VCS Quality Assurance and Quality Control Plan

Monitoring Carbon Stocks in the Rimba Raya Biodiversity Reserve

Version 1.2
August 30, 2010

Background

The QA/QC plan is an integral part of the Rimba Raya monitoring plan and will provide the basis for verifying the accuracy and consistency of field measurements and ensuring the integrity of data collection, analysis, and management of project databases and database archival during the crediting period. The ultimate purpose of implementing the QA/QC plan is to ensure the net avoided emissions are measured and monitored precisely, credibly, verifiably and transparently.

Methodology

The methodology for this project follows the "Baseline and Monitoring Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests, Version 5.1 December, 2009", developed by Winrock International[1]. The full report[2] of the methodology should be used as a reference when reading this section along with the Final Baseline Emission Estimate for the PT Rimba Raya Restoration Concession[3].

Quality control (QC) procedures to be applied to the monitoring process

Quality Control (QC) is a system of routine technical activities, to measure and control the quality of the inventory as it is being developed.

The QC system is designed to:

- Provide routine and consistent checks to ensure data integrity, correctness, and completeness;
- Identify and address errors and omissions;
- Document and archive inventory material;
- Record all QC activities.

QC activities include general methods such as accuracy checks on data acquisition and calculations and the use of approved standardized procedures for emission calculations, measurements, estimating uncertainties, archiving information and reporting. Higher tier QC activities include technical reviews of source or sink categories, activity and emission factor data, and methods.

[1] www.v-c-s.org/docs/NM-Baseline-Component_A-Land-Use-Change-(plantations)_v5.1_031209.pdf

[2] Accessed April 10, 2010 at http://www.v-c-s.org/docs/NM-Baseline-Component_A-Land-Use-Change-(plantations)_v5.1_031209.pdf

[3] Rimba Raya Preliminary Baseline Report, Version 4.0

Quality assurance (QA) procedures to be applied to the monitoring process

Quality Assurance (QA) activities include a planned system of review procedures conducted by personnel not directly involved in the inventory compilation/development process. Reviews by independent third parties, will be performed upon a finalized inventory following the implementation of QC procedures. These reviews verify that data quality objectives were met, ensure that the inventory represents the best possible estimates of emissions and sinks given the current state of scientific knowledge and data available, and support the effectiveness of the QC program.

To ensure the net avoided emissions are measured and monitored precisely, credibly, verifiably and transparently, a quality assurance and quality control (QA/QC) procedure shall be implemented, including:

1. Collection of reliable field measurement;
2. Reliable collection and analysis of aerial imagery (if applicable);
3. Verification of methods used to collect field data;
4. Verification of data entry and analysis techniques;
5. Data maintenance and archiving.

If after implementing the QA/QC plan it is found that the targeted precision level is not met, then additional field measurements need to be conducted until the targeted precision level is achieved.

1. Reliable field measurements

Collecting reliable field measurements is an important step in the QA plan. Those responsible for the carbon measurements should be trained in all aspects of field data collection and data analyses. The Standard Operating Procedures (SOP's) should be established for each step of field carbon measurements. These SOPs should detail all phases of the field measurements so that the measurements can be repeated. A document should be produced and completed verifying that all QA/QC steps have been taken.

Field crews should receive training and be fully cognizant of all procedures and the importance of collecting accurate data. An audit program for field measurements and sampling should be established. A typical audit program consists of three types of checks. During a "hot" check, auditors will observe members of the field crew during data collection on a field plot (this is primarily for training purposes). Cold checks occur when field crews are not present for the audit. Blind checks represent the complete re-measurement of a plot by the auditors. Hot checks allow the correction of errors in techniques. Measurement variance can be calculated through blind checks. When field work is completed, about 10 percent of the plots should be checked independently. Field data collected at this stage can be compared with the original data, and errors should be corrected and recorded. Errors can be expressed as a percentage of all plots that have been rechecked to provide an estimate of the measurement error.

2. Reliable aerial imagery collection and analysis

If collected properly, aerial imagery is a powerful and cost-effective way to estimate carbon stocks remotely. A systematic sampling design should be used to select plots for analysis. A subset of image plots should be selected randomly and interpreted independently by at least

one different analyst. Persons involved in the field measurement work should be trained in field data collection and data analyses. Standard Operating Procedures (SOPs) for each step of the imagery collection and analysis shall be developed and adhered to at all times. These SOPs should detail all phases of the field measurements and contain provisions for documentation for verification purposes, so that measurements are comparable over time and can be checked and repeated in a consistent fashion. Field-team members shall be fully aware of all procedures and the importance of collecting data as accurately as possible.

