UNITED NATIONS
RECOMMENDATION:
INDONESIA'S REDD+
ACTION PLAN FOR
INFORMATION,
MONITORING &
MEASUREMENT,
REPORTING AND
VERIFICATION (MRV)

UN-REDD
PROGRAMME

July 2011

United Nations Recommendation:

Indonesia's REDD+ Action Plan For Information, Monitoring & Measurement, Reporting And Verification (MRV)

UN-REDD Global Programme

Produced by the Global Programme of The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD Programme). The Programme was launched in September 2008 to assist developing countries prepare and implement national REDD+ strategies, and builds on the convening power and expertise of the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP).

For more details on the UN-REDD Programme see http://www.un-redd.org/.

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EXECUTIVE SUMMARY

Greenhouse gas (GHG) emissions from deforestation, forest degradation and peatland drainage are the major contributors to Indonesia's emissions profile, making it one of the world's highest emitting countries. The development and implementation of mechanisms to reduce emissions from deforestation and forest degradation; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks (REDD+) is now a national priority for the Government of Indonesia as part of their climate change mitigation and adaptation strategies. National REDD+ efforts should strive towards internationally-recognised standards and verification under the United Nations Framework Convention on Climate Change (UNFCCC), while ensuring national ownership and safeguarding sovereignty.

This document, prepared by the UN-REDD Programme, sets out an United Nations recommended action plan for developing, implementing and operationalising an Indonesian system for Information, Monitoring and Measurement, Reporting and Verification (MRV) for REDD+, following the most recent internationally-agreed decisions under the UNFCCC and methodological guidelines of the Intergovernmental Panel on Climate Change (IPCC). Implementation of Indonesia's Information, Monitoring and MRV System should follow a phased approach, in line with the three phases of REDD+. The document details the requirements for Indonesia to complete each phase.

Indonesia is currently in Phase 1, building national REDD+ capacity through international partnerships and initiatives. Phase 1 will further require Indonesia to determine its institutional arrangements for Information, Monitoring and MRV, establish an MRV Institution and develop national REDD+ policies and measures.

In Phase 2 Indonesia should to begin to implement national policies and sub-national REDD+ demonstration activities – ensuring they are results-based through a monitoring system – and develop a system for providing information on how the REDD+ safeguards are being addressed and respected, as set out by the UNFCCC.

In Phase 3 REDD+ will become fully integrated with other mitigation mechanisms under UNFCCC, meaning that the REDD+ activities should be fully measured, reported and verified. This will require an operational Satellite Land Representation System to provide activity data on forest area and forest area changes, and a National Forest Inventory for REDD+ to quantify emissions or removals per unit activity. These will be combined in a REDD+ GHG Inventory to report on the mitigation performance of REDD+ activities in the country, for submission to the UNFCCC as part of Indonesia's National Communication.

This document sets out institutional arrangements and capacity building needs to develop and implement each of these components. The Annexes detail a) specific methodologies to develop each of the components, b) a one-year calendar of activities, and c) a budget template with some preliminary figures.

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SECTION 1: CONTEXT

1. INTRODUCTION

Climate change threatens many of the United Nations Millennium Development Goal (MDG) commitments and achievements Indonesia has made in the past decade. With 17,000 islands, Indonesia is especially vulnerable to rising sea levels and floods, while erratic weather patterns could impact agricultural production that supports the livelihoods of much of the rural population. Most MDG goals, particularly poverty reduction, will therefore be severely compromised in the absence of adequate adaptation interventions.

Indonesia is also a major emitter of greenhouse gases GHGs: annual GHG emissions amounted to approximately 1.7 gigatonnes (Gt) in 2000 and 2.1 Gt in 2005. As a major GHG emitter vulnerable to the effects of rising global temperatures, the Government of Indonesia has played a leading role in addressing global climate change. At the G20 Summit in Pittsburgh in September 2009, President Susilo Bambang Yudhoyono committed Indonesia to a 26% GHG emission reduction target by 2020 (compared to a business-as-usual (BAU) scenario), and a 41% target with international support. By shifting to a less carbon-intensive economic growth model and playing a leading role in addressing global climate change, the country aims to:

- Play a proper and appropriate role in combating climate change which threatens the country's future prosperity and well-being;
- Create a more sustainable and diversified economic growth model in the provinces and districts without sacrificing the country's national economic and development objectives, and providing new energy and purpose for its decentralisation programme;
- Be a leader in innovative climate financing, providing diverse models to capture global financing to support not only Indonesia's climate change programmes but also the country's more general development objectives.

As Indonesia continues to develop, its total GHG emissions are expected to rise to 2.95 Gt by 2020 under a BAU scenario (Boer et al., 2010) (Figure 1). Emissions from land use, land use change and biomass burning (emissions from deforestation and peat degradation) made up approximately 70% of Indonesia's 2000 GHG emissions: by far the largest contributors to Indonesia's current and expected future emissions under this BAU scenario. These practices not only contribute to global climate change but also threaten biodiversity conservation and the provision of livelihoods and myriad ecosystem services. As the country seeks to mitigate its contribution to global emissions, therefore, this sector is a major reductions target.
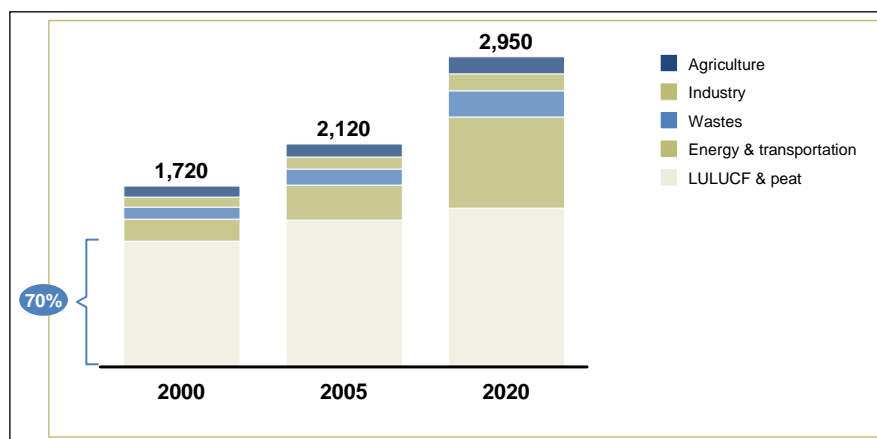

Figure 1. Projected BAU emissions (million tonnes CO_2 emissions) in Indonesia (Boer et al., 2010).

1.1   REDD+

The 15th Conference of the Parties (COP15) to the UNFCCC in 2009 adopted a Decision (4/CP.15) 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" (REDD+), an international policy mechanism to reduce emissions from forestry activities. For the practical development and implementation of REDD+, the Decision advises Parties to "use the most recent Intergovernmental Panel on Climate Change (IPCC) guidance and guidelines (IPCC, 2003; 2006), as adopted or encouraged by the COP, as appropriate, as a basis for estimating anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes".

A Decision adopted by Parties at COP16 in Cancun, December 2010, states the five forest related activities identified under REDD+ (FCCC/CP/2010/7/Add.1/C/Par.70):

(i)   Reducing emissions from deforestation;
(ii)   Reducing emissions from forest degradation;
(iii)   Conservation of forest carbon stocks;
(iv)   Sustainable management of forests;
(v)   Enhancement of forest carbon stocks.

This broad scope was agreed in order to reflect the wide range of countries' national circumstances (e.g. high forest cover and high deforestation/high forest cover and low deforestation/expanding forest areas and corresponding carbon stocks).

At COP16 Parties also agreed to a series of rules to formally structure REDD+. Importantly, with paragraph 73 of the Decision, the COP "decides that the activities undertaken by Parties referred to in paragraph 70 [the five REDD+ activities] should be implemented in phases". This is significant as it allows developing countries to undertake a learning-by-doing approach, and allows the participation of all potential REDD+ countries regardless of their current national circumstances. Paragraph 73 outlines the activities to be undertaken in each of the three REDD+ phases as follows:

1. Development of national strategies or action plans, policies and measures, and capacity-building;
2. Implementation of national policies and measures and national strategies or action plans that could involve further capacity-building, technology development and transfer and results-based demonstration activities;
3. Evolution of all the REDD+ activities into results-based actions that should be fully measured, reported and verified.

Paragraph 71 of the Cancun Agreements also sets out a number of elements that developing country Parties aiming to undertake REDD+ activities under the Convention are requested to develop:

- A national strategy or action plan (this document is one such action plan);
- A robust and transparent national forest monitoring system for the monitoring and reporting of REDD+ activities;
- A system for providing information on REDD+ safeguards.

Given the pace and extent of deforestation and forest degradation across the country, REDD+ has become a priority for Indonesia. More than 80% of Indonesia's planned emission reductions could be achieved through the forestry sector and peatland management. This translates to an emission reduction in the forestry sector of 0.672 Gt CO_2e to reach the 26% reduction target and 1.039 Gt CO_2e to reach the 41% reduction target. REDD+ could therefore play an important role in supporting Indonesia's voluntary commitment to reduce its national GHG emissions. For this to be realised some

significant steps, ranging from capacity building to institutional development and policy interventions, have to be taken.

1.2   INFORMATION, MONITORING & MEASUREMENT, REPORTING AND VERIFICATION (MRV) FOR REDD+

This document provides guidance on the development and implementation of Information, Monitoring and Measurement, Reporting and Verification (MRV) systems for REDD+ under the UNFCCC in Indonesia. The context and implications of each of these components are now outlined.

Firstly, "Information" refers to the UNFCCC's request for Parties aiming to undertake REDD+ activities to develop a system for providing information on how REDD+ safeguards are being addressed and respected throughout the implementation of REDD+ activities, while respecting sovereignty. The concept of safeguards was introduced during COP15 and adopted as part of the REDD+ Decision at COP16 (1/CP.16). The seven REDD+ safeguards listed in Annex 1 of the Cancun Agreements text are:

(a) Actions to be consistent with the objectives of national forest programmes and international conventions and agreements;
(b) Transparent and effective national forest governance structures;
(c) Respect for the knowledge and rights of indigenous peoples and local communities;
(d) The full and effective participation of relevant stakeholders;
(e) Actions to be consistent with the conservation of natural forests and biological diversity;
(f) Actions to address the risks of reversals (permanence);
(g) Actions to reduce displacement of emissions (leakage).

To fulfill the Decision requirement, countries need to develop a REDD+ Safeguards Information System that provides all the necessary information, in a transparent and openly available manner, on how the REDD+ safeguards are addressed in the implementation of all national and sub-national (demonstration) activities and policies related to the five REDD+ activities. Because this applies to demonstration activities, the Information System must be operational in Phase 2 of REDD+.

Secondly, "Monitoring" refers to a system which:

1. In Phase 2 of REDD+:
    a. Validates that sub-national demonstration activities are results-based (i.e. result in measureable positive outcomes), which is a requirement of the Convention (Decision 1/CP16 Para. 73) – through a *Demonstration Activities Monitoring System*; and
    b. Provides basic national-level coverage data, e.g. forest cover changes and the location of fires (which should feed into the REDD+ Safeguards Information System, to provide information on safeguards such as forest governance structures, the conservation of natural forests, permanence and leakage)[1].

2. In Phase 3 of REDD+:
    a. Validates that the implementation of national policies and measures on all the national territory are results-based (i.e. determines how much of each REDD+ activity is taking place over the national territory and how these are changing) – through a *National Performance Monitoring System*; and
    b. Continues to provide basic national-level coverage data.

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[1] A Satellite Land Representation System (SLRS) can generate the requisite data on the location, extent and related changes of the five REDD+ activities for sub-national demonstration activities and basic national coverage data.

Thirdly, an MRV System – which, along with the above-outlined monitoring systems comprise a National Forest Monitoring System (Par. 71(c) Decision 1/CP.16; Par. 1(d) Decision 1/CP.15) as referred to by the UNFCCC – fulfils the REDD+ measurement, reporting and verification commitments under the Convention (Art. 4). The purpose of an MRV System is to assess and report on anthropogenic GHG emissions by sources and removals by sinks related to forest land. This system must enable identification and tracking of actions and processes related to the five activities identified under REDD+, following the most recently adopted or encouraged IPCC methodological approaches (Decision 4/CP.15).

In the IPCC's Good Practice Guidance the most common methodological approach to the "Measurement" component of MRV is to combine information on the extent to which a human activity takes place (activity data, AD) with coefficients which quantify the emissions or removals per activity unit (emission factors, EF). To collect this data for the REDD+ activities requires:

1. A Satellite Land Representation System (SLRS) to assess AD on forest area and forest area changes;
2. A National Forest Inventory (NFI) to assess EFs on carbon stocks and carbon stock changes.

This information is combined to compile a GHG Inventory for REDD+ (Figure 2), forming part of countries' National Communications to the UNFCCC: the "Reporting" element of MRV. The core elements of National Communications are information on GHG emissions and removals, measured in CO_2e, and details of activities a country has undertaken to fulfil its commitments under the UNFCCC.

"Verification" refers to the subsequent process of independent review (checking of the accuracy and reliability), undertaken by the UNFCCC Secretariat through its roster of experts, of reported information and the procedures used to generate information. This process will involve a team of experts visiting the country to review the methods used for compiling the GHG-I. A complete MRV System (Figure 2) should allow countries to access international <u>performance-based</u> REDD+ finance.

Once it is fully operational in Phase 3 of REDD+, the MRV System can also able to be used to MRV any other Nationally Appropriate Mitigation Actions (NAMAs) in the Agriculture, Forestry and Land Use (AFOLU) sector (Annex II of Decision 1/CP.16) that Indonesia chooses to undertake. For example, if Indonesia chooses to undertake mitigation activities on agricultural land, then these activities would be measured, reported and verified through the same MRV System as the five REDD+ activities.
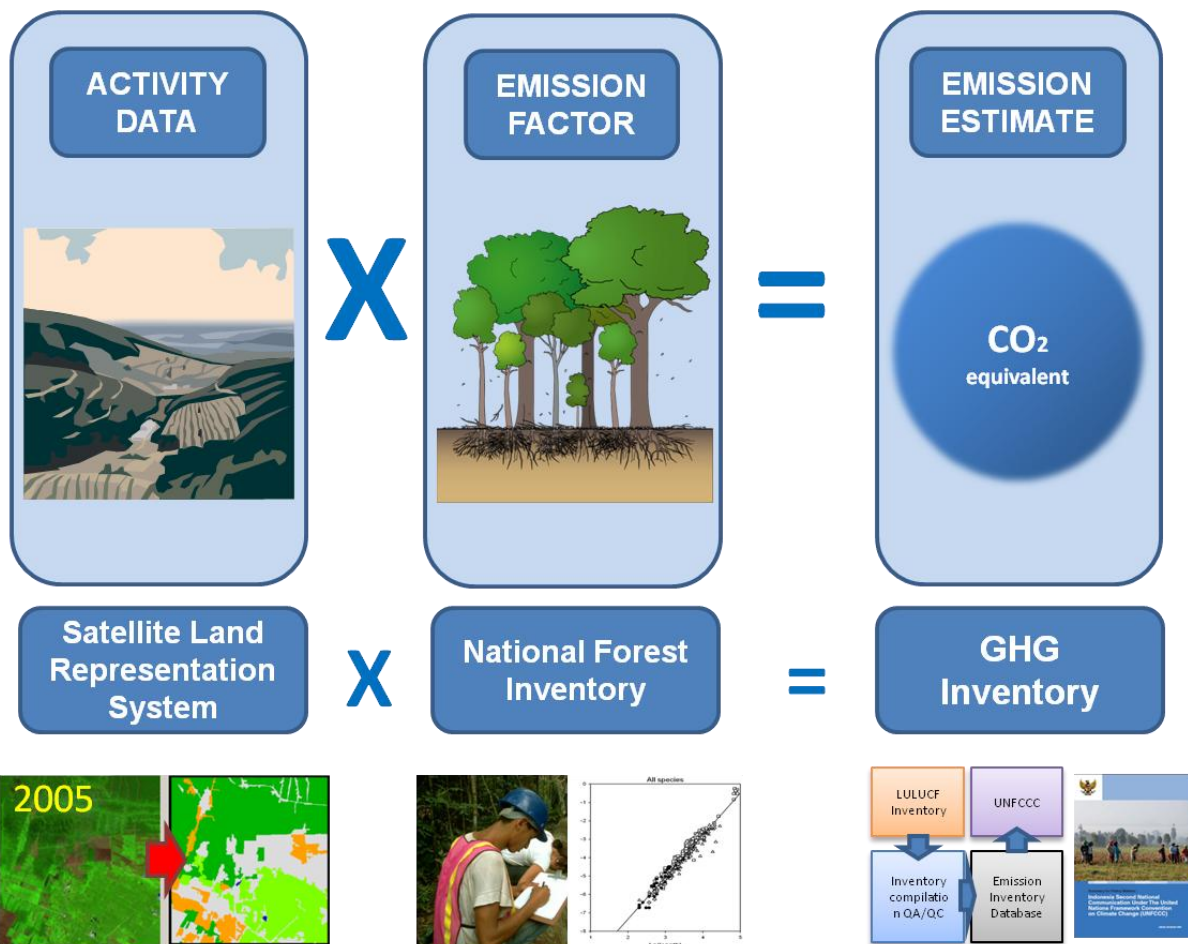
Figure 2. The IPCC's methodological approach to calculate anthropogenic GHG emissions by sources and removals by sinks related to forest land.

