## Technical Support to the Democratic Republic of Congo for the Development of a National Forest Inventory System

**Democratic Republic of Congo** 

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## **US Forest Service**

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## 1.0 INTRODUCTION

The USDA Forest Service (USFS), through the Office of International Programs, is an implementing partner with the Central African Regional Program for the Environment (CARPE) launched in 1995 by the United States Agency for International Development (USAID). USFS provides targeted technical assistance aimed at capacity building for improved natural resource management in the Congo Basin, focusing its efforts on forest management and planning processes implemented by CARPE partners and by the host country governments.

## 1.1 Background

Since 2003, DRC has developed and is in the process of implementing its National Plan for Forest and Nature Conservation (*Plan National Foret et Conservation de la Nature – PNFC*). This plan identifies the establishment of a National Forest Inventory (NFI) as a priority activity, among others, for DRC to improve its ability to management effectively its vast forests.

To improve the management of forests and plan for the future, DRC desires a general multiresource inventory of its 135-136 million ha of forests. About 30 million ha of forest are in logging concessions and protected areas where some inventory information already exists. DRC is particularly concerned about the 105 million ha of forest outside of concessions and protected areas because the country plans to zone its forests into additional concessions, protected areas and community forests. That said, any national forest inventory would have to capture the status of forests throughout DRC.

Going forward the DRC government is developing a participatory forest zoning process aiming at identifying what (protection, extraction, rural development, carbon concessions, etc.) they would like to do where (on a map). Clearly data is critical to such a land use planning process and national forest inventories are critical component to not only inform decision making for zoning but also Reduced Emissions from Deforestation and Forest Degradation (REDD+) projects, policy, and methodology (Measurement, Reporting, and Verification - MRV).

REDD+ policy implementation, and more broadly sound natural resource management, requires at least knowledge of resources (and trends), decisions on land uses and monitoring impact, and institutional strengthening. Additionally, independent government "owned" longitudinal forest inventory data is required to improve forest management and governance to more effectively monitor and enforce extractive industries (formal and informal). Fundamentally, DRC desires a forest inventory that can be modified to include the capture of other data necessary for biodiversity conservation, REDD+, and other emerging forest issues. DRC looks to the example of other nations such as the United States that contain vast areas of forest.

During the *World Forestry Congress* held in October 2009 in Buenos Aires, Argentina the DRC delegation meet with the USFS leadership in view of exchanging information and perspectives.<sup>1</sup> During this meeting, the DRC delegation highlighted its principle priority actions outlined in the PFNC. After some discussion, the USFS leadership noted that recognizing the long history of the USFS in implementing its NFI that perhaps there is an opportunity for further technical exchange between the USFS and MECNT on that important subject matter.

Additionally, during the COMIFAC Regional Workshop on *Monitoring Carbon Stocks and Fluxes in the Congo Basin* held in Brazzaville, Republic of Congo in February 2010, contact was made

<sup>&</sup>lt;sup>1</sup> <u>http://www.cfm2009.org/en/index.asp</u>

with the FAO UNREDD MRV program staff.<sup>2</sup> During the plenary sessions and side meetings it became clear that this FAO program was playing an important role in DRC in the context of supporting Congolese institutions in their technical preparation and ultimate implementation of an MRV system for an eventual REDD+ program. Moreover, it was noted that this FAO program had ongoing or exploratory activities in other tropical forested countries and regions across the world, including at the Congo Basin level through COMIFAC. Follow on informal discussions between this FAO staff and the USFS-IP resulted in an interest to explore how our respective institutions could find synergies if not partnership in our technical support to DRC (and perhaps other countries/regions) for specifically the NFI element of a REDD+ MRV system.

Therefore, in this context USFS-IP, MECNT-DIAF, and FAO UNREDD MRV developed an initial scoping and technical exchange mission to determine how to best move forward. More specifically, the DRC requested USFS to mobilize a Forest Inventory and Analysis (FIA) team for a technical exchange visit to DRC to discuss the FIA, its structure, data collection methods, results and utility with a view to drawing experience from FIA as DRC seeks to establish an NFI tailored to its needs and context. The Scope of Work for the mission is found in Appendix 4.1 in which the following objective of the mission was articulated.

## 1.2 **Objective**

The objective was to carry out a technical exchange between experts from the USFS national forest inventory (NFI) system and DRC authorities and experts in view of exploring how to best support the design and implementation of a multi-resource NFI to meet DRC forest governance and management objectives.

## 1.3 Process

The mission was carried out in DRC from 15-27 May, 2010 with full participation from all three partners. A series of introductory meetings, technical exchange sessions, and field visits were carried out. Appendix 4.2 presents the detailed itinerary and objectives for the various meetings and activities over the course of the mission. Appendix 4.3 highlights the names and institutions the team met with.

The team visited a number of organizations with interests in the forests of DRC. During our meetings with DIAF (*Direction Inventaire et Amenagement Forestiers*), Chip Scott gave two presentations. The first set the stage for discussions on forest inventory and monitoring. He described the 15 steps to be taken when planning, implementing, managing information, estimation and reporting. After presentations from DIAF on their inventories and desire to implement a National Forest Inventory (NFI), Chip gave a presentation on the US Forest Service NFI conducted by the Forest Inventory and Analysis (FIA) program.

In order to better understand the challenges of conducting forest inventories in DRC, the team visited the Luki Biosphere Reserve. This allowed the team to better appreciate the wide range of conditions, extensive savannas, remoteness and difficult access.

The following sections summarize the findings, issues, and recommendations of the USFS DRC NFI team.

<sup>&</sup>lt;sup>2</sup> COMIFAC workshop documentation can be found at the following links:

 <sup>&</sup>lt;u>http://osfac.net/workshop/default.html</u>

 <sup>&</sup>lt;u>http://cbfp.org/proceedings/items/COMIFAC-Workshop\_Brazzaville-Documentation.html</u>

## 2.0 FINDINGS, ISSUES, & RECOMMENDATIONS

## 2.1 Findings

### 2.1.1 Background on Prior Forest Inventories in DRC

The team met with the DIAF staff including: Sebastien Malele, Director, Christophe Musampa, Chief of the Division of Cartography and Remote Sensing (Geomatics) staff, and Andre Kondjo, Chief of the Inventory staff. They described prior inventory efforts in DRC which are geographically summarized in Figure 1.

They described what they referred to as an NFI which was being done by region (much as was done at that time in the US and elsewhere). Each region would be done in turn, and then could be repeated as necessary. They did plots along lines with about 500 ha per 0.5 ha plot (20 x 250m). They removed nonsample areas, such as villages. They used this to determine the sampling intensities using a 95% Confidence Level with 2-7% sampling errors. They used plots along lines except in inventory unit # 2 (see Figure 1) where they used random selection by stratum. They mapped the land use/cover on the lines, so can estimate the classes in combination with the strata. Among other things, they evaluate tree quality. They have subteams for plot layout, measurements, and quality control (20% Quality Control largely due to locational errors). They had 2-5 teams with a field supervisor for support/logistics.

Local volume equations (no heights) were developed for commercial species and noncommercial species groups by developing a subsample of trees across diameter classes. Volume was computed by measuring diameter at 3 points using Relaskop – base, midpoint, and before branching out. They have also done some felled tree studies. While the data are available to develop regional volume equations (tally sheets), DIAF suggested that such regional equations would not be accurate due to the diversity across DRC. The concessionaires do not agree with the equations, since they cannot find the timber volume expected (however, this seems to be the case around the globe). The DIAF forest management staff thinks the equations are fine.