3. Verification of field data collection

To verify that plots have been installed and the measurements taken correctly, 10-20% of plots shall be randomly selected and re-measured independently. Key re-measurement elements include the location of plots, DBH and tree height. The re-measurement data shall be compared with the original measurement data. Any deviation between measurement and re-measurement below 5% will be considered tolerable and error above 5%. Any errors found shall be corrected and recorded. All errors discovered should be expressed as a percentage of all plots that have been rechecked to provide an estimate of the measurement error.

4. Verification of data entry and analysis

Reliable estimation of carbon stock in pools requires proper entry of data into the data analyses spreadsheets. To minimize the possible errors in this process, the entry of both field data and laboratory data shall be reviewed using expert judgment and, where necessary, comparison with independent data to ensure that the data are realistic. Communication between all personnel involved in measuring and analyzing data should be used to resolve any apparent anomalies before the final analysis of the monitoring data is completed. If there are any problems with the monitoring plot data that cannot be resolved, the plot should not be used in the analysis.

5. Data maintenance and archiving

Due to the long-term nature of the Rimba Raya project activity, data shall be archived and maintained safely. Data archiving shall take both electronic and paper forms, and copies of all data shall be provided to each project participant. All electronic data and reports shall also be copied on durable media such as CDs and copies of the CDs are stored in multiple locations.

The archives shall include:

- Copies of all original field measurement data, laboratory data, data analysis spreadsheet;
- Estimates of the carbon stock changes in all pools and non-CO2 GHG and corresponding calculation spreadsheets;
- GIS products (including all aerial imagery if applicable);
- Copies of the measuring and monitoring reports.

Table 1. Quality control activities and procedures

QC activity	Procedures
Check that assumptions and criteria for the selection of activity data emission factors and other estimation parameters are documented.	Cross-check descriptions of activity data emission factors and other estimation parameters with information on source and sink categories and ensure that these are properly recorded and archived.
Check for transcription errors in data input and reference.	Confirm that bibliographical data references are properly cited in the internal documentation Cross-check a sample of input data from each source category (either measurements or parameters used in calculations) for transcription errors.
Check that emissions and removals Reproduce a representative sample of emission or removal calculations are calculated correctly.	Selectively mimic complex model calculations with abbreviated calculations to judge relative accuracy.
Check that parameter and units are correctly recorded and that appropriate conversion factors are used.	Check that units are properly labeled in calculation sheets. Check that units are correctly carried through from beginning to end of calculations. Check that conversion factors are correct. Check that temporal and spatial adjustment factors are used correctly.
Check the integrity of database files.	Confirm that the appropriate data processing steps are correctly represented in the database. Confirm that data relationships are correctly represented in the database. Ensure that data fields are properly labeled and have the correct design specifications. Ensure that adequate documentation of database and model structure and operation are archived.
Check for consistency in data between categories.	Identify parameters (e.g., activity data, and constants) that are common to multiple categories of sources and sinks, and confirm that there is consistency in the values used for these parameters in the emissions calculations.
Check that the movement of inventory data among processing steps is correct	Check that emission and removal data are correctly aggregated from lower reporting levels to higher reporting levels when preparing summaries. Check that emission and removal data are correctly transcribed between different intermediate products.
Check that uncertainties in emissions and removals are estimated or calculated correctly.	Check that qualifications of individuals providing expert judgment for uncertainty estimates are appropriate. Check that qualifications, assumptions and expert judgments are recorded. Check that calculated uncertainties are complete and calculated correctly. If necessary, duplicate error calculations on a small sample of the probability distributions used by Monte Carlo analyses.
Undertake review of internal documentation	Check that there is detailed internal documentation to support the estimates and enable reproduction of the emission and removal and uncertainty estimates. Check that inventory data, supporting data, and inventory records are archived and stored to facilitate detailed review. Check integrity of any data archiving arrangements of outside organizations involved in inventory preparation.
Check time series consistency	Check for temporal consistency in time series input data for each category of sources and sinks. Check for consistency in the algorithm/method used for calculations throughout the time series.
Undertake completeness checks.	Confirm that estimates are reported for all categories of

	sources and sinks and for all years. Check that known data gaps that may result in incomplete emissions estimates are documented and treated in a conservative way.
Compare estimates to previous estimates	For each category, current inventory estimates should be compared to previous estimates, if available. If there are significant changes or departures from expected trends, re- check estimates and explain the difference.