Information, Monitoring and MRV Systems should be developed following the three phases of the REDD+ mechanism, ensuring results-based demonstration activities in the Phase 2, and fully measured, reported and verified (i.e. performance-based) REDD+ mitigation activities in Phase 3 (Figure 3). Each phase aims to build capacity and prepare for the subsequent phase, meaning that there can be an element of overlap between phases, e.g. preparing and building capacity for the NFI and REDD+ GHG inventory in Phase 2. The length of time it takes to progress through the three phases will vary from country to country, depending on existing capacities and capabilities, national circumstances and levels of international support received.
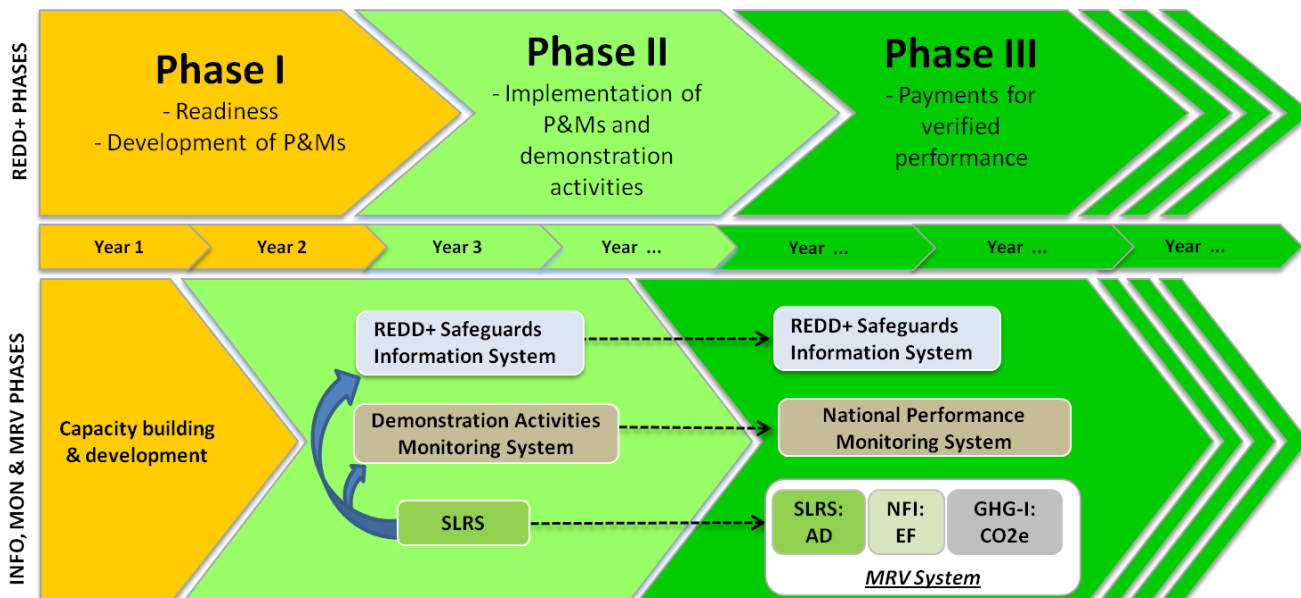
Figure 3. Multiphase implementation of REDD+ through MRV development and components of the Information, Monitoring and MRV System for REDD+. Phase 2 will involve the operationalisation of the REDD+ Safeguards Information System and the Demonstration Activities Monitoring System, both of which should derive data and imagery from a Satellite Land Representation System (SLRS). The transition to Phase 3 should be achieved through the operationalisation of the full Information, Monitoring and MRV System, involving the production of Activity Data (AD) from the SLRS, and Emission Factors (EF) from a National Forest Inventory (NFI), which should be compiled into a REDD+ GHG Inventory. The REDD+ Safeguards Information System remains active in Phase 3, while the Demonstration Activities Monitoring System is upgraded to a National Performance Monitoring System.

1.3   THE NATIONAL INVENTORY SYSTEM

The periodic production of national GHG inventories requires countries to set a series of functions for their planning, preparation and management. To this end, the most appropriate reference is Article 5.1 of the Kyoto Protocol of the UNFCCC, which formalised these functions in a decision text as the "national system" for a GHG inventory. A national inventory system includes all institutional, legal and procedural arrangements made within a country for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and for reporting and archiving inventory information.

The main objectives of national systems are to assist Parties to estimate their anthropogenic GHG emissions by sources and removals by sinks, to report these emissions and to ensure and improve the quality of their inventories. National inventory systems should be designed and operated to ensure the transparency, consistency, comparability, completeness and accuracy of inventories. In the context of REDD+, the national inventory system comprises the elements through which the REDD+ GHG inventory is compiled, i.e. the SLRS for AD and NFI for EFs. For NAMAs in the LULUCF sector, such as agricultural mitigation actions, the approach for compiling the GHG inventory is the same. The activities to develop both inventories should therefore be closely coordinated.

As a Non-Annex 1 (developing) Party under the Convention, Indonesia will most likely be requested to fulfil the same reporting requirements as Annex 1 (developed) Parties in Phase 3, when REDD+ is integrated with other mitigation actions under the Convention. This will involve the submission of National Communications every four years, and update reports every two years. Nevertheless, it is advisable for Indonesia to submit a National Communication following Annex 1 reporting requirements prior to Phase 3 is reached. This can for example be done for the next National Communication to UNFCCC, which is scheduled for 2014. Such an exercise will provide valuable feedback from the UNFCCC and their roster of experts in charge of verification that will help Indonesia improve its GHG inventory prior to Phase 3.

1.4   OBJECTIVES & GUIDING PRINCIPLES

This document provides guidance for Indonesia to leverage maximum benefits from the future REDD+ mechanism under the UNFCCC by setting out the requisite elements in a phased approach to MRV, fully integrated with the three phases of the REDD+ mechanism. The phased approach also allows optimal allocation of human, material and financial resources. The recommended action plan presented here includes all the operations and actions that the Government of Indonesia should undertake to achieve an operational REDD+ information and monitoring system that is a prerequisite to moving to the next phase, as well as all of the activities required to develop a fully operational Information, Monitoring and MRV System.

The 2006 IPCC Guidelines (though not yet adopted by the UNFCCC) provide the methodological basis for the proposed Indonesian Information, Monitoring and MRV System, since they are the most up-to-date guidelines produced by the IPCC and are fully consistent with the 2003 IPCC Good Practice Guidance (GPG) for Land Use, Land Use Change and Forestry (LULUCF), currently adopted by the UNFCCC for reporting GHG Inventories. Due to the significance of peatland emissions in Indonesia, the Information, Monitoring and MRV System should place specific emphasis on this area.

Establishing clear long-term institutional arrangements, roles and responsibilities – i.e. a National Inventory System – is essential in order to design, establish, manage and report on an Information, Monitoring and MRV System under the UNFCCC. Clear institutional mandates must therefore be put in place for the coordination of administrative and technical duties, quality checking of reported figures and fulfilment of procedural requirements of MRV for REDD+. Moreover, effective coordination mechanisms will be important to ensure interaction between all stakeholders at the national and sub-national levels, which will involve capacity building for the implementation of MRV components as an essential first step in the implementation of REDD+. This should include supporting legislation in Indonesia. Institutional arrangements for the Information, Monitoring and MRV System should be based on existing institutions and capabilities where possible, only building new ones where necessary.

The approach taken to the development and implementation of Information, Monitoring and MRV for REDD+ recommended by this document has been guided by a number of key policy and technical principles. The policy principles are the following:

1. **National ownership**: Indonesia should have the full control of all MRV-related processes. International organisations or foreign institutions can provide support for technical capacity building and institutional capacity development.
2. **Support to UNFCCC process**: Indonesia will be expected to fully integrate REDD+ under the UNFCCC, and to incorporate REDD+ into their national policies and legislation.
3. **Autonomy**: Indonesia should develop the system according to national circumstances, capabilities and priorities. Institutional arrangements should be based where possible on existing institutions, with the creation of new ones being the result of necessity.
4. **Responsibility**: Indonesia should be fully and solely responsible for the implementation of their Information, Monitoring and MRV System, including reporting.

A number of technical principles should guide national institutions in implementing the activities described in this document. The aim of these technical guiding principles is to establish a learning-by-doing process with set milestones and deliverables. The technical guiding principles are the following:

1. **Nationally tailored**: The Information, Monitoring and MRV System should be robust, flexible, transparent and country-driven, to allow adjustment to national circumstances. Sub-national demonstration activities, including monitoring, and the results thereof, should necessarily form part of and feed into the System.

2. **Operational:** The Information, Monitoring and MRV System should be funded by the State budget and be reported on annually.
3. **Centrally coordinated, standardized and scalable top-down system**: The MRV Institution should define standardised methodology protocols and agree data supply plans with data suppliers.
4. **Leverage of existing competencies, capacities and information**.
5. **IPCC compliance:** The Information, Monitoring and MRV System must be in line with the most recently adopted or recommended IPCC Guidance and Guidelines.
6. **Cost-efficiency**: Activities should seek out the most cost-effective solutions at all stages and structural levels.
7. **Multiple benefits**: The Information, Monitoring and MRV System must go beyond carbon and become a multifunctional instrument, aiming to serve as a guide for social, economic and environmental policies and provide information on forestry-related fields such as biodiversity. The system should be flexible enough to serve different purposes, for example, reporting on the needs of donors as well as UNFCCC.
8. **Phased approach**: Following the three phases of REDD+, development and implementation of the Information, Monitoring and MRV System should be undertaken in phases:

    - Phase 1: Development and testing of the monitoring and Safeguards Information System (1 year);
    - Phase 2: Operationalisation of the Safeguards Information System with a domestic sub-national monitoring system and basic national land cover data (2-4 years) that should support an interim results-based fund (such as the Amazon Fund);
    - Phase 3: Full operationalisation of the Information, Monitoring and MRV System for mitigation actions under the UNFCCC (after 3-4 years from the beginning of the Phase II).

SECTION 2: IMPLEMENTATION

2. REDD+ PHASE 1: CAPACITY BUILDING & INSTITUTIONAL ARRANGEMENTS

Indonesia should follow the phased approach to Information, Monitoring and MRV as set out by the UNFCCC. Indonesia is currently in Phase 1 of REDD+, involving the development of national strategies and action plans, policies and measures, and capacity building for the establishment and testing of the Information, Monitoring and MRV System for REDD+. By the closing of this phase, Indonesia should have obtained the necessary historical data for establishing their reference emission level (REL) and/or reference level (RL).

2.1 REDD+ PARTNERSHIPS & INITIATIVES

As part of Phase 1, the Government of Indonesia has entered into bilateral partnerships with the Governments of Norway, the United States, Australia and others, and is participating in international programmes such as the FCPF and UN-REDD, which aim to build capacity and readiness for REDD+ (outlined below).

A concrete outcome to date is the establishment of a UN-REDD Programme Management Unit (PMU) within the Ministry of Forestry (MoFor), which aims to assist the Government of Indonesia in establishing and organising a fair, equitable and transparent REDD+ architecture and build REDD+ capacity. Another key domestic readiness activity has been the creation of the REDD+ Task Force under the coordination of the President's Delivery Unit for Development Monitoring and Oversight (UKP4), which has begun planning capacity building and knowledge sharing activities such as workshops relating to REDD+ readiness. At the Provincial level, both the REDD+ Task Force and UN-REDD Indonesia have identified pilot provinces (Central Kalimantan and Central Sulawesi, respectively) for the implementation and testing of sub-national REDD+ demonstration activities, which have begun implementation in 2011.

The Norway-Indonesia Climate Change Partnership

In response to the President's emissions reductions commitment, on May 26th 2010 the Governments of Indonesia and Norway signed a Letter of Intent (LoI) outlining a USD 1 billion programme of "*Cooperation on reducing greenhouse gas emissions from deforestation and forest degradation*". This ambitious programme aims to be implemented in three phases: 1) **Preparation**, with five key results achieved mostly by the end of 2010; 2) **Transformation**, involving substantial capacity building and sub-national implementation in a pilot province (Central Kalimantan) over the period 2011-2013; and 3) **Contributions for verified emission reductions**, from 2014 onwards, for national level implementation of measures to reduce emissions. This is a global-profile programme aiming to reduce deforestation and land degradation, and the associated GHG emissions, in Indonesia.

Payments will be made to the Government of Indonesia based on deliverables as outlined in the LoI. A Joint Consultation Group, comprised of representatives of the Government of Indonesia and the Government of Norway, has been formed as a forum for dialogue and to oversee the implementation of the deliverables of the LoI.

The REDD+ Task Force

The signing of the LoI and the Government of Norway's USD 1 billion commitment is a first important step towards the delivery of important benefits and lessons for Indonesia's climate change efforts. The combined magnitude of the endeavour, the urgency of the challenges, and the limited timeline for the preparation stage serve as the rationale for the provision of support through this project. The Government of Indonesia created the REDD+ Task Force under the coordination of UKP4 to

consolidate and coordinate all REDD+ initiatives and ensure that LoI implementation reflects the wider Indonesian climate change agenda and interests. The REDD+ Task Force is chaired by the Head of UKP4, Kuntoro Mangkusubroto, and comprised of individuals from the Ministry of Finance, the National Development and Planning Agency (BAPPENAS), the Ministry of Forestry (MoFor), the Ministry of Environment (MoE), the National Land Agency (BPN), the National Council on Climate Change (DNPI), and UKP4.

In August 2010, the Governments of Indonesia and Norway agreed that the Norwegian Government will provide initial funding of USD 30 million to prepare for the implementation of the above LoI, to be lead by the Indonesia REDD+ Task Force. UNDP is acting as the financial manager for Phase 1 of the LoI, supporting the above request from the Government of Indonesia and Norway through the framework of a standard UNDP Cost Sharing Agreement and project document, in close coordination with the UN-REDD Programme. A "Fast Track" modality is being applied to allow greater decision-making autonomy and flexibility at the local level, thus expediting necessary recruitment, procurement and other operational processes.

