key to an effective reporting framework. The reporting framework will be IPCC compliant, and shall include classification of initial and final land use categories, identification and measurement of activity data, emissions factors, total change on carbon stock and total CO<sub>2</sub> emissions. Relevant explanations and notations should also be provided in reporting formats.

**c) Verification**

Quality assurance and quality control procedures will be required to be developed. Accuracy assessments will be used to provide a check for bias and of confidence in predictions through testing the system in a range of circumstances to check whether any inaccuracies in the results are biased toward over or underestimation in a national inventory.

MRV systems are a long-term proposition and should be allowed to evolve over time. There will therefore be a need for continuous improvement in the system. Using the verifications and accuracy assessments efforts can be made to progressively improve models over time.

Uncertainty assessment will also be required to assess the confidence that can be placed in the overall result of the model application at the reporting scale. Accuracy assessments are an important part of testing for any bias in inventory results. Validation and verification are also required and this is planned to be done by an independent 3rd Party expert.

Specifically the consultant shall:

1. Design a credible monitoring and verification system for land use, land use change and forestry to:
  - a. account for CO<sub>2</sub> emissions and removals due to changes in carbon stocks on a timely basis
  - b. use relevant methodology to build successive carbon stocks scenarios to calculate the net change of carbon stocks at a point in time by subtracting the previous scenario from the scenario related to the relevant point in time
  - c. Use GIS for archiving and analyzing data coming from land-uses and carbon stocks
2. Develop a detailed plan to establish sustained MRV capacities within Ghana, which includes the following:
  - a. Capacity gap assessment based on the state of the existing national forest monitoring technical capabilities and the requirements for the MRV system;
  - b. Develop a road map and foster its implementation through a sustained and efficient institutional framework including competence in measuring and monitoring at different levels, support of national policies and REDD+ actions, international reporting and verification, and linking MRV of actions and MRV of transactions.
3. Develop a plan for how to integrate sub-national REL and MRV systems, based on existing efforts/mechanisms, into a national system;
4. Determine required level of accuracy for MRV and of an appropriate system in relation to available remote sensing imagery and related costs;
5. Design an institutional set-up encompassing all relevant national stakeholders involved in MRV and REDD implementation and mechanisms to ensure transparent and open exchange and management of data;
6. Explore the possibility of integrating relevant socio-economic data linked to the mandatory safeguard information system, according to COP decisions.
7. Develop sustained communication mechanism on MRV, via the development of a communication plan and outreach materials
8. Develop the capacity of relevant national stakeholders involved in MRV and REDD implementation in the following areas:
  - a. Processing and interpretation of satellite datasets at national level for forest area change, and forest degradation monitoring using remote sensing and GIS

- b. Designing a national and sub-national stratification
- c. Designing protocols and implementing measurements in defined carbon pools
- d. Targeted sampling and surveys to establish national conversions/expansion factors
- e. Establish capacities and implement a systematic national forest carbon measurement and monitoring system, i.e. through permanent sample plots
- f. Development of a prototype MRV for a set of REDD demonstration activities, focusing on key drivers/processes and engagement with implementation actors such as land owners, and communities, for monitoring and reporting at demonstration sites.
- g. Development and implementation of an accuracy and uncertainty assessment for the MRV

#### 4.0 Workshops/Seminars and training materials

1. Training and capacity building sessions for staff of the REDD Secretariat as well as other relevant stakeholders involved in REDD+ implementation shall be an essential part of this project.
2. Report shall be prepared summarising each capacity building session, number of persons in attendance and stakeholder representations; training method and materials and major outcomes.
3. The consultant shall present the results through workshops or seminars.

#### 5.0 Project team competency and expertise Requirements

To ensure that adequate capacity is built in-country, the project will require a collaborative venture, involving international and local experts with the relevant expertise and training. A team leader of international repute would be required to coordinate and liaise between experts at various levels (international, local) to make sure the delivery of the final report is done on time.