Figure 1 indicates three categories of forest inventories previously carried out: 1) "management inventories" (violet) and 2) "pre-investment inventories" (green) both carried out with technical and financial support from the Canadian International Development Agency (CIDA) in the 1970's and 1980's under the previously described NFI model; and 3) "allocation" inventories (red) which despite the name were essentially management inventories that SPIAF (precursor to DIAF) carried out on behalf of the concessionaires. The overall objective of all three was to value the forest. The 7 "management inventories" and "pre-investment inventories" units were chosen to get a range of types. They have the tally sheets, but not electronically.

These forest inventories generally followed these steps: The inventory steps are:

1. Determine the forest area of the concession

- 2. Inform the people that there will be an inventory and harvesting, and get local approval.
- 3. Survey the boundary and take photos.
- 4. Logistical preparation
- 5. Develop volume equations
- 6. Conduct sampling transects and lines
- 7. Interpret photos and create maps
- 8. Create report

As SPIAF did not have funding after the CIDA programs ended they effectively became consultants for doing management inventories. This and other factors lead to many of the CIDA trained staff leaving the public sector for the private sector.





In total DIAF has inventoried 22% of the forest area at some point in the past, so there is much to do. Moreover, the data from those inventories are largely, if not entirely, limited to hard copy paper printouts, paper maps, etc. and any digital record is not available in Kinshasa. The World Bank is providing funds (\$2.6M) to do zoning for 3 provinces (the 3 largest and most forested) to cover a total of 47M ha. Earlier unit inventories are at least 20 years old and were done at the 800-1,000K ha level which does not provide much detail for zoning.

In 2002 a new, modern Forest Code was promulgated. Since then, a series of management guidelines pertaining to a whole range of forest management technical issues/methods/procedures including inventories have been drafted by DIAF. An important part of the process to clean up and re-launch the forest sector in DRC was to conduct a legal review of the old forest titles and convert the valid ones into forest concessions. This was carried out by an inter-ministerial committee who reviewed the 156 old forest titles based on criteria for conversion to forest concession<sup>3</sup>. 70 of them have passed review, representing 10M ha.

The current, modern forest titles eligible for conversion to concessions are restricted to 300K ha and are required to do inventories according to DIAF standards that are largely developed. Not all of this has been inventoried. The DIAF would like to integrate the management inventory and NFI, i.e., use the management inventory rather than do NFI plots on inventoried concessions (See Issues section below). Once fully approved, then they have 4 years to complete all the steps – complete a management plan (including many studies including management inventories), build a sawmill, and begin harvesting. Among other things, there is community involvement in developing the zones. Once these and other criteria are met, they could apply for a 25-year concession.

#### 2.1.2 Management Inventory

DIAF continues to work on the previously mentioned guidelines for forest management primarily for concessions. 12 are complete and DIAF plans to do 10-13 more which are in draft form and under review.<sup>4</sup> See appendix 4.4 for a complete list. These guidelines seem thorough and clear. They are largely based on the CIDA supported system from the 1970's and 1980's. The guidelines require line inventories with a sample 12.5 m on either side of the line. The largest size class is sampled all along the line. Smaller segments are used for smaller size classes. Since the USFS team would not recommend using a line-based system for the NFI, not much

<sup>4</sup> They are available at <u>www.mecnt.cd</u> , specifically

<sup>&</sup>lt;sup>3</sup> The World Resources Institute (WRI) provided the following details on criteria http://www.globalforestwatch.org/english/centralafrica/pdfs/WRI Q-A legal rev 4Apr2006.pdf

The verification process of the requests for conversion submitted by titles holders will be based on the following criteria: a. The conformity of the documents submitted to the documentation required (Article 2); b. The legal validity of the conventions (titles) under which the conversion is requested and of their eventual transfer to a third party (Article 5); c. Respect of the legal, environmental, social and fiscal obligations attached to the existing titles, by the title holder or by all other third parties to which logging rights may have been transferred (Article 5); d. The existence and maintenance of a wood processing plant, in conformity with the terms of the wood supply guarantee and/or letter of intent, exception made to well-documented cases of force majeure (Article 5); e. The analysis of the proposed business plan (Article 5).

http://www.mecnt.cd/index.php?option=com\_content&task=view&id=59&Itemid=27.

time was dedicated to review and/or discussion of these guidelines. While grid systems are common for sampling at a variety of scales (stands to nations), the line-sampling method used cannot be statistically treated as a series of plots since they touch one another and are not statistically independent of one another. To be used correctly, each line would need to be treated as a sample size of 1. This would dramatically reduce the precision of the estimates, thus negating the field efficiency of line sampling.

### 2.1.3 REDD Measurement, Reporting, and Verification

Matieu Henry from the FAO UN REDD MRV team in Rome likewise participated in the technical discussions and field visit. He presented the proposed FAO methodology for a Reducing Emissions from Deforestation and Forest Degradation (REDD+) MRV system for DRC.<sup>5</sup> The REDD+ mitigation mechanism still remains under negotiation. However, as a significant move forward in building the architecture of the mechanism, the 15th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) adopted a decision on "Methodological guidance for activities relating to reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries", or REDD+ (Decision 4/CP15).

One of the key elements for REDD+ implementation and success is the development of transparent, comparable, consistent, complete and accurate national forest Measurement, Reporting and Verification (MRV) systems. National forest MRV systems are the means of determining whether or not the parties effectively meet their respective mitigation objectives under the UNFCCC. The FAO – UN REDD proposal for national forest MRV systems refers to the requirements of Decision 4/CP15 and to the outcomes of the REDD+ negotiations under the UNFCCC Subsidiary Body for Scientific and Technical Advice (SBSTA) and Ad-hoc Working Group on Long Term Cooperative Actions (element of the Bali Action Plan) (AWG-LCA) for its methodological solutions.

The MRV system FAO proposes is summarized in Figure 2.

<sup>&</sup>lt;sup>5</sup> Powerpoints of interest are DRC\_NFI\_MRV2.ppt (also see Jour 2\_Maniatis\_DRC\_MRV\_Brazza.pdf).





FAO is proposing a monitoring system for carbon in combination with an NFI by adding other variables as needed. FAO plans to stratify into major forest types (dense evergreen, dense deciduous, dense dry, and the forest/savanna mosaic), because the pressures on them differ (fuelwood vs. selective logging), as do the amounts of carbon/ha. FAO noted that in the current negotiation text under UNFCCC (FCCC/AWGLCA/2010/6), the expected REDD+ mechanism is defined as: "developing country Parties should contribute to mitigation actions in the forest sector by undertaking the following activities:

- a) Reducing emissions from deforestation;
- b) Reducing emissions from forest degradation;
- c) Conservation of forest carbon stocks;
- d) Sustainable management of forest;
- e) Enhancement of forest carbon stocks."

The COP decision 4/CP 15 on methodological guidance agreed to in Copenhagen used the following wording to define REDD+ by *"Acknowledging the importance of reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries".* These REDD+ activities are shown in Figure 3.



## Figure 3. FAO representation of the 5 REDD+ activities

DRC ultimately could get compensated (e.g., carbon credit) under the UNFCCC either by reducing losses or creating new gains as compared to Reference Level or Reference Emission Level (to be established by the country).