The UN-REDD Programme

The UN-REDD Programme (www.un-redd.org) is a collaborative partnership between UNDP, UNEP and FAO. At the national level, the UN-REDD Programme supports developing countries in the implementation of REDD+ strategies, guided by the principles of country ownership and the United Nations human rights-based approach, and with a strong focus on engagement of all stakeholders, including indigenous peoples and civil society organisations. UN-REDD Indonesia has already supported the Government of Indonesia in many of the key issues to be addressed through the Indonesia-Norway cooperative programme. The UN-REDD Programme provides a means of mobilising lessons and experience on REDD+ initiatives globally and brings together the complementary knowledge and expertise of the three UN agencies.

In order to strengthen preparation for the LoI with Government of Norway, the Indonesian UN-REDD National Joint Programme has supported various initiatives and national consultations on REDD+ and related LoI activities, conducted by the MoFor, BAPPENAS and UKP4.

Under the UN-REDD Programme, FAO will provide support to the Government of Indonesia on issues specifically relating to the Information, Monitoring and MRV for REDD+. To this end, a Letter of Agreement (LoA) between the MoFor and FAO ("*Consultation and capacity building for a Measuring, Reporting and Verification (MRV) system based on the national REDD+ architecture*") was signed in January 2011.

World Bank Forest Carbon Partnership Facility

Indonesia is set to receive USD 3.6 million through its participation in the World Bank's Forest Carbon Partnership Facility (FCPF), a global REDD+ capacity building programme. Of the total, approximately USD 0.5 million will be directly implemented by the WB, and USD 3 million by the Government of Indonesia. The government's USD 3 million is intended to help address REDD+ readiness gaps and will be implemented by MoFor, the National Forestry Council (DKN) and the Ministry of Finance. Specific activities to be funded through the FCPF grant are:

- Management of readiness strategy (demonstration activities), including institutional strengthening and capacity building (linking to UN-REDD), environmental and social assessment and support for regulatory arrangements of incentives;
- Analysis and mapping of drivers of deforestation;
- REDD Investment Strategy (co-funded by the Forest Investment Program (FIP)).

United States programmes

The US is supporting Indonesia in relation to REDD+ through several initiatives.

1. The USAID Indonesian Forest and Climate Support (IFACS) Project aims to reduce the threats of deforestation and help the Government of Indonesia conserve the country's tropical forests, wildlife (including orangutans) and ecosystem services (including the generation of clean water, reduction of soil erosion, food security and carbon sequestration). This is a four-year project that is expected to result in the following benefits to Indonesia:
   - A 50% reduction in the rate of forest degradation and loss from conversion, illegal extraction and over-harvesting over six million hectares;
   - Improved management of 3.5 million hectares of tropical forest landscapes;
   - A 20% increase in financial resources for forest management, increased transparency, and access to information to strengthen capacity of government, civil society and the private sector for conservation and sustainable management of forest resources, biodiversity and ecosystem services at targeted landscapes;
   - Low carbon growth development strategies piloted at the local level in eight districts.

2. The US-Indonesia Comprehensive Partnership supports the development of a Climate Change Centre, in conjunction with DNPI, to help "translate science into policy".
3. Through the US Department of Treasury and its "Debt-for-Nature" programme, called the Tropical Forest Conservation Act, there are ongoing negotiations for direct support to the Berau Forest Carbon Program as a Government of Indonesia National REDD+ Demonstration Activity.
4. The US Environmental Protection Agency (US-EPA) is assisting Indonesia through training on GHG Inventory Compilation (all sectors) using a UNFCCC-sanctioned tool developed by the US Environmental Protection Agency (EPA), US Forest Service (USFS) and Colorado State University.

In addition, USAID supports the USFS in forest and climate related capacity building activities in Indonesia. In this respect, the USFS assists Indonesia with MRV, peatland research and reduced impact logging. This includes direct support to the REDD+ Task Force.

The Indonesia-Australia Forest Carbon Partnership

The heads of state of Indonesia and Australia signed the Indonesia-Australia Forest Carbon Partnership (IAFCP) agreement in 2008, with the aim of supporting Indonesia's REDD process through two focal activities:

- National capacity building for REDD policies, strategies and methodologies ($10 million);
- Financing of the Kalimantan Forests and Climate Partnership as a practical demonstration project ($30 million).

The IAFCP is funded under Australia's $200 million International Forest Carbon Initiative (IFCI) and $40 million (detailed above) has been allocated to the IAFCP to date. Of this $40 million, an initial $2 million has been allocated to support the Indonesian Government to design and implement a Forest Resource Information System (FRIS) and a National Carbon Accounting System (INCAS). Both of these systems seek to support carbon monitoring in Indonesia; however, the FRIS also seeks to support sustainable forest management in general. INCAS aims to provide a comprehensive and credible account of Indonesia's land-based emissions profile and sinks capacity, with the ultimate objective of informing national REDD efforts. Information for INCAS is compiled through remote sensing, data analysis (land use and management, climate and soil, growth and biomass), and spatial and temporal ecosystem modelling.

Other Partnerships & Initiatives

Indonesia is involved in a number of other government partnerships related to REDD+, including:

- The UK-Indonesia Climate Change Partnership, focusing on policy and institutional reform for improving the country's response to the impacts of climate change;
- Germany's Forests and Climate Change Programme (FORCLIME), aiming to reduce greenhouse gas emissions from the forest sector while improving the livelihoods of Indonesia's poor rural communities, and the development of a system for providing information on REDD+ safeguards;
- Japan's International Cooperation Agency's (JICA) Forest Resources Management through Satellite Imagery Project, aiming to upgrade the capacity of MoFor to conduct forest resources monitoring and assessment.

There are also a number of non-government initiatives in place in Indonesia relating to REDD+, the most prominent of which are:

- The World Agroforestry Centre's (ICRAF) ALREDDI (Accountability and Local Level Initiative to Reduce Emission from Deforestation and Degradation in Indonesia), aiming to build capacity on carbon accounting and monitoring systems;
- The Center for International Forestry Research (CIFOR), based in Bogor, researches and publishes regularly on REDD+ issues, globally and Indonesia-specific;
- The Nature Conservancy (TNC), a non-profit undertaking a REDD pilot project in the Province of Berau;
- The World Wildlife Fund's (WWF) Heart of Borneo initiative to conserve and reduce the pressure on Borneo's forests, including through REDD+.

2.2 NATIONAL REDD+ STAKEHOLDERS

Ministry of Forestry (MoFor)

The Ministry of Forestry is responsible for land under Permanent Forest Status, i.e. land allocated for use as conservation forest, protection forest, limited production forest, production forest or conversion forest (FWI/GFW 2002). Specific tasks undertaken by the MoFor are:

- Measurement of forest area;
- Measurement of forest stocks;
- Mapping of forest types;
- Administration of production forest areas;
- Protection and rehabilitation of forest ecosystems;
- Implementation of efforts to conserve natural forests;
- Forest outreach and education;
- Mapping and management of peatland located in the forest estate.

The MoFor manages the Forest Resource Information System (FRIS), which aims to support the implementation of sustainable forest management practices by compiling information on land use change within designated forest lands, facilitating a process of data sharing and exchange and supporting decision making. The components of FRIS are remote sensing, ground-based measurement, a geodatabase, modelling, data sharing and exchange, and decision support. FRIS generates information on Indonesia's forestland which supports the Australia-funded INCAS programme.

The MoFor has 19 decentralised offices across the country and a budget of approximately $6 million for carrying out the country's forest inventory. In 2009 the Director of the MoFor's Directorate of Forest Resource Inventory and Mapping (FRIM) was appointed as the National Program Director of the UN-REDD National Joint Programme.

Ministry of Environment (MoE)

The MoE aims to improve environmental quality and natural resource management with a view to mainstreaming environmental and sustainable development principles, with an emphasis on creating a green economy and reducing the rate of decline of ecosystem carrying capacities and resource depletion. Specific targets are:

- The control of pollution and environmental degradation;
- The protection of land, biodiversity and forest ecosystems;
- The sustainable management of natural resources and the environment.

The MoE is currently responsible for reporting national communications to the UNFCCC. It recently compiled Indonesia's second national communication.

Ministry of Agriculture (MoA)

The MoA promotes best agricultural practice, providing infrastructure and facilities and processing and marketing services with the aim of achieving national food security through market competitiveness, research and development, while safeguarding farmer welfare. The MoA is responsible for monitoring all agricultural lands in the country and maintains an agricultural statistics database and GIS web interface that detail the location and extent of different crops.

The Indonesian Soil Research Institute (ISRI) under the Ministry of Agriculture carries out research on soils including peatland. Among other things ISRI analyses carbon stock changes in peat.

National Land Agency (BPN)

The National Land Agency (Badan Pertanahan Nasional) is a Non-Departmental Government Institution responsible to the President. (In accordance with Presidential Decree No. 10 of 2006). BPN has the task of carrying out government duties related to land at national, regional and sectoral level outside of the forest estate. The focus of BPN is mainly on land ownership, land registration and establishing rights over land.

National Coordinating Body for Surveying and Mapping (BAKOSURTANAL)

BAKOSURTANAL is responsible for conducting governmental duties relating to surveys and mapping. Its specific functions in relation to MRV are:

- To assess and propose national policies related to surveys and mapping;
- To develop national spatial data infrastructure;
- To monitor and guide the activities of government institutions in relation to national surveys and mapping.

Presidential decree 85/2007 decides upon the development of a National Spatial Data Network (NSDN). The NSDN consists of Network Nodes (ministries and provincial and local governments and cities that handle spatial data) and a Network Node Connector (NNC) – a role appointed to BAKOSURTANAL. The tasks of the NNC are to build and maintain the NSDN access system, to facilitate the exchange of data and to provide assistance for the Network Nodes. In the presidential decree no provisions are made for the coordination structure of the NSDN.

National Aerospace Agency (LAPAN)

LAPAN is the government institute responsible for carrying out civil and military aerospace research and development, including remote sensing and climate data processing. LAPAN's Stasiun Bumi Satelit Penginderaan Jauh ("Deep Sensory Earth Satellite Station") is located at Pare-pare, South Sulawesi. Its main functions are to receive and record data from earth observation satellites such as Landsat, Spot, ERS-1, and JERS-1. Specialists at the Laboratorium Komputer Induk ("Master-Planning Computer Laboratory") in Jakarta undertake preliminary satellite imagery image processing such as geometric and radiometric correction. Semi-processed data are then passed on to other institutions and

ministries for further analysis. In relation to forest land cover data, LAPAN technicians classify Landsat images into forest and non-forest, and pass these maps on to the MoFor. They also produce fire maps with MODIS imagery.

National Council on Climate Change (DNPI)

DNPI is a cross-ministerial council chaired by the President with members from the Ministry of People's Welfare, Ministry of Economic Affairs, Ministry of Environment, Ministry of Finance, Ministry of Home Affairs, Minister of Foreign Affairs , Minister of Energy and Mineral Resources, Ministry of Forestry, Ministry of Agriculture, Ministry of Industry, Ministry of Public Works, National Development Planning Agency, Ministry of Maritime Affairs and Fisheries, Ministry of Trade, Ministry of Communications, Ministry of Health and the Meteorology and Geophysics Agency. DNPI has eight specialised working groups focussing on (1) adaptation, (2) mitigation, (3) technology transfer, (4) funding, (5) post-2012, (6) LULUCF, (7) basic sciences and greenhouse gas inventory and (8) marine environment. The tasks of DNPI are:

- Formulation of national policies, strategies, programmes and activities relating to climate change adaptation, mitigation, technology transfer and financing;
- Formulation of mechanisms and procedures for carbon trading;
- Monitoring and evaluation of the implementation of policies relating to climate change;
- Strengthening of Indonesia's international position to encourage developed countries to take greater responsibility in responding climate change.

National Development Planning Agency (BAPPENAS)

BAPPENAS is a central government institution responsible for formulating national (annual, five-year, and long-term) development plans. It is also responsible for coordinating foreign (bilateral and multilateral) development cooperation. Recent work of BAPPENAS includes the National Action Plan on GHG reductions, including NAMAs, and the National REDD+ Strategy. Work areas of relevance to Information, Monitoring and MRV for REDD+ are: data and information on natural resources and regional development; national spatial coordination; development and monitoring of policies and measures.

Central Statistical Agency (BPS)

The Central Statistical Agency (Badan Pusat Statistik, BPS) is a non-departmental government institution directly responsible to the President. The functions of BPS are:

- To provide data to the government, and public;
- The data is derived from its comprehensive statistical activities, comprises of periodic information on structure and growth of economy, social change, and development. Those statistics may be derived from its own researches and surveys as well as from other government department as secondary data;
- To assist statistics divisions of government departments and other institutions, in developing statistical system, needed to setup work program and periodic reporting scheme;
- To develop and promote standards to be incorporated in the implementation of statistical techniques and methods, and to provide necessary services in the field of education and training in statistics;
- To establish cooperation with international institutions and other countries for the benefit of Indonesia's statistical development.

2.3   INSTITUTIONAL ARRANGEMENTS

As part of Phase 1, Indonesia should need to define its structure for Information, Monitoring and MRV for REDD+ and initiate capacity building of all the institutions involved in the system, with a view to operationalising these institutional arrangements in Phase 2. This sub-section presents a recommended set of institutional arrangements for Information, Monitoring and MRV for REDD+ in Indonesia, based on existing capacities and capabilities, with a view to building on current strengths and collaborations, consolidating capacity shortcomings and building new institutions where necessary (Figures 5 and 6).

The institutional arrangements for Information, Monitoring and MRV for REDD+, once approved by all stakeholders, should be legally enacted by a legal act (such as a Presidential Decree, Act of Parliament etc). The recommended set of institutional arrangements is based on the type of data required for forest monitoring and MRV and on the reporting requirements set by UNFCCC taking into account the existing mandates in Indonesia.


Figure 4. Institutional arrangements for Information, Monitoring and MRV for REDD+ in Indonesia. The components contained by the red box represent the elements required for Phase 2 of REDD+. The components contained by the green box together comprise the institutional arrangements for the complete Information, Monitoring and MRV System.

PHASE 3: INFORMATION, MONITORING & MRV SYSTEM

Nat. Peatland Survey (Research Consortium)

A targeted effort to generate and collate information on peatlands. Data on EFs from peatlands will feed into NFI and REDD+ GHG-I.

Human Resources
TBC

NFI (MoFor)

Used to obtain GHG emission factors (EFs) from sources and removals by sinks for each forest-related land use sub-categories. Involves extensive field-based data collection.

Human Resources
x6 for Management Unit
x6 for Data Unit
x6 for GIS/RS Lab
x4 for Audit Unit
xN for Field Teams

NFI will contribute EFs to GHG-I

REDD+ GHG-I (MRV Institution)

Allows the COP to monitor progress made by Parties in meeting their commitments, and provides the basis for assigning eventual incentives or penalties under the Convention.

Human Resources
Team of 5 people

Statistics Office

Nat. Communication (MoEnv & DNPI)

Submission of reports every 4 years to the UNFCCC detailing GHG inventories, information on mitigation actions and their effects, and support received; as well as biennial update reports on inventories and mitigation actions.

Human Resources
TBC

SLRS will contribute Activity Data to GHG-I

PHASE 2: INFORMATION & MONITORING SYSTEM

MRV Coordination (MRV Institution)

The ultimate objective of the National MRV System to make Indonesia compliant with Article 4 of the UNFCCC and enable Indonesia to report on results-based REDD+ actions.

Human Resources
x5 for Data Unit
x11 for Monitoring Unit
x~92 for Field Teams

Regular interaction and coordination

Information System (REDD+ Agency)

Provides information on how the REDD+ safeguards are addressed and respected in the implementation of the national policies and measures related to the five REDD+ activities.

Human Resources
TBC

Satellite imagery will form part of information system web interface

Satellite System (Shared Platform)

In Phase 2 the SLMR will provide remote sensing monitoring data of sub-national demonstration activities and national coverage of basic indicators. In Phase 3 will provide activity data (AD) for MRV System.