The project team should consist of a **Team Leader**, and at least the following specialists:

1. Forestry Specialist
2. Carbon Modeling Specialist
3. Remote Sensing and GIS Specialist

### **1. Team Leader/ Forestry Specialist**

- Post graduate degree (MSc and/or PhD) in Forest Science, or Natural Resource Management,
- At least 10 years of working experience on forest resources management, forest inventory, monitoring and assessment, land use land cover change mapping land in the Tropics;
- Excellent knowledge on climate change, in general and on REDD, in particular, on methodologies, technical procedures and guidelines of UNFCCC and IPCC;
- Technical understanding of UNFCCC policies and guidelines and forest carbon markets.
- Proficiency in both spoken and written English;
- Strong inter-personal skills, in particular, demonstrated team leadership qualities, and excellent oral communication skills

### **2. Carbon Modelling Specialist**

- Post graduate degree (MSc and/or PhD) in Forest Science, Natural Resource Management, or Agriculture
- At least 7 years of working experience in forestry, especially with regard to deforestation and forest degradation data collection/monitoring
- Experience in forest carbon assessment, land use and land use change monitoring.
- Proven experience in integrating MRV methodologies into policy planning and capacity building.
- Experience in institutional capacity building of national counterparts at the national and/or local level.

### **3. Remote Sensing and GIS Specialist**

- Post graduate degree (MSc and/or PhD) in GIS and Remote Sensing or similar
- At least 5 years of working experience in forestry applications, especially with regard to deforestation and forest degradation data collection/monitoring
- Experience in forest carbon mapping, land use and land use change mapping and monitoring, and spatial modelling and analysis

- Experience in MRV development methodologies and institutional capacity building of national counterparts at the national and/or local level.

## 6.0 Institutional and organizational arrangements

During the delivery of services, the Consultant shall be under the direct supervision of the Head, National REDD+ Secretariat (NRS) or any staff of the NRS delegated by the Head for that responsibility. The Consultant shall also work closely with the World Bank Task Team Leader for the FCPF and other key national and international stakeholders.

### Duration of the assignment

The assignment shall be completed in 12 months and shall take place between November 2012 to October 2013.

The final Consultancy Report shall be submitted to the REDD+ Secretariat not later than two weeks after receiving comments from the key stakeholders following consultant's presentation on the draft Report.

### Deliverables

*The Consultant will be required to produce:*

1. An inception report indicating work schedule, methodology, planned consultations etc. which shall be submitted one (1) week after signing of contract.
2. Proceedings of consultant's presentation on REL framework to key stakeholders
3. Proceedings of consultant's presentation on MRV framework to key stakeholders
4. Proceedings of consultant's presentation to key stakeholders on the draft report by the end of the 4<sup>th</sup> month.
5. Submission of the full report lays out a suitable framework for the establishment of Ghana's reference emission levels, and a responsive and robust MRV system. The methods and data used in the assignment need to be fully documented, electronically stored and made available in a readily accessible fashion to technical experts in Ghana.

## Delivery and payment schedule

Output	Payment (%)
Inception report	20
Draft report	40
Final report	40

## REFERENCE MATERIALS

The following reference documents are recommended to the consultant;

- a. REDD+ Readiness Preparation Proposal
- b. Forest Preservation Programme document
- c. Inventory Reports (various, from FC-RMSC)
- d. National Communication to UNFCCC (I&II, from EPA)
- e. IPCC documents (Various)
- f. Forest and Wildlife Policy (Revised version 2012)
- g. Numerous international case studies and publication
- h. Forest governance policies

## Contact

For further information about the project and on these terms of reference please contact:

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<sup>1</sup> UNFCCC SBSTA 30 decision and draft text for Copenhagen negotiated in June 2009 (should be available to workshop participants): <http://unfccc.int/resource/docs/2009/sbsta/eng/109.pdf>