The Decision states that countries will have to use the most recent Guidance and Guidelines of the Intergovernmental Panel on Climate Change's (IPCC), as adopted or encouraged by the COP, as a basis for estimating anthropogenic forest-related greenhouse gas (GHG) emissions by sources and removals by sinks, forest carbon stocks and forest area changes (Decision4/CP.15 Article 1 (c)). Estimating emissions and removals by sinks will have to be done in an adequate, consistent, complete and transparent manner and be applied to the five carbon pools that will have to be measured and reported on (these being: aboveground biomass, belowground biomass, deadwood, litter and soil organic matter) (IPCC, 2003).

Moreover, the IPCC proposes two ways of estimating carbon stock changes: Gain-Loss and Stock Change. Gain-Loss refers to a method in which the changes of carbon stocks are estimated by considering all the pertinent processes and calculated as the difference between the carbon accumulation (e.g., tree growth) and the loss of carbon (source-sink). The Stock Change method measures carbon as the difference of carbon stocks for a given land unit over two points in time (net change over time).

FAO proposes to stratify and do a pre-sample to evaluate variability. Furthermore, they propose to compute the costs by stratum and optimize plot design and sample sizes <u>by strata</u>. The stratification could be for cost, for biomass homogeneity, and for likelihood of activity (e.g., managed and unmanaged and the five REDD+ activities).

The provisions of the UNFCCC are only related to the 'anthropogenic' emissions and removals with the intention that we try to control at least the human-induced emissions and removals. However, in the Land Use, Land-Use Change and Forestry (LULUCF) sector, emissions and removals of greenhouse gases (GHG) occur as a combined effect of both anthropogenic and numerous natural processes (e.g., tree growth, natural disturbances etc.). A specific approach was designed by IPCC for the LULUCF sector in the estimation of anthropogenic effects. This approach is based on the assumptions that, for large areas and for periods of several years, (i) any **unmanaged forest land**, e.g., a natural forest with no direct human activity is in a steadystate, and that (ii) any emissions and removals on a managed forest land are due to human activity. Assumption (i) can also be formulated so that the inter-annual variations in background emissions and removals due to natural processes, though these can be significant, are assumed to average out over time. These assumptions in most situations allow one to estimate the anthropogenic emissions and removals in a country with a reasonable accuracy, while complying with all principles of reporting under the UNFCCC as mentioned above. Therefore, the IPCC Guidelines require the estimation of all emissions and removals on managed land. In other words, anthropogenic emissions and removals on all land in a country are estimated by estimating all (both natural, as well as anthropogenic) emissions and removals on the managed part of the country (this approach is often referred to as the 'managed land proxy'). Note that, in this context, all lands immediately become managed where human activities occur, including those that result in deforestation and degradation.

Ideally, one would use an NFI system in which multi-temporal inventory data and trends could be obtained. In all Annex I countries, this is the approach used. However, this is not the case for most non-Annex I countries (including DRC), of which most do not presently have a NFI or one targeted at providing this type of information. The challenge DRC faces is to ensure that they have the capacity and funding to repeat the NFI over time yielding multi-temporal inventory data (Tier 2). This challenge (need) led FAO to suggest a deeper stratification scheme, for which FAO UNREDD MRV proposes the proxy of the Intact Forest Landscape (IFL)<sup>6</sup>. This IFL

<sup>&</sup>lt;sup>6</sup> **The Intact Forest Landscape (IFL)**: An intact forest landscape (IFL) is defined as: *…an unbroken expanse of natural ecosystems within the zone of current forest extent, showing no signs of significant human activity, and large enough that all native biodiversity, including viable populations of wide-ranging species, could be maintained' (Potapov et al. 2008*). In order to locate areas that satisfy the IFL definition, a set of criteria were developed by

will also serve as basis to divide the land into 'managed' and 'unmanaged' land and exploited and un-exploited forest land.

However, FAO recommends creating a 6 km buffer area within the unmanaged areas in order to measure also the unmanaged forest land. This will undoubtedly be a sticking point (see Issues section below) as the common, accepted definition of managed areas is those with human influence. Since DRC forests are considered to be largely inhabited, limiting "managed" areas to formally allocated management units might be expedient though not true to the definition. In North America, unmanaged area examples include interior Alaska and northern Canada. Additionally, they will likely stratify using the map presented in the Forest of the Congo Basin: State of the Forest 2008 report (created with USAID/CARPE support to South Dakota State University and others). This was requested by DRC authorities in order to be able to upscale to the regional level.

The sampling in the production areas presents a challenge. Currently, the idea discussed between DIAF and FAO is that the DRC government reaches an agreement with the logging companies to produce sub-inventories (that will be verified) using their own detailed management inventory but applied to all the carbon pools and following IPCC requirements for REDD+ reporting requirements. These sub-inventories will be then fully integrated in the NFI and potentially they may be the basis to report on the REDD+ activity on "Sustainable Management of Forest Land".

Although not the focus of this mission or the presentation, FAO noted interest and steps taken to scale up work in DRC to the regional Congo Basin level.<sup>7</sup>

#### 2.1.4 National Forest Inventory

Since 2002, there is a moratorium on new concessions. DIAF suggests the need to do a "knowledge of the resource" inventory for multiple objectives but largely to map forests of permanent production from which logging concessions could be allocated in the future as well as supporting the identification of additional *foret classee* (protected areas).. These are not management inventories as they would be much less detailed. DIAF would like the NFI to fill this role. Moreover, they want all their inventories to be multi-resource and on all lands. At this stage DIAF wants to focus initially on the 3 most forested provinces. They anticipate using the methods used in the 1970's and 80's for the NFI in areas outside current logging concessions... The new guidelines would be used in the production forests. As for the FAO UNREDD MRV system and its multi-purpose "NFI", the primary focus is carbon and with a direct national application. DIAF suggested a concern that the sampling intensity proposed by the FAO is

Potapov and colleagues (2008) designed in such a way that they are globally applicable and easily replicable. This allows for repeated assessments over time as well as verification by independent replication of assessments. Complete reference - Potapov, P., A. Yaroshenko, S. Turubanova, M. Dubinin, L. Laestadius, C. Thies, D. Aksenov, A. Egorov, Y. Yesipova, I. Glushkov, M. Karpachevskiy, A. Kostikova, A. Manisha, E. Tsybikova, and I. Zhuravleva. 2008. Mapping the world's intact forest landscapes by remote sensing. Ecology and Society 13(2): 51. [online] URL: http://www.ecologyandsociety.org/vol13/iss2/art51/.

<sup>7</sup> It was noted that the Central African Forest Commission (COMIFAC) agreed to take a regional approach to REDD+ starting with DRC. FAO suggests that such an approach would be more efficient, such as using regional equations.

good for carbon but might not be high enough for their needs of identification of new concession areas. Since the REDD+ design is targeted at the country scale, then the USFS agrees that the other sub-national information needs of an NFI may not be met.

### 2.1.5 Remote Sensing Status

The most recent aerial photography that exists was acquired in the 1950s and is not complete in areas of persistent high cloud cover (i.e., the equatorial forest areas). As a result, they have shifted their remote sensing approach to a satellite-based system depending largely on Landsat TM, MODIS, and SPOT.

The Observatoire Satellite des Forets d'Afrique Centrale (OSFAC), based in Kinshasa, is the focal point of the GOFC-GOLD network for Central Africa. OSFAC has the long term objective of building regional capacity to use remotely sensed data to map forest cover and forest cover change across Central Africa. OSFAC has strategic relationships with South Dakota State University (SDSU), University of Maryland (UMD), NASA, and is well supported by USAID/CARPE. OSFAC also has a close relationship with DIAF and could serve as part of the capacity necessary to implement an NFI in the DRC. The infrastructure, capacity, and strategic partnerships provided by OSFAC may provide a remote sensing-based approach to integrate the REDD+ MRV objectives with the DIAF's NFI objectives.