Human Resources
x21 for GIS & RS Lab
x 3 for System Development
x 4 for Data Management

- - - → Institutional linkages & data sharing

Figure 5 (previous page). Institutional arrangements for Information, Monitoring and MRV for REDD+ in Indonesia, including functions of each component, the required human resources (several to be completed), institutional linkages and how these correspond with Phases 2 and 3 of REDD+.

The LoI between Indonesia and Norway includes the establishment of a National REDD+ Agency and an MRV Institution. It is recommended that the REDD+ Agency has an overall coordination role of the Information, Monitoring and MRV System, as well as hosting the REDD+ Safeguards Information System. However, the REDD+ Agency will have a number of other roles, so is not a primary focus for this recommendation document. Instead, we here concentrate on the technical elements and the institutions that should be accountable for undertaking them.

MRV Institution

A key activity in Indonesia's REDD+ Phase 1 should be the definition and establishment of a coordinating institution for MRV activities, for which the following arrangements are recommended. Overall coordination, oversight and steering of all MRV activities (including for all other mitigation activities in the AFOLU sector) should be undertaken by the **MRV Institution**[2], as outlined in the Norway-Indonesia Letter of Intent. This institution should be created with the mandate to manage, oversee and guide all activities relating to MRV of land-based mitigation actions, including REDD+, in Indonesia (Figure 6). The MRV Institution should be the key structure for the internal monitoring of the outcomes of national REDD+ policies and measures (measured in net forest cover changes).

The MRV Institution Director should act as the budget holder and external representative for the Institution. The governing body of the Institution should be a Steering Committee, comprised of the

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[2] The MRV institution could be an independent institution or structured within an existing organisation. The tasks and operational elements described in this document can apply to the institution in either form, provided that responsibility for the roles and activities are explicitly assigned and accountability is ensured.

Heads of each of the sub-units of the Institution and the Heads of the SLRS Shared Platform and the NFI, should coordinate and plan the Institution's activities.

The operational elements of the institution should be undertaken by three units:

- The REDD+ GHG Unit (five staff) should assess GHG removals in relation to REDD+ activities, for submission to the MoE for compilation of the National GHG Inventory Report, which should form part of the country's National Communication to the UNFCCC. Staff of this Unit must be familiar with the UNFCCC process, decisions and reporting requirements, and IPCC Guidance and Guidelines.

- The Data Management Unit (five staff) should implement and manage the land monitoring web interface component of the REDD+ Safeguards Information System, in collaboration with the National REDD+ Agency which should have overall responsibility for the REDD+ Safeguards Information System. Members of this Unit should be familiar with software development and web programming.

- The Monitoring Unit (11 HQ staff; ~92 decentralised staff) is the largest of the Units and will be divided into two components. The central staff of the Monitoring Unit should be responsible for assessing REDD+ policy measures and performance at the provincial level and support to provincial Field Teams, with each of ten technical officers responsible for between one and seven provinces, depending on the size and circumstances of each province. Technical officers should have project management experience, technical knowledge of forest inventories and be effective communicators. The second component of the Monitoring Unit – the Field Teams – should be responsible for stakeholder engagement and promotion of REDD+ policies, measures and activities. These teams should work closely with Provincial and District Governments and oversee and provide guidance on REDD+ policies and measures at these decentralised levels. Field Teams should be comprised of a forester (who also acts as the Team coordinator), a botanist, a driver and a technician. The larger provinces may require more than one field team, while some smaller provinces could be covered jointly by one field team. However, it may be desirable to have at least one field team per province to emphasise provincial autonomy.
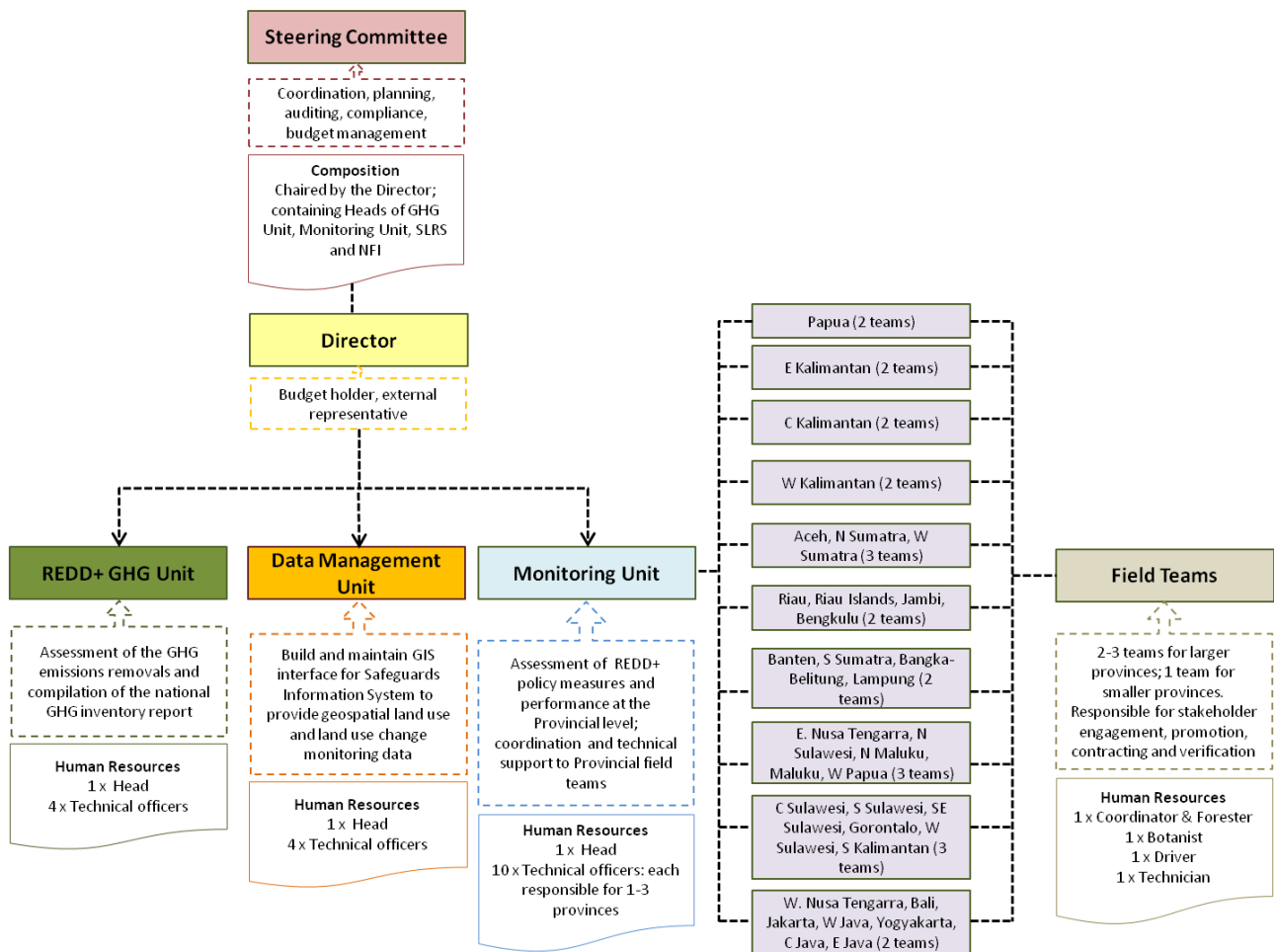
Figure 6. Structure of the MRV Institution in Indonesia, including the functions (dashed-lined boxes) and necessary human resources for each sub-unit. The divisions of provinces per field team are simply to illustrate that a field team may cover more than one province, and do not represent an explicit recommendation. A different configuration will likely be more applicable in Indonesia.

2.4   DEVELOPMENT OF REDD+ POLICIES & MEASURES

The final component of REDD+ Phase 1 is the development of national REDD+ policies and measures. This process should involve defining where and how the five REDD+ activities will be distributed across the national territory, thereby delineating the mitigation potential of REDD+ in exact figures in the country. This is a critically important activity for monitoring and MRV because it is only by first defining the ways in which REDD+ will be enacted and implemented that specific methodologies can be developed to monitor these activities. Through this process, Phase 1 should provide an indication of how the monitoring system should be developed by defining the specific monitoring requirements.

In May 2011, President Yudhoyono signed a two-year moratorium on issuing new permits for conversion of natural forest and peatland, which represents a key national-level REDD+ measure. In practical terms, it means that monitoring efforts should focus on areas of natural forest and peatland to determine whether the moratorium is being adhered to.

Nevertheless, an urgent activity remains the definition and division of all five REDD+ activities at the Provincial level, which will yield important information for the national mitigation potential of REDD+ and further monitoring requirements in the subsequent phases.

3. REDD+ PHASE 2: INFORMATION & MONITORING

This is a transition phase which focuses on the implementation of national policies, measures, national strategies and action plans; technology development and transfer; and results-based demonstration activities. National policies and measures should be implemented through activities implemented at the provincial level, with a few pilot provinces as frontrunners. Indonesia could enter the second phase of REDD+ at the beginning of 2012.

In this phase, several operational elements will need to be implemented. These elements must:

1. Ensure that information is provided on how the REDD+ safeguards are being promoted and supported;
2. Illustrate that demonstration activities are results-based; and
3. Provide basic national-level forest monitoring information.

A Satellite Land Representation System (SLRS) can generate data and information on several of the safeguards as well as for the Demonstration Activities Monitoring System and basic national coverage data.

3.1 REDD+ SAFEGUARDS INFORMATION SYSTEM

The recommended tool for sharing information freely on how the REDD+ safeguards are promoted and supported in the implementation of the national policies and activities related to the five REDD+ activities is a web portal interface. This web portal should provide information on the safeguards related to monitoring, namely:

- Transparent and effective national forest governance structures;
- Respect for the knowledge and rights of indigenous peoples and local communities;
- Actions to be consistent with the conservation of natural forests and biological diversity;
- Actions to address the risks of reversals (permanence);
- Actions to reduce displacement of emissions (leakage).

To this end, the System should provide information on:

- Current legislation pertaining to land uses and designations;
- Indigenous land and territorial rights and all measures and activities that the country is undertaking to promote them;
- Land use governance structures and functions, from central government to provincial government level, including protected areas; and
- Non-government (communities, NGOs, private actors) activities.

The REDD+ Safeguards Information System will be an important tool for helping to secure the full and effective participation of local and international stakeholders in the REDD+ process through open access to information through the web portal. The information should be freely provided over the internet, and act as the entry point for any stakeholder or otherwise interested party seeking information on REDD+ in Indonesia.

The REDD+ Safeguards Information system should be developed and hosted by an independent agency with a specific focus on REDD+. The **National REDD+ Agency**, which is planned as part of the Indonesia-Norway LoI would be the most suitable agency to take on this role. An independent, multi-stakeholder committee should provide guidance on the REDD+ Safeguards Information System's implementation. Under this guise, the role of the National REDD+ Agency should be to:

- Develop a web interface to make information on REDD+ safeguards freely available;

- Collect geospatial, social, ecological and governance data and information for web interface;
- Upload and update data and information on the web interface when it becomes available.

The National REDD+ Agency should be provided with shapefiles from MoFor, MoE, BPN, BAKOSURTANAL, LAPAN and research institutes (e.g. CIFOR, the Climate Centre and (national and international) universities). The Data Management Unit within the MRV Institution (see Figure 7) should provide land use and land use change monitoring data.

3.2   NATIONAL & SUB-NATIONAL MONITORING SYSTEM

In REDD+ Phase 2 Indonesia will need to have in place a monitoring methodology for assessing and ensuring that the implementation of REDD+ demonstration activities (e.g. in pilot provinces) is results-based through detailed information on the implementation of the REDD+ activities, through a Demonstration Activities Monitoring System. At the national level, information on some broad land cover indicators, such as forest cover, forest cover change and the locations of fire, will also need to be made available[3].

The structure of the most appropriate Demonstration Activities Monitoring System methodology will depend on the way the Government of Indonesia decides to link national mitigation performance with sub-national activities, i.e. the approach taken to 'nesting' REDD+. The United Nations recommends the Provincial Approach to nesting REDD+ (Figure 8).
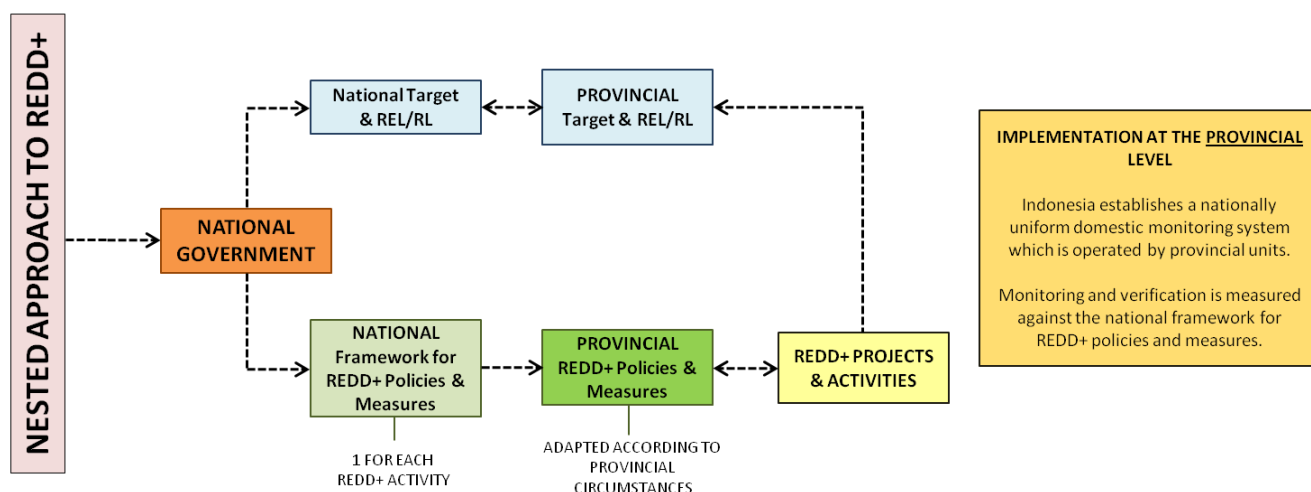
Figure 7. Provincial approach to nesting REDD+ in Indonesia.

Under the Provincial Approach, the central government sets a national framework for policies and measures for each REDD+ activity, which are then adapted individually by each Province according to their circumstances (for instance, the Province of East Papua may be selected to focus on conservation activities; the Province of West Java may be selected to focus on activities to enhance forest carbon stocks).

Provincial units, under the direction of the MRV Institution, would be deployed to promote selected REDD+ activities in close collaboration with provincial and district governments, providing technical guidance and provincial harmonisation of activities. The collaboration with provincial and district governments is also important to incorporate REDD+ activities under the spatial plans. In addition, provincial units could also provide technical support to non-government REDD+ activities, such as projects coordinated by NGOs.

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[3] Information from the Demonstration Activities Monitoring System and national level land use indicators can be made openly available through the REDD+ Safeguards Information System.

The emissions reductions and removals resulting from these projects and activities are then measured against the provincial emissions reduction targets and provincial reference emission levels/reference levels (REL/RL), which are in turn collated for all provinces and measured against the national target and RELs/RLs.

3.3   SATELLITE LAND REPRESENTATION SYSTEM

The operationalisation of a Satellite Land Representation System (SLRS) will be required in Phase 2 to provide remotely-sensed monitoring data of sub-national demonstration activities and national coverage data for basic land use indicators. The SLRS should provide data to enable the Monitoring Unit of the MRV Institution (see Figure 7) to guide field activities with a sampling-driven approach, as well as provide data and information for the REDD+ Safeguards Information System and the monitoring systems. This SLRS should become fully operational in Phase 3 of REDD+ when it will need to provide AD across the entire national territory (wall-to-wall) as part of the MRV System.

In order to establish the SLRS and make it operational an open source software platform will be developed, which should facilitate easy alterations in the future and allow full country ownership. The methodologies to analyse remote sensing data have to be capable of detecting annual changes in forest cover as well as assessing changes in land use.

An example of such a platform is TerraAmazon, developed by the Brazilian Space Agency (INPE), used in operational monitoring systems of the Amazon. The Amazonian operational monitoring system is capable of detecting annual changes in forest cover and can be used as a basis for the development of the Indonesian monitoring system. In addition, the European Commission's Joint Research Centre (JRC), together with FAO, have developed the Remote Sensing Forest Resource Assessment (FRA-RS) approach, which can serve as a basis to assess land use changes. Moreover, both the Government of Indonesia, through LAPAN, and FAO have close links with South Dakota State University's Geographic Information Science Center of Excellence (GISCE), which has developed methodologies to assess changes in forest canopy cover loss. By combining the experience from these institutions, existing Indonesian remote sensing capacities and the knowledge of Indonesia's specific circumstances, an original and sophisticated Indonesian SLRS can be developed.

The structure in Figure 8 is recommended for management of the SLRS. A shared platform for the development and operation of the SLRS for REDD+ should include **BAKOSURTANAL**, **LAPAN**, **MoFor**, **Ministry of Agriculture, MoE, BPN**, the **MRV Institution** and the **National REDD+ Agency**. One agency should be appointed to coordinate the work and to be the responsible party for sharing the information with the other stakeholders in the MRV framework.

A Director within the coordinating agency should be appointed to oversee the Platform and act as its external representative. A steering committee chaired by the Director should be comprised of officials from each of the agencies represented in the Platform, and should coordinate and plan activities, auditing and compliance, and manage the budget.

The platform has three functions. The main function is to provide comprehensive land representation data. This is the core task of the platform and provides all the information on forest cover and land use required for the monitoring system and the SLRS and will supply the REDD+ Safeguards Information System with necessary geospatial information on some of the safeguards. The second function is to support this work through continuous development of software and systems. This is required to stay up to date with the latest remote sensing developments and to continuously improve the accuracy, quality and cost-efficiency of the data. The third function is data management and storage. The system will produce vast amounts of data which will need to be managed, processed and archived in ways that will be it easily accessible to all of the agencies working in the platform.

Following these functions there should be three operational sections of the Platform. The GIS and Remote Sensing Laboratory should contain approximately 20 technical officers from the different

agencies and ministries, as well as one Head (manager), who should work collaboratively to provide comprehensive land representation of REDD+ activities through the collection and analysis of satellite data. The technical officers require expertise and experience in spatial data processing and analysis using remote sensing and GIS software.

The second operational team of the Platform should be the System and Software Development Unit (three staff), which should monitor the global development of GIS and remote sensing software and provide regular advice and updates to the GIS and Remote Sensing Lab on the latest technologies and techniques. These officers require technical knowledge and experience of developing, writing and using spatial analysis software.

The third team is the Data Management Unit (three staff), which should coordinate and organise data management and storage. These staff require knowledge and experience of database design, development and management.

It is not necessary for all the units of the SLRS shared platform to be housed within the same institution. It is possible that the functions or part of the functions of one or more of these units are already undertaken by existing government agencies, in which case this responsibility should remain and coordinate with the other units (whether they are newly created or within a separate institution).
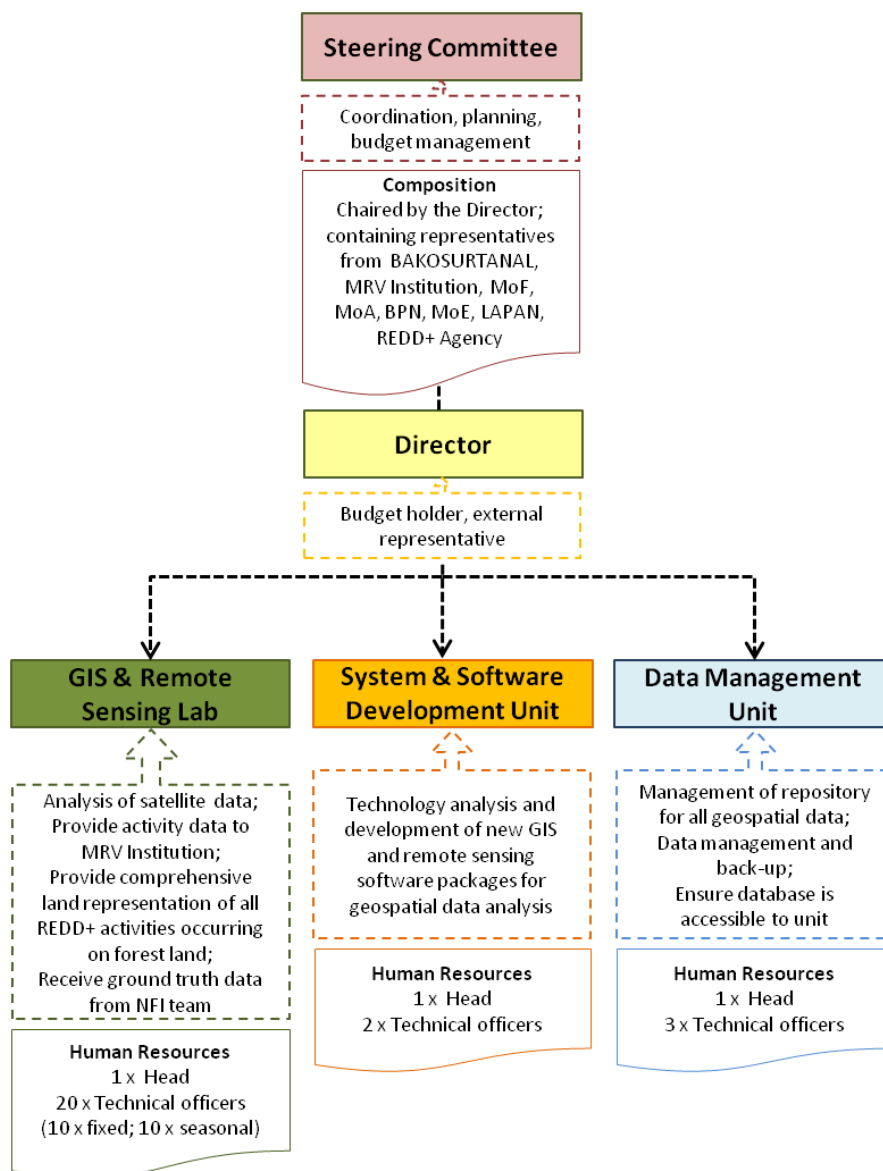
Figure 8. Structure of the SLRS Shared Platform, including functions and necessary human resources for each sub-component.

4.   REDD+ PHASE 3: INFORMATION, MONITORING & MRV

In this Phase REDD+ will be fully integrated with other mitigation mechanisms under UNFCCC. All MRV (National Inventory System) elements will have to be operational, in addition to the Phase 2 elements, and the system and the resultant data subjected to verification from the roster of experts coordinated by the UNFCCC Secretariat.

Beyond the specific activities and objectives of Indonesia's MRV for REDD+, the system should have the capacity to be used as a tool to implement national policies and measures beyond REDD+ activities. For instance, the operational SLRS should allow the tracking of land use activities across the country (not limited to REDD+). Another example is the NFI as a means to establish a participatory approach for forest-related measurements by including local communities and the private sector. The early establishment of a structured long-term vision for Indonesia's Information, Monitoring and MRV System could therefore generate co-benefits for national policies and local practice.

4.1   NATIONAL FOREST INVENTORY

The principal aim of the National Forest Inventory (NFI) for Information, Monitoring and MRV System is to obtain information on GHG emission factors (EF) by sources and removals by sinks (i.e. carbon stock changes) for each of the forest-related land use sub-categories[4] (Maniatis & Mollicone 2010). An NFI can include remote sensing and field surveys. EFs are specific to local conditions, such as site fertility and tree species, and are thus usually very diverse across a national territory. However, EFs usually do not change over time, and therefore only need to be estimated once for a specific area.

The implementation of an NFI is a complex process which requires deep knowledge of country-specific ecological and socio-economic conditions, in addition to extensive field-based data collection. See Annex 1 for methodological guidance on NFI development.

In order to build on existing national expertise, the **MoFor** should retain its current responsibility for producing the country's NFI for REDD+, and should receive the requisite technical support and capacity building assistance at the national and sub-national levels to adapt current practices to apply internationally-recognised standards and data collection and analysis methodologies. In this way it should be able to deliver an accurate and cost-effective NFI for REDD+ in a timely manner.

The most immediate activity will be the adaptation of the existing NFI to meet the requirements for REDD+. This is already scheduled under the UN-REDD Indonesia Programme. Secondly the implementation and training in the use of a specialised forest inventory database in MoFor HQ in Jakarta is recommended. Training could be funded by the UN-REDD Indonesia Programme and carried out by a forest database specialist from FAO HQ.

Following the existing organisational structure, a director within MoFor should oversee and manage the NFI (Figure 10). Field data collection should be carried out at the decentralised level through MoFor's 19 decentralised offices (BPKH), that should act as data collection hubs. Staff of these offices should be coordinated by a Central Management Unit, comprised of a head and five technical officers. These technical officers require project management experience, excellent communication and technical knowledge of forest inventories and plot sampling.

Teams at the decentralised offices should receive technical training on forest-based sampling and data collection for NFI for REDD+ and be provided with maps detailing the locations of sample plot sites.

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[4] The IPCC identifies six broad land-use categories as a basis for estimating and reporting GHG emissions and removals from land use and land-use conversions. The land uses may be considered as top-level categories for representing all land-use areas, while sub-categories (e.g. forest type) will be necessary to describe national circumstances significant to emissions estimation.

This requires a Central GIS and Remote Sensing Lab (six staff), that should support the field units. This unit will also compile maps and shapefiles of the locations of completed plots, to be incorporated into the monitoring system. Staff of the GIS/RS Lab require technical knowledge and experience of spatial data processing, analysis and map production.

Data collected should be managed and analysed at central level to support the development of the EFs from this data, but also to support the forest planning based on the information on growth and carbon stocks. For this purpose data should be sent to MoFor HQ for processing, analysis and entry into the specialised database by a Central Data Analysis and Archiving Unit (six staff). Technical officers of this Unit require knowledge and experience of spatial data analysis and database management.

Finally, a Central Auditing Unit (four staff) should undertake internal quality control of all data, to ensure consistency and transparency. Technical officers of this unit require knowledge and experience of data quality analysis and evaluation.
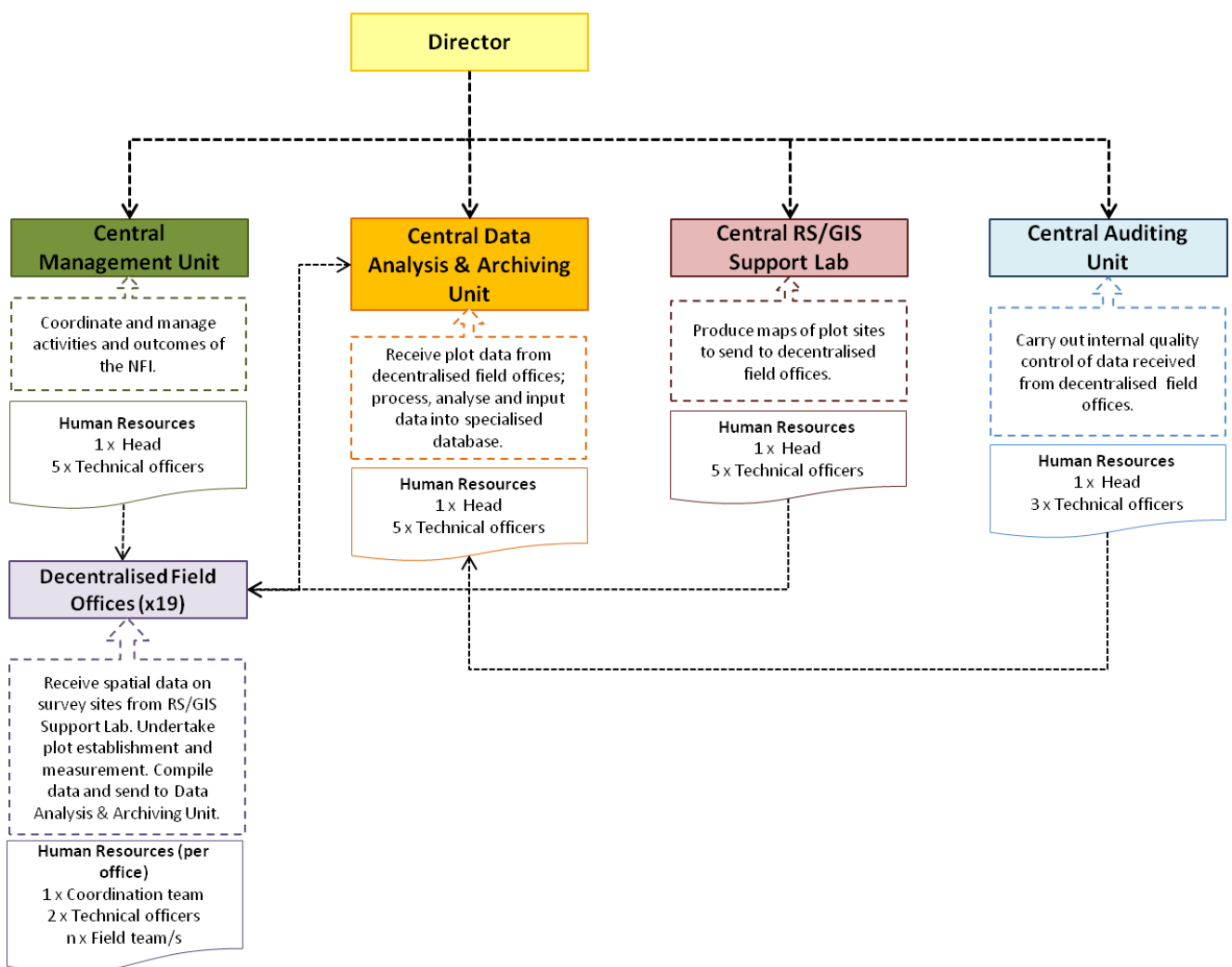
Figure 9. Institutional structure for the National Forest Inventory for REDD+.

4.2   NATIONAL PEATLAND SURVEY

The vast carbon stores in Indonesia's peatlands, estimated at 55 ± 10 GtC (Jaenicke et al., 2008), justify the inclusion of a separate entity, a National Peatland Survey (NPS), with the objectives of:

- Generating and collating information to assess the EFs derived from their draining, clearance and/or conversion;
- Identification and testing of options for protection and sustainable management of peatlands;
- Enhancement of understanding and involvement of key stakeholders in peatland management.

The NPS should pass data and information generated on peatland EFs for incorporation into the NFI and the REDD+ GHG-I. Following existing mandates, the NPS should be undertaken by the Indonesian Soil Research Institute under the Ministry of Agriculture and the Ministry of Forestry. These two agencies currently share the mandate of mapping and management of the large majority of the peatlands in Indonesia, either being under agricultural land or under forest land. Because of the on-going research on peatland in Indonesia we recommend a structure that allows input from other government agencies and research institutes currently involved this work.

4.3   REDD+ GHG INVENTORY

The function of Indonesia's national GHG inventory (GHG-I) is to estimate and report anthropogenic emissions by sources and removals by sinks. Under the UNFCCC, information reported in GHG inventories[5] through National Communications represents an essential link between science and policy, providing the means by which the COP can monitor progress made by Parties in meeting their commitments and in achieving the Convention's ultimate objectives. The information reported in a National GHG-I provides the basis for assessing each Party's performance as compared to its REL/RL (or commitment), and is therefore a requisite antecedent for assigning any incentives or penalties.

The quality of GHG-Is relies not only upon the robustness of the science underpinning the methodologies and the associated credibility of the estimates – but also on the way this information is compiled and presented. Information must be well documented and consistent with the reporting requirements outlined in the UNFCCC guidelines (UNFCCC 2004). The IPCC has developed specific reporting guidelines (IPCC 2006) in order to support Parties in providing information and estimates of anthropogenic GHG emissions and removals.