FAO has started a strategic collaboration with the Brazilian Space Agency, INPE, to provide technical support on the issues of forest monitoring through Remote Sensing to all the potential REDD+ countries. In particular in DRC and in the other countries of the region this will occur through a specific MRV project supported by the Congo Basin Forest Fund. Linking this component with OSFAC and other partners seems logical and mutually beneficial.

The UN-FAO Forest Resource Assessment 2010 Remote Sensing Survey (RSS) uses satellitebased remote sensing to improve information on global tree cover and forest land use. The RSS obtained systematic information on the distribution and changes in forest cover and forest land use from 1990 to 2000 and for 2005 at regional, ecozone, and global levels. The survey is based on a sample of 10-kilometer by 10-kilometer tiles at longitude and latitude intersections. This intersection-based sample design does not have uniform probabilities of selection since longitude lines are closer at higher latitudes. It may not be a problem in the DRC, but may not work well across the entire COMIFAC area. A regular tessellation (perhaps hexagonal) would provide a basis for solving this problem and also provide a logical basis for intensification.

This approach and the work completed for the RSS would need to be evaluated in the context of REDD+ MRV model building and monitoring objectives as well as DIAF's NFI objectives. It may, however, provide a reasonable "first approximation" NFI while meeting the REDD+ MRV objectives and hence qualify for funding under REDD MRV.

## 2.2 Issues

#### 2.2.1 Management Inventory

DIAF and the FAO REDD MRV proposal include management inventories as part of an integrated system for REDD+ and NFI. The management inventory data would be used in concessions for both REDD+ and for the other NFI needs. This raises several issues.

- This would require that the management inventory include all 5 carbon pool estimates, however, only aboveground (and perhaps below ground) tree biomass would be readily estimated from the data collected currently. To add the other components on all plots would be prohibitively expensive. It might be possible to develop a statistically valid subsample of plots. In addition, to some of the REDD+ emission factors and models, some plots might need to be permanent rather than temporary (as are the management inventory plots).
- The concession inventories are to be conducted by the concessionaires, so having them do
  the carbon sampling could create some plot integrity (management bias) issues. Even if
  there was no treatment bias (such as avoiding harvests on REDD samples), there could be
  the perception of a bias which might limit REDD+ payments. Plus there would be an added
  cost and complexity of having to train crews on each concession to conduct the carbon
  sampling.
- One alternative is to place the REDD+/NFI samples across all managed lands including management areas. This would give the desired sampling intensity, and would be done by DIAF crews other than the concessionaire. While the access cost might be higher to have DIAF crews do the sampling, concessions are among the most easily accessed forests. This also helps to ensure that DIAF is in control of the timing of the measurements.

#### 2.2.2 REDD Measurement, Reporting, and Verification (MRV)

A number of things need to be clarified (or at least remain unclear to us).

- The REDD MRV proposal mentions Tier 2 and 3 but does not clarify them, other than to say that the target is Tier 2 with the possibility of moving to Tier 3 in the future. (Tier 1 is insufficient for payments). From the GOFC-GOLD Sourcebook the IPCC tier levels (1, 2, and 3) are noted to be levels of accuracy and precision of carbon stock information with Tier 1 using IPCC default values; Tier 2 requiring country-specific data; and Tier 3 highly disaggregated carbon stock data for different pools and assessment of change through multiple measurement and modeling. Precision and accuracy as well as cost and complexity increase as one moves from Tier 1 to 2 to 3.<sup>8</sup>
- The proposal mentions the possibility of using a combination of permanent and temporary plots, but does not elaborate. We recommend permanent plots to estimate carbon stock changes. We recommend against using temporary plots for estimation of carbon stocks, since they will result in differing estimates over time and cannot estimate carbon flux. However, they might be useful for one-time model development.

<sup>&</sup>lt;sup>8</sup> GOFC-GOLD, 2009, A sourcebook of methods and procedures for monitoring and reporting anthropogenic greenhouse gas emissions and removals caused by deforestation, gains and losses of carbon stock in forests remaining forests, and forestation. GOFC-GOLD Report version COP15-1, (GOFC-GOLD Project Office, Natural Resources Canada, Alberta, Canada).

- The issue of managed and unmanaged (such, as remote forests or savannas in southern region) needs to be carefully thought through. The rules allow for not monitoring unmanaged areas mostly as a means of reducing monitoring costs (as was mentioned above). However, it is unclear that significant areas of DRC are truly unmanaged this would require that they be uninhabited and unaltered by man. For example, DIAF informed the team that much of the currently occurring savanna in the Bas Congo, Bandundu, and South Eastern provinces are frequently burned by humans in order to keep them as savanna. Our understanding is that reforestation, under the enhancement of forest Carbon stocks "activity", is included in REDD+, thus efforts to restore forests in savannas through fire management to facilitate regeneration could be credited and therefore inventoried/monitored. Of course, the sampling could be much lighter in these areas. We suggest that all lands be sampled.
- While not the core objective of this mission, an important issue was raised about the proposed FAO/COMIFAC regional approach to national REDD MRV systems. While generally the partners were supportive of the principles there was significant concern raised by DIAF that "going regional" will effectively take funding for half of the proposed forest inventory plots previously discussed in DRC with the perception that they would be done in other COMIFAC member countries. Previous interactions with FAO UNREDD MRV representatives suggest that there are many benefits to scaling up to the regional level, not the least of which are efficiencies by minimizing the number of plots needed thus driving national costs down while apparently achieving equal or better/more robust data statistically (uncertainty thresholds could be reduced). Clearly more open discussions are needed on the pluses and minuses of the proposed regional approach to REDD MRV systems as the partners pursue differing models of partnership going forward.

#### 2.2.3 National Forest Inventory

- As was mentioned above, the USFS team understood that the DIAF would like to sample different subsets of DRC forests with the three inventories the NFI would include all forest lands (except those covered by management inventories), but would prioritize the 3 most forested provinces. REDD+ MRV measurements would be done on NFI plots, or at least a subset of them but only in managed forest areas. Thus the proposal is to do NFI-only plots in unmanaged forests as a means of determining if they too should be allocated for concessions (or alternatively protected). As noted above, we believe that the REDD+ MRV/NFI sampling should be done on top of management areas. Similarly, as mentioned for MRV, we believe that the NFI should cover all lands. DIAF needs to be able to estimate forest area and the movement of land into and out of forest (land use and land cover change). This requires sampling nonforest areas anything that could become forest. To be a National Forest Inventory, it needs to be "national."
- Another concern of trying to integrate REDD+ MRV and NFI is timing. Under current
  expectations for REDD readiness, the carbon field inventory plots for the REDD MRV must
  be done by the end of 2012. DIAF wants to target the 3 provinces first for the NFI. This
  creates a risk of not completing the MRV in time if it dependent on the NFI.
- Implementing an NFI not integrated with the REDD+ MRV, however, will raise the critical issue of funding. Of the three types of inventories discussed only the NFI has no current

donor or dedicated DRC budget (REDD MRV inventories have some important although possibly insufficient funding and management inventories will be borne as operating costs of the concessionaires). Clearly this is a key issue and the driver for DIAF to find integration options with the REDD MRV inventories to achieve beyond carbon-based objectives.