A national inventory of anthropogenic GHG emissions and removals is typically divided into two parts: reporting tables (standardized data tables that contain mainly quantitative (numerical) information) and an inventory report (comprehensive and transparent information about the inventory e.g. overview of trends, inventory compilation methodology and information on uncertainties). See Annex 1 for methodological guidance on GHG-I development.

Once Indonesia fully establishes its REDD+ Safeguards Information System, National Performance Monitoring System, SLRS and NFI, it should be in compliance with the requirements of REDD+ under the UNFCCC. The ultimate objective of the MRV System for REDD+ is to implement Indonesia's National GHG-I for reporting to the UNFCCC in order to access the funds from payments for verified performance. REDD+ activities are listed in the UNFCCC framework as part of the AFOLU sector. Other inventory sectors are Energy, Industrial Processes and Product Use (IPPU), Waste and other.

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[5] The UNFCCC established the commitment for Parties to report national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies to be promoted and agreed upon by the Conference of the Parties.

The **MRV Institution** should be responsible for the National REDD+ GHG-I (see figure 6), which forms part of the country's four-yearly National Communication to UNFCCC. The data for these reports and communications should be quality-checked by the **Central Statistical Agency** before being compiled into the reports and passing to the **MoE**. From here the report should be submitted to **DNPI** which, as official UNFCCC focal point, should retain its responsibility for submitting National Communications to the UNFCCC every four years (to include inventories, information on mitigation actions and their effects, and support received). These three agencies should also coordinate the biennial submission of update reports containing updates of the national GHG-I, including a national inventory report and information on mitigation actions, needs and support received.

The work of the GHG Unit within the MRV Institution should be divided into two streams (Figure 10). The main work stream should follow IPCC methods to develop the GHG-I for REDD+ activities, through training lead by FAO/UNDP under the UN-REDD Programme. This training should result in adherence to Tier 2 reporting in Phase 2 using the Gain-Loss Method (implemented by 2012), and Tier 3 reporting in Phase 3 using the Stock-Difference Method (implemented by 2014). In this way, Indonesia should aim to start reporting through the gain-loss (default) method as soon as possible in order to report at Tier 1 and Tier 2 accuracy level, and receive feedback from the UNFCCC on its MRV system and methods. In Phase 3, once the country has collected the necessary data, it can then consider using the stock-difference method (for which it will need two NFIs) in order to report at Tier 3 accuracy level. This approach allows the country to build its national capacity on GHG inventory through a learning-by-doing process including international feedback on its MRV system, and report at Tier 3 accuracy in Phase 3 of REDD+.

The secondary work stream should comprise the implementation of the Australia-funded Indonesian National Carbon Accounting System (INCAS), which aims to provide a comprehensive and credible account of Indonesia's land-based emissions profile and sinks capacity, with the ultimate objective of informing national REDD efforts. Information for INCAS is compiled through remote sensing, data analysis (land use and management, climate and soil, growth and biomass), and spatial and temporal ecosystem modelling. Under this stream, one technical officer of the MRV GHG Unit should undergo AusAID-lead training to facilitate the development of this system.
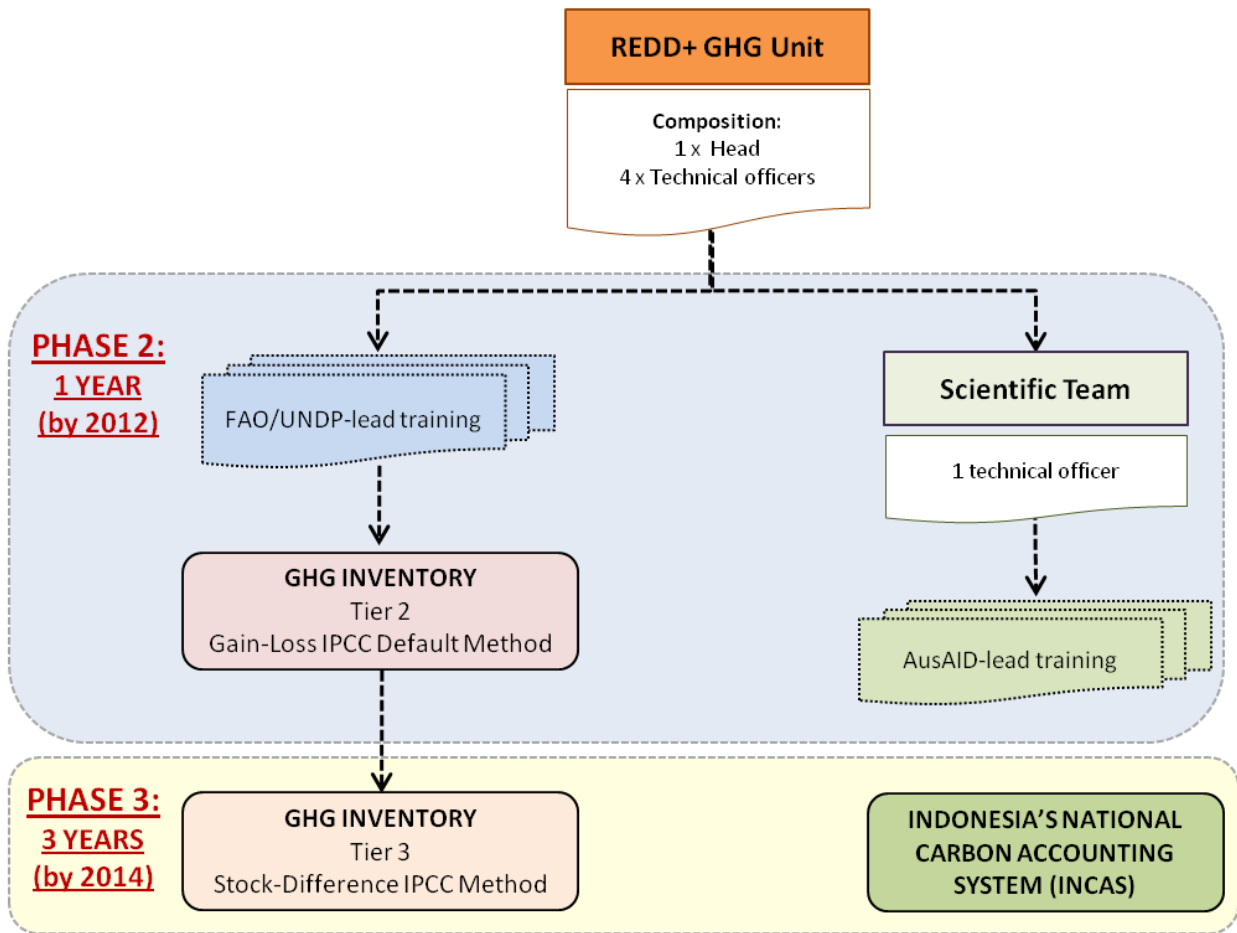
Figure 10. Structure of, and phased approach to, the REDD+ GHG Unit.

5. SYNTHESIS

This UN recommendation is based on the following:

- Decisions from the Conference of the Parties (COP) under UNFCCC;
- IPCC Guidance and Guidelines;
- On-going programmes in Indonesia, i.e. the Letter of Intent between Indonesia and Norway;
- Existing government mandates and capacities (based on meetings with stakeholders and desk-based analysis);
- Experience from other countries.

The decision to focus our recommendation on **Information**, **Monitoring** and **MRV** rather than just MRV follows from the <u>decision from COP16</u> in Cancun held in December 2010. This decision states that REDD+ will be implemented in 3 phases, in which the development of the technical components of REDD+ are staggered. Following this decision, Indonesia is required to establish a REDD+ Safeguards Information system and a monitoring system in phase 2. A full MRV system will have to be established in order to enter Phase 3. Each of these systems will share a common component, namely a satellite land representation system.

<u>IPCC Guidance and Guidelines</u> provide information on how to do undertake a GHG inventory, an central element of the MRV system. The IPCC approach requires the collection of AD (through remote sensing) and EFs (through field measurements), and is a requirement under Decision 4/CP.15.

The <u>LoI</u> between Indonesia and Norway includes the establishment of a National REDD+ Agency and an MRV Institution. In this recommendation we include these two bodies in the institutional arrangements and specify the tasks they should undertake (though with less of a focus on the REDD+ Agency).

The recommended institutional arrangements follow <u>existing government mandates and capacities</u>. We acknowledge that mandates may have changed or will change. It is recommended that existing mandates guide the assignation of specific roles and responsibilities for Information, Monitoring and MRV for REDD+.

Through the global UN-REDD programme and other programmes, FAO is working on Information, Monitoring and MRV in a number of countries. <u>Lessons from other countries</u> have been incorporated into this recommendation.

Numbers of staff required are included in the recommendations on institutional arrangements. These numbers are tentative and aim to provide some guidance, but are not an explicit recommendation as part of this document.

Next Steps

Indonesia is currently in Phase 1 of REDD+, and activities currently underway will help Indonesia progress to Phase 2. These activities include:

- The national REDD+ Strategy: a joint effort by the Ministry of Forestry and BAPPENAS, which was continued by the REDD+ Task Force;
- Demonstration Activities being undertaken in Central Kalimantan, Central Sulawesi, Jambi and others;
- Efforts to establish a REDD+ Agency and an MRV Institution as part of the implementation of the LoI between Norway and Indonesia;
- Efforts by the Ministry of Forestry to establish a REDD+ Safeguards Information System;
- Efforts to improve spatial data collection and management.

All of these are necessary to establish the SLRS, the Demonstration Activities Monitoring System and the REDD+ Safeguard Information System, the necessary components for REDD+ Phase 2.

Preparations for Phase 3 are also underway. These include the redesign of the national forest inventory and efforts to establish a national carbon accounting system. These activities are currently being initiated due to the time they take to develop and operationalise. Payments for verified performance once Indonesia has reached Phase 3.

The full Information, Monitoring and MRV System will make Indonesia UNFCCC-compliant and allow it to access REDD+ financing, but will also provide valuable information on land use to feed into development and spatial plans. Through the use of wall-to-wall satellite mapping this system can also provide necessary information on other land based sectors. It allows for a quick analysis of effectiveness of policies and measures and thus provides feedback on how to make these more effective.

In order to operationalise and manage this system, agencies must be appointed to specific tasks. There must be clear mandates, accountability, transparency and effective coordination between the agencies. This coordination is needed to combine the various types of information into one GHG inventory and one coherent REDD+ approach.

The first steps that need to be taken are the clear identification of tasks to be undertaken, the assignment of agencies to these tasks and the identification of coordination lines and information flows. In this document we make recommendations on each of these issues.

Work on the technical components of the system should begin as soon as possible. This should begin with the establishment of SLRS Shared Platform, the REDD+ Safeguards Information System and the Demonstration Activities Monitoring System, in order to prepare for Phase 2. Work on the NFI design and methodology should also begin. Finally, the information gathered through the SLRS and the NFI should be combined into a GHG Inventory and incorporated into the National Communication to UNFCCC. The next National Communication submitted by Indonesia (in 2014) can provide a valuable exercise in preparing for Phase 3.

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7. ANNEXES

ANNEX 1: MRV METHODOLOGICAL GUIDANCE

Activity Data Assessment: SLRS

The IPCC indicates that countries should accurately and completely represent and report all land areas in a country where human activities take place (land-use categories). This land representation should also reflect the historical trends in land-use area (20 years as a default value as suggested by the IPCC 2003, 2006) and information be reported to ensure transparency and comparability of estimates. In the context of REDD+, activity data (AD) refers to the aerial extent of an emission and removal category. For example, in the case of deforestation, this would refer to the area of deforestation in hectares over a known time period.

The SLRS for Indonesia described in this section is an operational wall-to-wall system based on Approach 3 (explained further below) of the IPCC GHG reporting guidelines (2006b), with satellite remote sensing data that monitors annual changes in land use with a methodological approach that must be consistent with historical deforestation and degradation rate assessments, in line with UNFCCC reporting requirements. The proposed SLRS for Indonesia could be based on the TERRA-AMAZON system, an open source software platform, developed by the Brazilian Space Agency (INPE) and used in the Amazonian operational monitoring systems (PRODES-DETER-DEGRAD).

The guiding principles for the development of the SLRS are:

- Compliance with UNFCCC reporting for consistent land use representation;
- Based on the successful proven operative SLRS and adapted to country's needs;
- Cost-effective for annual national coverage;
- Operational performance;
- Wall-to wall based on multi-data approach;
- Fully open source, no license costs/dependency.

The strengths of remote sensing stem from its ability to provide spatially explicit information and repeated coverage, including the possibility of covering large and/or remote areas that are difficult to access otherwise. Archives of remote sensing data span several decades and can therefore be used to reconstruct past time-series of land cover and land use.

IPCC APPROACHES TO AD MEASUREMENT

The IPCC (2003) proposes three approaches to measure AD. We present them here in order of increasing information content, but they are not hierarchical or mutually exclusive. Approach 1 identifies the total area for each individual land-use category, but does not provide information on changes of area between categories and is not spatially explicit. Approach 2 expands on Approach 1 by introducing tracking of land-use changes between categories. Approach 3 extends Approach 2 by tracking land-use changes on a spatial basis (i.e. geographically explicit).

The UNFCCC (2006) and the IPCC (2003) call for an adequate, consistent, complete and transparent approach to AD reporting. AD reporting under REDD+ will be required to go back 20 years, cover the entire territory of the country, and assign uncertainty values to the reported data. Given these methodological considerations, it is advisable for Indonesia to use Approach 3. This implies the use of geographically explicit data collected in the field or through remote sensing techniques. The strategic methodological option of using remote sensing data rather than field data to assess AD simultaneously allows (i) the assessment of forest area change; (ii) the observation of trends in forest area change (at present and up to 20 years back); and (iii) significant reduction of the amount and cost of measurements to be undertaken in the field (Stach et al., 2009).

WALL-TO-WALL MONITORING

As the removal of emissions in one place could result in an increase of emissions elsewhere, the concept of 'displacement of emissions' will need to be addressed in the context of REDD+ (FCCC/AWGLCA/2009/L.7/Add.6). To address national-level leakage (as opposed to international leakage), the SLRS needs to provide full coverage (wall-to-wall) of the national territory, to detect and prevent leakage occurring from one region to another.

THE TERRA-AMAZON PLATFORM

The INPE platform, TerraAmazon, is freely available and provides options, tools and algorithms which can be adapted to country needs. INPE's technology to support their Amazonia monitoring systems is composed of three operational and complementary systems: DETER, DEGRAD and PRODES. This is the largest and most robust operational forest monitoring system in the world and has been providing official annual rates of gross deforestation to the Brazilian government since the late 1980s. Monthly information on forest cover changes in Amazonia have been provided to the government control and enforcement agency since 2004, allowing early measures to be taken to prevent further non-authorized deforestation activities. Moreover, DETER, DEGRAD and PRODES are distributed free of charge.

In collaboration with Brazil's INPE, the UN-REDD Programme through FAO can facilitate countries in the training with the Brazilian forest monitoring system in order to improve their national technical capacity, providing the opportunity for countries to set up independent SLRSs that will be valuable also as a tool to report on GHG emissions, following the IPCC's Guidelines and Guidance. INPE offers this capacity building in the form of an intensive training course at the recently created Regional Training Centre in Belem, Brazil (INPE Amazonia), at a minimum cost. These training courses aim to improve knowledge on the use of remote sensing, information technology (IT) and modelling aspects of a SLRS. Country-specific activities such as the assessment of historical forest cover change should be carried out during this training course. The goal of the collaboration in this capacity building effort is to train technical forest and IT personnel from Indonesia. This will allow them to use the system, adapt it to Indonesian needs and use training on the TerraAmazon system as a capacity building tool to establish a national forest monitoring system. The knowledge gained should also be valuable to expand monitoring of the entire Indonesian national territory, which may become relevant for GHG inventories related to LULUCF or AFOLU.