- To start a truly national inventory based on the staffing and current resources will be a major undertaking. We suggest a step-wise approach to progressively build the NFI over time, much as the MRV proposal recommends.
- Definition of Land Use and Land Cover classes. In order to ensure a regional integration of the NFI, the maps use definitions adopted by COMIFAC countries in their State of Forest (2008). Anyway it will be probably necessary to follow up on the definitions used, as some national circumstances may require some additional criteria for the classification scheme. Determining accuracy requirements is an inexact science. Largely it is a matter of the willingness of the decision-maker to accept uncertainty in the estimate. If they are risk averse, then the sampling errors should be low (e.g., 5-10%) and the Confidence Levels high (e.g., 95%). In the case of REDD+, payments will ultimately be based on the level of accuracy and uncertainty estimates the more confidence in the results, then the higher the payments. Due to the interest in using the NFI to orient new concession allocations, there may be advantages to intensifying the sample to lower the risk for potential concessionaires (forest industry). This could be done in a variety of ways.
- DIAF would like help to finalize/validate their existing equations. We agree with Matieu Henri (FAO) that it would make sense to evaluate the development of regional volume and biomass equations using height (merchantable or total) to localize the estimates. With some specific-gravity data, it might then be possible to develop stem biomass estimates, however, it is unclear whether the specific gravity (density) data existing for the species.

## 2.2.4 Remote Sensing

DIAF evidently does not have planometric maps of the central part of the DRC (due to clouds). Perhaps the Shuttle Mission (SRTM) could be used to develop digital elevation models.

## 2.3 **Recommendations**

#### 2.3.1 Management Inventory

- The DIAF seems to be on a good path to developing the standards and guidelines (*Normes*) for conducting management inventories. The only recommendation is that the management inventories not be integrated with the REDD+ sampling due to the potential or perception of treatment bias. As noted earlier, integrating them creates concerns regarding permanent vs. temporary samples, training the crews, selection of a subsample to keep costs of additional carbon pool sampling down, timing of the work.
- Even if there were no REDD+ MRV plots, similar concerns would exist if DIAF chose to not sample the concession areas with the NFI. We recommend that the NFI sample concessions. There is the additional benefit of having a means of validating the concessionaire's results.

### 2.3.2 National Forest Inventory Integrated with REDD MRV

- 1. We recommend that the NFI and REDD+ MRV be fully integrated, thus using the same sample locations (or at least that one will be a statistical subsample (subset) of the other). However, if the NFI sample is much larger or is sequenced by province, then the NFI might slow up the MRV.
- For an NFI and especially for REDD+ MRV, we strongly recommend the use of permanent (vs. temporary) sample plots. This greatly enhances the precision/accuracy of change estimates, plus permits the estimation of the components of change, such a growth, mortality, and removals.
- 3. As noted earlier, **we recommend that all lands be sampled as part of the NFI** in order to be able to assess the flows of land into and out of forest.
- 4. We recommend evaluating the development of regional volume and biomass/carbon equations using height (merchantable or total) to localize the estimates. With some specific-gravity data, it might then be possible to develop stem biomass estimates. Belowground biomass should also be estimated as part of this study.
- 5. Development of Objectives, Questions, and Variables

We worked through much of the process for determining the Objectives for an integrated REDD+ MRV and NFI. In keeping with DIAF's commitment to conduct multi-resource inventories, they chose the following Broad Objectives from the list that Chip Scott presented:

- a. Forest Health
- b. Ecosystem Restoration
- c. Biological Diversity
- d. Wildlife Habitat
- e. Forest Production
- f. Carbon Balance

Based on these, the initial draft list of Questions is:

Generic Questions and Their Indicators			
No.	Generic Question	Indicator	
1	What is the amount and distribution of tree species and how is it changing over time?	Tree abundance	
2	What are growth and mortality rates overall and for individual species and how are these rates changing? Are these related to management or other factors?	Tree growth and mortality rates	
3	What is the condition/health of tree species? What is the degree of pest/pathogen damage?	Tree condition	
4	What is the crown condition of tree species?	Crown condition	
5	Are forests replacing themselves? What factors are impacting regeneration?	Tree regeneration	
6	What is the abundance of snags and is it changing?	Snag abundance	
7	What is the amount and distribution of coarse woody debris and is it changing?	Coarse woody debris	
8	What is the amount and distribution of fine woody debris and is it changing?	Fine woody debris	

9	What is the composition and diversity of understory vegetation?	Understory native plant richness
10	What exotic species are present? Are exotic plant species increasing in abundance?	Presence/ Absence by Subplot
11	How is soil chemistry (carbon) changing?	Soil chemistry
12	What is the amount and distribution of forest cover types across the landscape and is it changing?	Landcover
13	What is the distribution of structural classes and how is this changing? What percentage is classified as primary?	Stand structure
14	What is the amount and distribution of land by land use? What land uses are contributing to loss of forest land?	Land Use
15	What is the patch size distribution and is it changing? Is interior patch size sufficient to maintain forest interior species?	Interior patch size
16	What is the relative distribution of forest land by stocking level, total merchantable volume and sawtimber volume, and how are these changing?	Tree value, log grade
17	What species and size classes have the highest harvest rates? Does total net growth exceed removals? What is the distribution of forest land by harvest intensity?	Tree harvest
10	What is the distribution of biomass across the forested landscape? Is total biomass increasing or decreasing? What are the effects of the five REDD+ activities on forest carbon	Diamaga / Draduction
18	Stock and forest carbon stock change?	BIOINASS/ Production
19	what is the net carbon flux of the site under current management?	Carbon balance

This is an excellent start. We encourage DIAF to continue the process, with or without our assistance. Once the Questions are refined, then they can begin identifying the variables to be measured.

- 6. Due to the remoteness of much of the forest, the most efficient sampling design and plot configuration should be used. DIAF has used a strip cruise approach. While efficient from a field sampling standpoint, the plot data are not statistically independent, thus resulting in underestimating sampling errors. A similar problem occurs with some of the FAO designs which use clusters of plots, such as is being proposed in Peru and Columbia. We recommend that USFS (Chip) work with DIAF on using existing plot and measurement time data, if possible, to evaluate alternative designs. This might require some presampling to get sufficient information. This represents a significant upfront cost, but there is the potential to save millions over the years.
- 7. Rather than recording variables in classes, where possible, **record the direct measurement, then classify later.** For example, percent tree cover is used to determine

forest land cover class. DRC uses 30%.<sup>9</sup> The US and others use 10%. Collecting tree cover as a percent rather than lumped into classes provides analytical flexibility.

#### 2.3.3 Remote Sensing

 Recognizing the FAO collaboration with INPE to provide technical support on the issues of forest monitoring through Remote Sensing in particular in DRC and in the other countries of the region through a specific MRV project supported by the Congo Basin Forest Fund, we recommend that this initiative will be integrated with the initiatives occurring under the CARPE program namely the OSFAC and UMD/SDSU/NASA work.

## 3.0 NEXT STEPS

## 3.1 Next possible steps for broader suite of partners

A prioritized list of future tasks that should be addressed in advancing the NFI development and implementation in the DRC can be found in Appendix 4.5. Together the three partners (USFS, FAO, and DIAF) developed a list of steps and tasks that need to be completed in order conduct the integrated NFI. We recommend that the USFS provide technical assistance on a number of the tasks. We also identified the following potential partners: ADB, AFD, ACDI, GTZ, AWF, CBFF, CI, FAO, FIB, GTZ, ITTO, OFAC, OSFAC, USAID, WB, WCS, WRI, and WWF.

## 3.2 Next possible steps for USFS

A prioritized list of future tasks for possible USFS engagement in DRC (and regionally) on NFI design and implementation follows:

- 1. Chip Scott will modify the spreadsheet of Objectives, Questions and Variables to better match DRC's needs, then Jim Beck will have it translated into French. DIAF will then modify it further to address and prioritize their needs.
- 2. Capacity building while the current DIAF leadership is skilled and experienced, the rest of their small staff is not. With ITTO support FAO is partnering with DIAF to take the lead on training a large field staff. Attention needs to be given to developing the skills needed for all other aspects of the inventory, including data management and reporting (areas that the USFS could provide some assistance). As for data management, evidently FAO has two people working on a database, so USFS could likewise potentially partner with them.
- Collect remote sensing and field experience from existing projects in DRC (and perhaps elsewhere) – USFS staff (Ken Brewer, Sean Healey and others) could assist with the remote sensing aspects. Chip is working on the inventory side by hosting international inventory sessions at the Oct. 5-7 FIA Symposium in Knoxville, TN. This could also serve as a capacity building opportunity.
- 4. Develop proposed methodology (plot and sampling designs and field procedures) Chip could work on the design with DIAF as noted in the recommendation.
- 5. Begin developing database and data entry program while the FIA data entry software and database are not flexible enough for use in DRC, the USFS National Inventory and Monitoring Application Center (NIMAC) may be able to provide some assistance. Chip has also helped Honduras design a flexible data entry system that is easy to change to other

<sup>&</sup>lt;sup>9</sup> DRC has submitted a definition to the UNFCCC Secretariat for its 'forest' to be defined as: 'A terrain with: a minimum tree cover of 30 % ; a surface area of 0.5 hectare and a minimum tree height of 3 metres.' For the purposes of REDD+ NFI that is the definition that will have to be followed (unless DRC changes it).

languages. The system has not yet been built, so USFS might want to seek USAID funding for this effort, so that it can be applied in multiple countries.

- 6. Decide on stratification for area estimation and sample allocation USFS could provide some advice.
- Pre-sampling to evaluate precision and costs by strata Chip could provide advice on how to conduct the pre-sampling and on collecting sufficient time/motion data to develop an optimal plot configuration and sampling design.
- 8. Finalize the methods (mostly sample size) and materials USFS could assist with the optimization of the design and sample sizes and with providing advice on field methods.
- 9. Finalize database and data entry program USFS could provide follow up advice based on the initial work.
- 10. Quality Assurance/Quality Control USFS could provide assistance on setting up a QA/QC system.
- 11. Compile data (apply the equations to the data, i.e., estimate biomass/carbon by pool) NIMAC is developing a generalized compilation system as part of a study for the National Forest System. This system might be applicable in DRC.
- 12. Compute and report estimates and their sampling errors, including QA USFS could help with developing the reporting tool based on the one NIMAC is developing for NFS. USFS could also provide training on how to use the tool and other software to analyze and report on the data.
- 13. Additional Technical Support related to ongoing Convention negotiations

## 4.0 **APPENDICES**

## 4.1 Scope of Work

## **Draft - USFS Team Scope of Work**

**US Forest Service International Programs** 

Technical support to the Democratic Republic of Congo for the development of a National Forest Inventory system



May 2010

## **Introduction and Background**

USFS-IP in Central Africa

The USDA Forest Service (USFS), through the Office of International Programs, is an implementing partner in the US Agency for International Development's (USAID) Central African Regional Program for the Environment (CARPE), providing targeted technical and capacity building assistance aimed at improving forest management in the Congo Basin. In an effort to focus this assistance in a manner which capitalizes on the relative strengths of the agency, the USFS is concentrating their efforts towards the land management planning processes of the CARPE landscapes. These landscapes were chosen for their biodiversity and conservation importance and established as foundations of regional conservation and sustainable natural resource use. These areas contain a mix of national parks and other protected areas, current or future timber and mining concessions, villages and settlements, and the neighboring areas on which communities depend for their day-to-day resources.

#### Forests of the DRC and need for a National Forest Inventory system

The forests of the Democratic Republic of Congo (DRC) represent the second largest bloc of tropical forests on earth. With the most forests of any African country, DRC's forests, indeed all of the forests of the Congo Basin, carry a great benefit to the world's environment. DRC recognizes this through the nation's new forestry laws that are based upon responsible natural resource management, the conservation of biological diversity, and better livelihoods for the Congolese. The DRC has also joined with many partners to pave the way for new approaches for people and forests.

To improve the management of forests and plan for the future, DRC desires a general multiresource inventory of its 135-136 million ha of forests. About 30 million ha of forest are in logging concessions and protected areas where some inventory information already exists. DRC is particularly concerned about the 105 million ha of forest outside of concessions and protected areas because the country plans to zone its forests into additional concessions, protected areas and community forests. However, any forest inventory would have to capture the status of forests throughout DRC. Moreover, DRC as a member of the Central Africa Forest Commission (COMIFAC), has identified improving knowledge of forest resources as one of ten key strategic areas for priority action in the Convergence Plan.<sup>10</sup>

<sup>&</sup>lt;sup>10</sup> As a part of the nascent USFS-COMIFAC technical cooperation partnership USFS technical assistance is requested through a regional workshop in which the USFS presents the US model for Multi-resource inventories and

Fundamentally, DRC desires a forest inventory that can be modified to include the capture of other data necessary for biodiversity conservation, REDD, and other emerging forest issues. DRC looks to the example of other nations such as the United States that contain vast areas of forest. Can their methods of forest inventory be applied to DRC?



The extent of forest (light green), logging concessions (brown) and protected areas (dark green) in the Democratic Republic of Congo which desires a national forest inventory to monitor the status of its forests and to plan forest management.

related implementing manuals/handbooks for COMIFAC ES and member state consideration. Follow on working sessions for adaptation to central Africa context could be envisioned. This activity would contribute to the 2009-11 Plan for the Convergence Plan - (Knowledge of the resource (PC Strategic Area 2) / Inventory of forest resources (timber, non timber, medicinal plants, and wildlife) (2.1) / *Poursuivre les inventaires (forêts, faune, PFNL, plantes médicinales)* (2.1.1)).

### The Forest Inventory and Analysis Program of the U.S. Forest Service

The U.S. Forest Service's Forest Inventory and Analysis (FIA) Program has existed in one form or another for over 70 years and covers all forests in the U.S. FIA is managed by the Research and Development branch of the U.S. Forest Service with the national FIA office located in Arlington, Virginia. The FIA provides the information needed to assess America's forests and projects how forests are likely to appear 10 to 50 years from now. FIA reports annually on status and trends in forest area and location; in the species, size, and health of trees; in total tree growth, mortality, and removals by harvest; in wood production and utilization rates by various products; and in forest land ownership. Data is also collected on soil, under story vegetation, tree crown conditions, coarse woody debris, and other forest resources. Because of the worldwide concern for carbon, the FIA data can be used to examine forest carbon characteristics with the U.S. Forest Service's Carbon Online Estimator among other tools.

FIA consists of two phases. Phase 1 classifies the land into forest and non-forest and measures fragmentation, urbanization, distance variables, and other features. Phase 2 consists of a set of field sample locations distributed across the landscape with approximately one sample location (FIA plot) every 6,000 acres. Forested sample locations are visited by field crews who collect a variety of forest ecosystem data. Non forest locations are also visited as necessary to quantify rates of land use change. Broadly speaking, the plots are established and inventoried with systematic and periodic follow up monitoring. The details of procedures and processes are quite numerous but readily available.