Emission Factor Estimation: NFI

STRATIFYING INDONESIA'S FOREST LAND

Countries seeking to implement REDD+ need to focus their efforts on forest-related emissions and removals from key activities. To this end, Indonesia will need to implement a forest stratification system, where key activities should be associated with strata (i.e. homogeneous forest populations). For example, in Kalimantan, emissions could be reduced by avoiding deforestation; whereas in Papua the emphasis could be on conservation.

The forest area of a country is not homogeneous in terms of species composition, management practices (e.g. unexploited, under sustainable management, conservation, etc.) or drivers of carbon stock changes (e.g. drivers of deforestation). In response to this diversity, the government should implement a set of diversified policies and measures to achieve sustainable management of its land resources.

In terms of MRV, this translates into a need for a detailed stratification of the entire national territory, as follows:

1. A stratification of the forest land area to identify and monitor areas of land with different biophysical properties, subject to different policies, measures and activities – i.e. the

stratification of the entire national territory according to biophysical and socio-economic variables.

2. Within a single stratum, different activities and institutional arrangements related to the management of forest carbon stocks should be identified, resulting in a more detailed sub-stratification.

For each stratum and/or sub-stratum, technical and methodological arrangements aimed at achieving the highest quality estimates in a cost-effective manner should be implemented. All on-going local monitoring activities should be taken into account or directly included in the GHG-I while the national monitoring activities verify the local estimates. Indonesia will need to develop a stratification scheme (such as the one shown in Figures 11 and 12) which incorporates the IPCC's indications (e.g. 'managed land' concept as a proxy to identify anthropogenic emissions by sources and removals by sinks) and reflects outcomes from the technical negotiations under the UNFCCC.
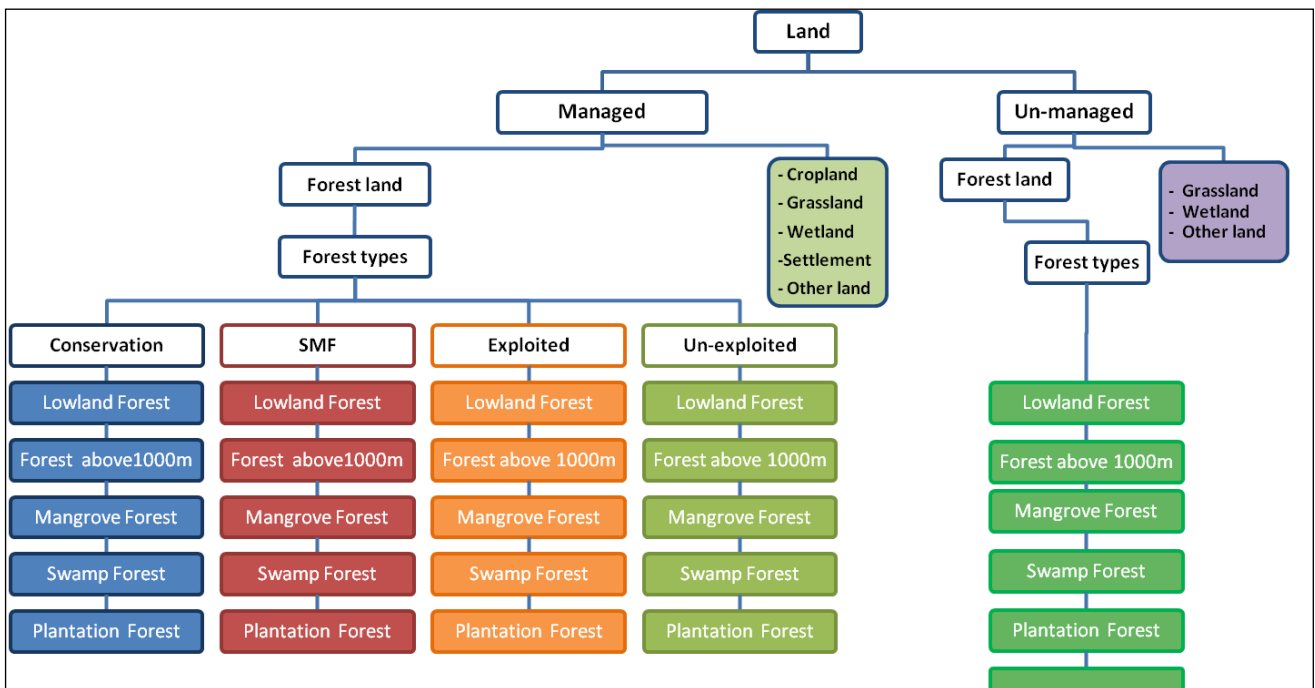
Figure 11. Potential land use classification/stratification system for Indonesia's national territory.
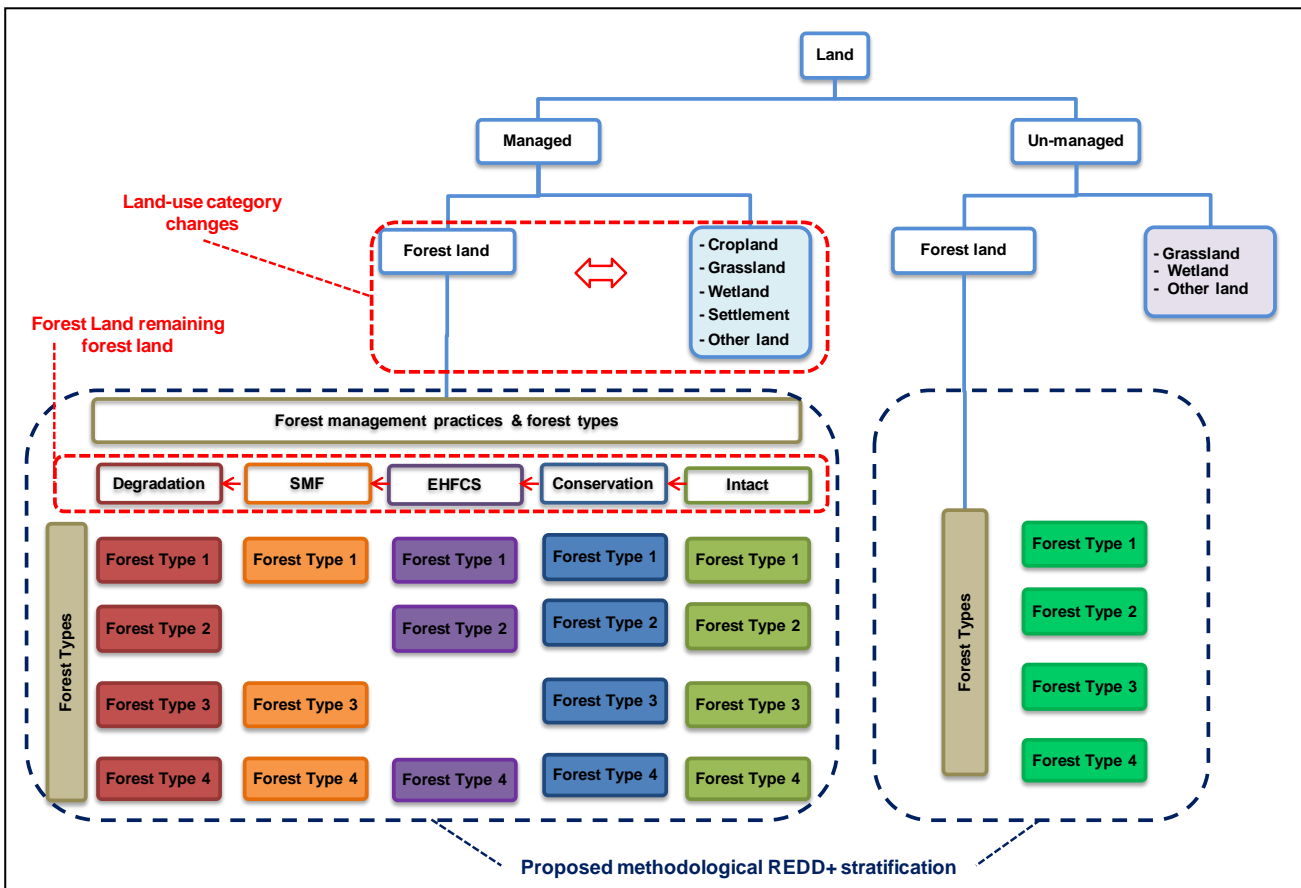
Figure 12. Land stratification scheme based on forest type and forest management practices.
With this scheme Indonesia may report on changes in carbon stock due to land use change activities (afforestation, reforestation and deforestation) reporting differences in carbon stock between forest land and cropland, grassland, wetland, settlement and other land. It may also report on changes in carbon stock in forest land remaining forest land while reporting on differences in carbon stock between and within the different forest management practices and forest types. SMF and EHFC stand for Sustainable Management of Forest and Enhancement of Forest Carbon Stocks, respectively. The figure will be updated once all stakeholders have agreed on Indonesia's main forest types.

IPCC's approach for GHG Inventories

TIER LEVELS

Information on carbon stock changes can be obtained in various ways. The IPCC has categorized these approaches into three levels of increasing data requirements and analytical complexity called 'Tiers' (IPCC 2003, 2006). Moving from Tier 1 to Tier 3 increases the accuracy (which is unknown for Tier 1) of the GHG estimates while increasing the complexity of the monitoring and analyses.

KEY CATEGORIES

Numerous sources of emissions and removals by sinks exist on land. In the context of reducing GHG emissions and establishing GHG-Is, Indonesia will have to pay particular attention to its major sources of emissions as they are required to report on them with increasing accuracy. Large sources of emissions have been coined 'Key Categories' by the IPCC. Indonesia should prioritise its resources and monitoring efforts to provide accurate estimates of such Key Categories, and evaluate which REDD+ activities (e.g. deforestation) represent a Key Category, for which it is good practice to use higher Tiers (2 or 3). However, national circumstances are always important and in the absence of better data Tier 1 could also be accepted for a Key Category in some cases.

THE METHODS: STOCK DIFFERENCE & GAIN-LOSS METHOD

The IPCC identifies two methods to assess carbon stock changes in the carbon pools: i) the process-based approach ('Gain-Loss Method'), which estimates the net balance of additions to and removals

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from a carbon stock and ii) the stock-based approach ('Stock Difference Method'), which estimates the difference in carbon stocks at two points in time. The Gain-Loss Method includes all processes that bring about changes in a pool including statistics on losses by harvest, fires, etc; while the Stock Difference Method measures the carbon stocks in relevant pools at two points in time to assess carbon stock change. Indonesia should aim to use the Gain-Loss Method for reporting in Phase 2 of REDD+ and Stock Difference in Phase 3.

THE 'MANAGED LAND' PROXY AND LAND-USE CATEGORIES

Countries will have to report on carbon stock changes (emissions and/or removals by sinks) only if these are human induced. In that respect the IPCC advices the use of the 'managed land' concept as a proxy to discriminate human induced emissions and removals. Only changes in managed land will have to be estimated and reported. If human activity occurs on land where there was previously no human activity ('unmanaged' land), it immediately becomes 'managed' land. In practical terms this means that a country territory will have to be divided into 'managed' and 'un-managed' land, or in other words, land where human activity occurs and land where human activity is absent. Countries will have to provide detailed definitions and a national approach to distinguish between unmanaged and managed land in a transparent manner (IPCC 2006b).

Countries will also have to divide their national territories into the following six land-use categories that the IPCC has defined for GHG reporting (IPCC 2003): (i) forest land; (ii) cropland; (iii) grassland; (iv) wetlands; (v) settlements and (vi) other land. It is good practice to ensure compatibility with the six land-use classes described above when developing national land classification systems (IPCC 2003). These categories can be further subdivided into categories which reflect national circumstances. When using a Tier 2 and 3 method, it is good practice to evaluate interactions between management practices that affect emission/stock change factors.

THE FIVE CARBON POOLS THAT DESCRIBE THE CARBON CYCLE AND CARBON FLUXES

The IPCC defines five carbon pools: aboveground biomass, belowground biomass, dead wood, litter and soil organic matter, which have to be measured and reported for GHG inventories. The generalised flowchart of the carbon cycle (Figure 13) shows all five pools and associated fluxes including inputs to and outputs from the system, as well as all possible transfers between the pools. The carbon cycle includes changes in carbon stocks due to both continuous processes (i.e. growth and decay) and discrete events (i.e. disturbances like harvest, fire, insect outbreaks, land-use change and other events). Continuous processes can affect carbon stocks in all areas in each year, while discrete events cause emissions and redistribute ecosystem carbon in specific areas (i.e. where the disturbance occurs) in the year of the event.
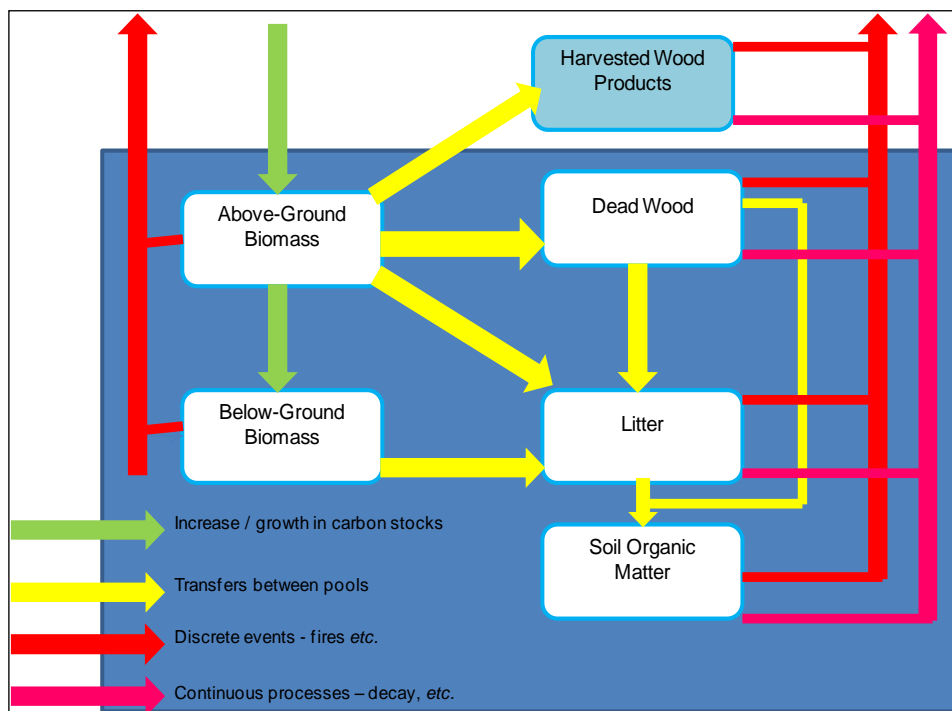
Figure 13. Generalised carbon cycle of terrestrial AFOLU ecosystems. This figure shows the flows of carbon into and out of the system as well as between the five carbon pools within the system (adapted from figure 2.1 IPCC 2006).

QUALITY CONTROL AND QUALITY ASSURANCE

It is important to assess the quality of data collection, compilation and analysis in order to have error estimates and improve future measurements. The IPCC 2006 Guidelines for National Greenhouse Gas Inventories (IPCC 2006b) contain the necessary clarifications regarding quality control (QC) and quality assurance (QA) for GHG inventories. QC procedures are internal to the process of inventory preparation, while QA consist of an external (independent) assessment of the quality of the reported estimates. It should also be noted that the UNFCCC Secretariat, through its roster of experts, will verify the methods and data in the National GHG Inventory that Indonesia uses to report.