FIA provides objective and scientifically credible information on key forest ecosystem processes and attributes: how much forest there is, what it looks like, whether the forest area is increasing or decreasing, whether we are gaining or losing species, how quickly trees are growing, dying, and being harvested, and how the forest ecosystem is changing over time with respect to the soil and other vegetative community attributes. Such information could have many important uses in DRC including:

- ✓ Helping formulate good forest policy (including forest zoning decisions), and to assess the effectiveness of current and past policy to promote sustainability
- ✓ Improving forest management plans and to assessing the effects of current and past management practices on DRC forests
- ✓ Serving as a starting point for scientific investigations in a variety of areas which involve changes in DRC forest ecosystems over time
- ✓ Formulating business plans which will be both economically and ecologically sustainable over time
- ✓ Keeping the Congolese informed about the health and sustainability of DRC's forests.

In summary, the U.S. Forest Service has a vast experience in forest inventory. The agency has been carrying out the FIA for over 70 years. There are ostensibly numerous opportunities for fruitful technical exchange and cooperation between the USFS and MECNT on forest inventory.

The DRC is therefore requesting the following approach:

- 1. U.S. Forest Service International Programs (IP) coordinates an examination of the FIA and determines its applicability to DRC forests.
- 2. In preparation for a FIA visit to DRC, DRC would assemble all appropriate information required by the FIA team. In addition, the FIA team would develop a list of questions for DRC to respond to prior to the FIA team arrival.
- 3. USFS-IP mobilize a FIA team technical exchange visit to DRC to discuss the FIA, its structure, data collection methods, results and utility with a view to applying some version of FIA to DRC.
- 4. L'équipe FIA établira par la même occasion un état des lieux des besoins requis pour le développement de la version du programme FIA adapter à la RDC ainsi qu'un budget approprié (TBD)

**Objective:** Technical exchange between USFS national forest inventory (NFI) system and DRC authorities and experts in view of supporting the design and implementation of a multi-resource NFI to meet DRC forest governance and management objectives.

Estimated Dates	Objective
May 15-17	Team arrives, settles in with introductions at US Embassy and USAID, and continues preparations
May 18	-USFS meeting at US Embassy (10h)
	-USFS introductions with MECNT (including the Minister and/or Minister's Forest Advisor) and Director of the Studies and Planning Department as well as DIAF staff
May 19-21	- DIAF presentations on: 1) forest conditions; and 2) current forest inventory systems, methods, and data.
	- USFS presentations of theoretical FIA approaches (adapted FIA approaches) to NFI
	- Discussions on technical issues.
May 22-24	Field visit in most logistically convenient and interesting forest to see and discussion forest conditions and otherwise discuss field techniques and challenges. Visite de la réserve forestière de la LUKI située dans la province du Bas Congo par route (490 km de Kinshasa) pour voir la forêt relique du Mayumbe : 1 jour aller, 1 jour visite, 1 jour retour.
May 25	Meetings with other Kinshasa based stakeholders (FAO, UN REDD MRV, FCPF, Coopération japonaise, GTZ, WRI, OSFAC) convened and led by DIAF to discuss who is doing what on NFI related technical support.
May 26	Debriefing with DIAF and USAID and planning sessions on next steps
May 27	Debrief, final wrap up trip report writing, and departure

Location and Timing: Draft itinerary follows:

## **USFS Team Composition:**

This USFS team will consist of three individuals with a collective set of experience in the following:

- Knowledge of national forest inventory and monitoring principles and methodologies utilized by the USFS in the United States:
  - Design of a statistically valid and robust plot based national forest inventory;
  - Incorporation of remote sensing tools and applications into NFI;
  - Integration of other resource inventories into a NFI;
  - Establishment and implementation of NFI on the ground
- Ability to adapt US knowledge and processes to the context of a region with limited human, financial and material resources and with different legal, social, cultural and economic frameworks and natural resources.

#### **USFS Team Tasks:**

- 1. Present the USFS FIA methods, principles, and approaches to DRC partners
- 2. Engage in technical exchange sessions on NFI design and implementation principles;
- 3. Develop a trip report on the mission (see description under 'Deliverables').
- 4. Be available for periodic follow up on information exchanges once the team has returned.

#### Tasks for the DIAF:

- 1. Prior to the arrival of the USFS team, the DIAF will gather all available and relevant information, the special areas of engagement, and projects being implemented for the team to review to allow them to adequately prepare for the work to be done while incountry. As much as possible, this information should be sent to the USFS team electronically prior to their arrival. Any documents not available in an electronic format should be made available to the team upon arrival.
- 2. Identify point(s) of contact who will accompany the USFS team throughout the mission and be available for follow up on information exchanges once the team has departed.
- 3. Inform and convene partners providing technical support on NFI related work of the team's arrival and purpose of the mission, such that interactions with the USFS team will be most effective and efficient in exchanging the data, needs, perspectives, etc. necessary for the mission.
- 4. In-country logistical support:
  - a. Inform local officials of team's arrival and purpose of their engagement in region.
  - b. Arrange for meetings with appropriate key officials and partners.
  - c. Arrange for in-country transportation and necessary lodging reservations (*Jim Beck to work with DIAF and USAID on this*).
  - d. Arrange for a translator to accompany the USFS team during the mission (*Jim Beck to work with DIAF and USAID on this*).

#### **Deliverables:**

Trip Report: the USFS team will produce a report detailing activities during the mission and all results and findings of the work toward the accomplishment of the objectives and tasks listed above. This report will include, but not be limited to:

- 1. Executive summary
- 2. Introduction

- 3. Issues, findings, & recommendations
- 4. Next steps:
  - a. A prioritized list of future tasks that should be addressed in advancing the NFI development and implementation in the DRC,
  - b. A prioritized list of future tasks for possible USFS engagement in DRC (and regionally) on NFI design and implementation
- 5. Appendices
  - a. Scope of work
  - b. Itinerary
  - c. List of contacts made

### Read ahead / background documents:

- The Forests of the Congo Basin: State of the Forest 2008 http://www.cbfp.org/Stateoftheforest.html
- USAID Central Africa Regional Program for the Environment http://carpe.umd.edu/
- CARPE Information Management Tool: <u>http://carpe-infotool.umd.edu/IMT/</u>
- USFS Trip Reports: http://rmportal.net/library/usda-forest-service-document-collection
- USFS/CARPE Land use planning guides: http://carpe.umd.edu/Plone/resources/carpemgmttools
- USFS Overview Activities in Congo Basin: http://www.fs.fed.us/global/globe/africa/basin.htm

Date	Description of meeting			
May 15	USFS team arrival in PM			
May 16	USFS team internal discussions and preparations			
May 17	- Meeting with John Flynn for general exchange and context setting			
	- Continued USFS team internal discussions and preparations			
May 18	- RSO Debriefing			
	- Introductory meetings with the DIAF to set stage and clarify mission objectives			
May 19	- Meeting with DEP for coordination of donors and other technical assistance partners and better understand who is doing what			
	<ul> <li>Meeting with National REDD coordination unit to introduce mission and get briefing on status of REDD in DRC</li> </ul>			
	- Meeting with SG, MECNT to introduce mission			
	- Meeting with Minister, MECNT jointly with CARPE Director to introduce mission			
May 20 - DIAF presentations on: 1) forest conditions; and 2) current and past forest inv systems, methods, and data.				
	- USFS presentations of FIA methodologies and approaches (adapted FIA methodologies and approaches) to NFI			
	- FAO UNREDD MRV consultant presentations on UNFCCC background, proposed methodological approach for MRV in DRC with special emphasis on Carbon NFI			
	- Discussions on technical issues.			
May 21	- Continued USFS/DIAF/FAO discussion on technical issues.			
May 22	- Travel to Luki Biosphere Reserve			
	- Introductions of mission and field staff and establish field program and objectives			
	- Continued USFS/DIAF/FAO discussion on technical issues.			
May 23	<ul> <li>Full day in forest to: 1) see diversity of forest types and conditions; 2) discuss field techniques and challenges; 3) learn about different silvicultural treatments and results to date; 4) visit research plots and discuss techniques; 5) visit other WWF and other partner Luki activities in the core, buffer, and transition zones.</li> <li>Continued USFS/DIAF/FAO discussion on technical issues.</li> </ul>			

## 4.2 Itinerary

May 24	- Return from Luki Biosphere Reserve
May 25	Series of individual meetings with other Kinshasa based stakeholders (AFD, GTZ, WRI, OSFAC, FIB) convened and led by DIAF to discuss who is doing what on NFI related technical support and early discussions on possible future cooperation.
May 26	Continued USFS/DIAF/FAO discussion on: - Identification and discussion of the DIAF objectives, questions, and metrics for the different types of forest inventory (REDD, Management Inventories, and NFI); - Identification on key steps and tasks for the development and implementation of NFI ; - Identification of potential contributions of various partners ; and - Other technical/methodological issues
May 27	<ul> <li>Meeting with FAO DRC Country Representative to introduce mission objectives and secure contact</li> <li>Debrief with USAID (CARPE and DRC Bilateral Mission)</li> <li>Continued USFS team discussion, identify immediate next steps, division of tasks, trip report writing, and departure</li> </ul>

## 4.3 List of Contacts Made

Name	Title/Institution
José ENDUNDO BONONGE	Minister, MECNT
Albert LIKUNDE LI-BOTAYI	Secretary General, MECNT
Sebastien MALELE MBALA	Director, DIAF, MECNT
Andre KONDJO	Inventory Division Chief, DIAF, MECNT
Christophe MUSAMPA	Geomatics Division Chief, DIAF, MECNT
Teddy NTENDAYI	Inventory Office Lead, DIAF, MECNT
Matieu HENRY	Consultant, FAO DRC UNREDD
Landing MANE	Director, OSFAC
Lyna BELANGER	Regional Coordinator, WRI
John FLYNN	Director, CARPE
David YANGGEN	Deputy Director, CARPE
Stephen HAYKIN	Chief of Mission, DRC USAID
Joseph HIRSCH	Agriculture Officer, DRC USAID
Francoise VANDEVEN	Secretary General, Federation Industrielle de Bois (FIB)
Jaap SCHOORL	Coordinator, GTZ DRC Biodiversity and Forest Programme
Susanne BELOT	Technical Advisor RH, GTZ DRC Biodiversity and Forest Programme
Marie-France GEVRY	Coordinator, Congo Basin NRM training support programme, University de Laval
Leon KANU MBIZI	Coordinator National REDD, DRC, MECNT
Fabien MONTEILS	Principal Technical Advisor, UNREDD DRC
Roger Mambeta NDONA	Coordinator National, WRI-DRC
Simon RIETBERGEN	Senior Forestry Specialist, AFTEN, World Bank
Ndiaga GUEYE	FAO DRC Country Representative
Francois KAPA	FAO DRC Forest Expert - Responsable FAO dossier REDD
Vangu LUTETE	FAO DRC Deputy Country Representative

Jose ILANGA LOFONGA	Director/Coordinator, Study and Planning Department, MECNT
Virginie LEROY-SAUDUBRAY	Chargee de Mission, AFD
Philippe Duchochois	MECNT Technical Advisor, AFD
Robert LEPROHON	USFS Consultant, DIAF, MECNT
Laurent NSENGA	Program Manager, WWF Luki

## 4.4 **Operational Guidelines for Forest Management (DIAF)**

## LISTE DES 25 GUIDES OPÉRATIONNELS (DIAF)

La DIAF dispose d'une série de guides opérationnels. Ces documents visent à jeter les bases techniques pour l'exploitation rationnelle et la gestion durable des ressources forestières du pays. Différents thèmes sont abordés et traduits dans des documents spécifiques (disponibles ou en élaboration). Les documents existants disponibles sont (\*nouveautés en cours de validation) :

- Glossaire des termes usuels en Aménagement forestier
- Normes de zonage forestier
- Liste des essences forestières de la République Démocratique du Congo;
- Normes de stratification forestière;
- Canevas de l'autorisation d'exploitation forestière anticipée;
- Normes d'élaboration du plan de sondage de l'inventaire d'aménagement;
- Normes d'inventaire d'aménagement forestier;
- Attestation de conformité du plan de sondage;
- Modèle de rapport d'inventaire d'aménagement;
- Protocole de vérification et d'approbation du rapport d'inventaire d'aménagement;
- Canevas de rédaction du plan d'aménagement;
  - o Canevas de description biophysique du milieu naturel;
  - Canevas de description socio-économique;
  - Normes d'affectation des terres;
  - Modèle de calcul de la possibilité forestière;
  - Mesures de protection de l'environnement et de conservation de la biodiversité dans les concessions forestières (équivaut à des normes d'intervention en milieu forestier. Document en gestation);
  - Canevas du plan de gestion quinquennal;
- Protocole de vérification et d'approbation du plan d'aménagement;
- Normes d'Exploitation Forestière à Impact Réduit (EFIR);
- Normes d'inventaire d'exploitation;
- Canevas d'élaboration du Plan Annuel d'exploitation forestière;
- Canevas de déclaration trimestrielle de production de bois d'oeuvre;
- Canevas du rapport annuel d'opérations forestières;
- Canevas de fiche de fermeture de l'Assiette Annuelle de Coupe
- Canevas de certificat de recollement.

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#### **Proposed NFI/REDD Development and Implementation Steps and** 4.5 **Possible Partner Roles**

(May 26, 2010)

Organizations

Steps/Tasks	DIAF	FAO	USFS
Objectives/Questions/Variables/Precision	FTI	FT	Т
Secure funding sources	1		
Capacity building	I	FTI	Т
Collect remote sensing and field experience from existing projects in DRC (and perhaps elsewhere)	I	FT	т
Develop proposed methodology (plot and sampling designs and field procedures)	TI	FTI	т
Begin developing database and data entry program	TI	FTI	Т?
Decide on stratification for area estimation and sample allocation	TI	FT	Т
Pre-sampling to evaluate precision and costs by strata	TI	FTI	Т?
Finalize the methods (mostly sample size) and materials	TI	FT	Т
Finalize database and data entry program	TI	FTI	Т?
Pre-field planning, tallysheets, maps, materials, and logistics	TI	FT	
Field data collection	TI	FT	
Quality Assurance/Quality Control	TI	FT	Т
Enter and edit data	TI	FT	
Identify or develop volume/biomass/carbon equations	TI	FTI	
Soil/litter sample analysis	TI	FT	
Compile data (apply the equations to the data, i.e., estimate biomass/carbon by pool)	TI	FT	T?
Reporting - Compute and report estimates and their sampling errors, including QA		FT	T?
Verification		FT	
Additional Technical Support related to ongoing Convention negotiations			Т

# Legend: E = Eunding T = Technical Support I = Implementation**Bold**= Leader/Coordinator