ANNEX 2: TIMETABLE OF ACTIVITIES

MRV INSTITUTION

Activity	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
Drafting of Presidential Decree to establish MRV Institution	■											
Drafting of ToRs for MRV Institution HQ Staff	■											
Submission of Presidential Decree to establish MRV Institution		■										
Posting of MRV Institution vacancies		■										
MRV Institution vacancies interviewing & selection		■										
Esatblishment of MRV Institution lab, inc office space & equipment			■									
First meeting of the MRV Institution steering committee			■									
Technical staff training			■									
Initiation of data collection: Web Interface & GHG Units				■								
Design & testing of web interface of Information System				■	■	■						
Web interface fully operational							■	■	■	■	■	■

PROVINCIAL MONITORING UNITS

Activity	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
Deployment of monitoring units to Pilot Provinces				■								
Recruitment of Field Teams in Pilot Provinces				■								
Training of Field Teams in Pilot Provinces					■	■						
Deployment of Field Teams in Pilot Provinces						■	■					
Field Teams in Pilot Provinces operational							■	■	■	■	■	■

SATELLITE LAND REPRESENTATION SYSTEM

Activity	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
Drafting of ToRs for SLRS	■											
Posting of SLRS vacancies	■											
SLRS vacancies interviewing & selection		■										
First meeting of the SLRS steering committee		■										
Esatblishment of SLRS lab, inc office space & equipment			■									
International workshop on SLRS work programme			■									
Technical staff training				■								
Collection and processing of data and images					■	■	■					
SLRS fully operational								■	■	■	■	■

NATIONAL FOREST INVENTORY

Activity	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
Specialist forest information database implementation		■										
Specialist forest information database training			■									
Digitisation of historical NFI data in specialised database				■	■	■	■	■	■	■	■	■
Drafting of ToRs for new NFI staff	■											
NFI vacancies interviewing & selection		■										
First meeting of the NFI steering committee			■									
Esatblishment of NFI lab, inc office space & equipment			■									
International workshop on NFI work programme				■								
Technical staff training - HQ					■							
Identification of NFI capacity building needs in the provinces						■						
Recruitment of Field Staff							■					

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Gantt chart — REDD+ GHG-I work programme schedule

Task	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
Technical staff training - Field Teams								▓	▓	▓	▓	▓
Field Teams operational (data collection)							▓	▓	▓	▓	▓	▓

REDD+ GHG-I

Task	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
Assessment of GHG-I capacities & needs	▓											
Drafting of ToRs for GHG-I		▓										
Posting of GHG-I vacancies			▓									
GHG-I vacancies interviewing & selection				▓								
First meeting of the GHG-I steering committee					▓							
Esatblishment of GHG-I lab, inc office space & equipment					▓	▓						
Technical staff training						▓	▓					
International workshop on REDD+ GHG-I work programme							▓					
Data collection and processing								▓	▓	▓	▓	▓

ANNEX 3: BUDGET TEMPLATE & PRELIMINARY FIGURES

This is a preliminary assessment of the full implementation cost of Indonesia's Information, Monitoring and MRV System over the first five years. The total cost over the five year period is USD 43 million, approximately USD 8.6 million per year. The costs include set-up, equipment and management/operation of the system.

		QUANTITIES						UNIT COST (USD)	TOTALS (USD)					
	Unit	Y1	Y2	Y3	Y4	Y5	Total		Y1	Y2	Y3	Y4	Y5	Total
1. Set-up of the "Information, Monitoring & MRV System" baseline support														
a. Procurement process for offices, laboratories and training centres upgrades														
Procurement contracts establishment and review	lumpsum	1						50,000	50,000	-	-	-	-	50,000
Baseline MRV Institution office equipment kit	lumpsum	1						200,000	200,000	-	-	-	-	200,000
Baseline SLMS office equipment kit	lumpsum	1						350,000	350,000	-	-	-	-	350,000
Baseline NFI office equipment kit	lumpsum	1						100,000	100,000	-	-	-	-	100,000
Baseline training centre upgrading and updating	lumpsum	1						250,000	250,000	-	-	-	-	250,000
Subtotal Procurement process for offices, laboratories and training centres upgrades									**950,000**	**-**	**-**	**-**	**-**	**950,000**
b. MRV Institution														
Director	pers.-year	1	1	1	1	1	5	50,000	50,000	50,000	50,000	50,000	50,000	250,000
REDD+ GHG Unit Senior Officer	pers.-year	1	1	1	1	1	5	35,000	35,000	35,000	35,000	35,000	35,000	175,000
REDD+ GHG Unit Technical Officers	pers.-year	4	4	4	4	4	20	25,000	100,000	100,000	100,000	100,000	100,000	500,000
Data Management Unit Senior Officer	pers.-year	1	1	1	1	1	5	35,000	35,000	35,000	35,000	35,000	35,000	175,000
Data Management Unit Technical Officers	pers.-year	4	4	4	4	4	20	25,000	100,000	100,000	100,000	100,000	100,000	500,000
Monitoring Unit Senior Officer	pers.-year	1	1	1	1	1	5	35,000	35,000	35,000	35,000	35,000	35,000	175,000
Monitoring Unit Technical Officers	pers.-year	10	10	10	10	10	50	25,000	250,000	250,000	250,000	250,000	250,000	1,250,000
Field Units Coordinator & Forester	pers.-year	19	19	19	19	19	95	25,000	475,000	475,000	475,000	475,000	475,000	2,375,000
Field Units Botanist	pers.-year	19	19	19	19	19	95	25,000	475,000	475,000	475,000	475,000	475,000	2,375,000
Field Units Technician	pers.-year	19	19	19	19	19	95	20,000	380,000	380,000	380,000	380,000	380,000	1,900,000
Field Units Driver	pers.-year	19	19	19	19	19	95	10,000	190,000	190,000	190,000	190,000	190,000	950,000
Secretaries	pers.-year	2	2	2	2	2	10	15,000	30,000	30,000	30,000	30,000	30,000	150,000
Subtotal MRV Institution									**2,155,000**	**2,155,000**	**2,155,000**	**2,155,000**	**2,155,000**	**10,775,000**
c. SLMS														

		Y1	Y2	Y3	Y4	Y5	Total	Unit cost	Y1	Y2	Y3	Y4	Y5	Total
Director GIS & Remote Sensing Lab	pers.-year	1	1	1	1	1	5	40,000	40,000	40,000	40,000	40,000	40,000	200,000
Senior Officer GIS & Remote Sensing Lab	pers.-year	1	1	1	1	1	5	35,000	35,000	35,000	35,000	35,000	35,000	175,000
Technical Officers System & Software Development	pers.-year	20	20	20	20	20	100	25,000	500,000	500,000	500,000	500,000	500,000	2,500,000
Unit Senior Officer System & Software Development	pers.-year	1	1	1	1	1	5	35,000	35,000	35,000	35,000	35,000	35,000	175,000
Unit Technical Officers	pers.-year	2	2	2	2	2	10	25,000	50,000	50,000	50,000	50,000	50,000	250,000
Data Management Unit Senior Officer	pers.-year	1	1	1	1	1	5	35,000	35,000	35,000	35,000	35,000	35,000	175,000
Data Management Unit Technical Officers	pers.-year	3	3	3	3	3	15	25,000	75,000	75,000	75,000	75,000	75,000	375,000
Secretaries	pers.-year	2	2	2	2	2	10	15,000	30,000	30,000	30,000	30,000	30,000	150,000
Subtotal SLMS										800,000	800,000	800,000	800,000	800,000	4,000,000
d. NFI															
Director	pers.-year	1	1	1	1	1	5	40,000	40,000	40,000	40,000	40,000	-	160,000
Central Management Unit Senior Officer	pers.-year	1	1	1	1	1	5	35,000	35,000	35,000	35,000	35,000	-	140,000
Central Management Unit Technical Officers	pers.-year	5	5	5	5	5	25	25,000	125,000	125,000	125,000	125,000	-	500,000
Central Data Analysis & Archiving Unit Senior Officer	pers.-year	1	1	1	1	1	5	35,000	35,000	35,000	35,000	35,000	-	140,000
Central Data Analysis & Archiving Unit Technical Officers	pers.-year	5	5	5	5	5	25	25,000	125,000	125,000	125,000	125,000	-	500,000
Central GIS/Remote Sensing Support Lab Senior Officer	pers.-year	1	1	1	1	1	5	35,000	35,000	35,000	35,000	35,000	-	140,000
Central GIS/Remote Sensing Support Lab Technical Officers	pers.-year	5	5	5	5	5	25	25,000	125,000	125,000	125,000	125,000	-	500,000
Central Auditing Unit Senior Officer	pers.-year	1	1	1	1	1	5	35,000	35,000	35,000	35,000	35,000	-	140,000
Central Auditing Unit Technical Officers	pers.-year	3	3	3	3	3	15	25,000	75,000	75,000	75,000	75,000	-	300,000
Decentralised Field Offices Coordination Team	pers.-year	19	19	19	19	19	95	30,000	570,000	570,000	570,000	570,000	-	2,280,000
Decentralised Field Offices Technical Officers	pers.-year	38	38	38	38	38	190	20,000	760,000	760,000	760,000	760,000	-	3,040,000
Decentralised Field Offices Field Officers	pers.-year	76	76	76	76	76	380	15,000	1,140,000	1,140,000	1,140,000	1,140,000	-	4,560,000
Decentralised Field Offices Assistants	pers.-year	57	57	57	57	57	285	10,000	570,000	570,000	570,000	570,000	-	2,280,000
Secretaries	pers.-year	3	3	3	3	3	15	13,000	39,000	39,000	39,000	39,000	-	156,000
Subtotal NFI										3,709,000	3,709,000	3,709,000	3,709,000	-	14,836,000
Subtotal Set-up of the "National Forest										7,614,000	6,664,000	6,664,000	6,664,000	2,955,000	30,561,000

Monitoring System" baseline support system

		QUANTITIES						UNIT COST	TOTALS (USD)					
	Unit	Y1	Y2	Y3	Y4	Y5	Total	(USD)	Y1	Y2	Y3	Y4	Y5	Total
2. Definition of methodologies to be followed for the "Information, Monitoring & MRV System"														
a. Definition of methodologies for each of the System components														
National workshops for methodology definition	workshop	2					2	30,000	60,000	-	-	-	-	60,000
b. Nat. ws. to define data collection methods for required outputs	workshop	1					1	30,000	30,000	-	-	-	-	30,000
c. Nat. ws. to define data mgt and analysis	workshop	1					1	30,000	30,000	-	-	-	-	30,000
d. Nat. ws. to define and identify the logistics associated to the above	workshop	1					1	30,000	30,000	-	-	-	-	30,000
Subtotal Definition of methodologies to be followed for the "Information, Monitoring & MRV System"									150,000	-	-	-	-	150,000

		QUANTITIES						UNIT COST	TOTALS (USD)					
	Unit	Y1	Y2	Y3	Y4	Y5	Total	(USD)	Y1	Y2	Y3	Y4	Y5	Total
3. Set-up of database systems														
a. Computer server														
Network / internet connection	lumpsum	1					1	20,000	20,000	-	-	-	-	20,000
Raw data matrices	server	1					1	20,000	20,000	-	-	-	-	20,000
Analysis of matrices	server	1					1	10,000	10,000	-	-	-	-	10,000
Output matrices	server	1					1	10,000	10,000	-	-	-	-	10,000
Subtotal Computer server									60,000	-	-	-	-	60,000
b. Maintenance of servers	service contract	1	1	1	1	1	5	5,000	5,000	5,000	5,000	5,000	5,000	25,000
Subtotal Set-up of database systems									65,000	5,000	5,000	5,000	5,000	85,000

		QUANTITIES						UNIT COST	TOTALS (USD)					
	Unit	Y1	Y2	Y3	Y4	Y5	Total	(USD)	Y1	Y2	Y3	Y4	Y5	Total
4. Capacity building														
a. Field teams - Technical inventory training														
NFI technicians	course	3					3	40,000	120,000	-	-	-	-	120,000
NFI managers	course	1					1	40,000	40,000	-	-	-	-	40,000
GHG-I managers	course	1					1	40,000	40,000	-	-	-	-	40,000
Subtotal Field teams - Technical inventory training									**200,000**	**-**	**-**	**-**	**-**	**200,000**
b. Data analysis teams - Data analysis training														
NFI technicians	course	1					1	40,000	40,000	-	-	-	-	40,000
SLMS managers	course	1					1	40,000	40,000	-	-	-	-	40,000
GHG-I managers	course	1					1	40,000	40,000	-	-	-	-	40,000
Subtotal Data analysis teams - Data analysis training									**120,000**	**-**	**-**	**-**	**-**	**120,000**
c. Quality assurance & control and estimation of uncertainties - Data analysis training														
NFI technicians	course		1				1	20,000	-	20,000	-	-	-	20,000
SLMS higher professionals	course		1				1	20,000	-	20,000	-	-	-	20,000
GHG-I higher professionals	course		1				1	20,000	-	20,000	-	-	-	20,000
Subtotal Quality insurance & control and estimation of uncertainties - Data analysis training									**-**	**60,000**	**-**	**-**	**-**	**60,000**
d. Training of trainers														
NFI	course	1					1	20,000	20,000	-	-	-	-	20,000
SLMS	course	1					1	20,000	20,000	-	-	-	-	20,000
GHG-I	course	1					1	20,000	20,000	-	-	-	-	20,000
Subtotal Training of trainers									**60,000**	**-**	**-**	**-**	**-**	**60,000**
Subtotal Capacity building									**380,000**	**60,000**	**-**	**-**	**-**	**440,000**

	Unit	Y1	Y2	Y3	Y4	Y5	Total	UNIT COST (USD)	Y1	Y2	Y3	Y4	Y5	Total
				QUANTITIES							TOTALS (USD)			
5. Implementation of the "Information, Monitoring & MRV System"														
a. Procurement of logistical materials														
Procurement contracts establishment and review / administration	lumpsum	10					10	3,000	30,000	-	-	-	-	30,000
NFI field teams equipment procurement (including cars)	lumpsum	19					19	50,000	950,000	-	-	-	-	950,000
Subtotal Procurement of logistical materials									980,000	-	-	-	-	980,000
b. Data collection														
SLRS	lumpsum	1	1	1	1	1	5	500,000	500,000	500,000	500,000	500,000	500,000	2,500,000
NFI	lumpsum	19	19	19	19		76	30,000	570,000	570,000	570,000	570,000	-	2,280,000
GHG-I	lumpsum	1	1	1	1	1	5	50,000	50,000	50,000	50,000	50,000	50,000	250,000
Information system	lumpsum	1	1	1	1	1	5	100,000	100,000	100,000	100,000	100,000	100,000	500,000
Subtotal data collection									1,220,000	1,220,000	1,220,000	1,220,000	650,000	5,530,000
c. Daily functioning of operational system	lumpsum	1	1	1	1	1	5	100,000	100,000	100,000	100,000	100,000	100,000	500,000
Subtotal daily functioning									100,000	100,000	100,000	100,000	100,000	500,000
d. Quality control and assurance of the data collection phase														
Local independent Consultants (two people for six months)	pers-day		200	200	200	200	800	150	-	30,000	30,000	30,000	30,000	120,000
Travel for consultants	travel		10	10	10	10	40	400	-	4,000	4,000	4,000	4,000	16,000
DSA for consultants (will travel half of their time)	dsa		100	100	100	100	400	50	-	5,000	5,000	5,000	5,000	20,000
Subtotal Quality control and insurance of the data acquisition phase									-	39,000	39,000	39,000	39,000	156,000
Subtotal Implementation of the "Information, Monitoring & MRV System"									2,300,000	1,359,000	1,359,000	1,359,000	789,000	7,166,000

	Unit	Y1	Y2	Y3	Y4	Y5	Total	UNIT COST (USD)	Y1	Y2	Y3	Y4	Y5	Total
		QUANTITIES							TOTALS (USD)					
6. Data analysis and report production														
a. Production of outputs - scheduling	lumpsum	1					1	5,000	5,000	-	-	-	-	5,000
b. Consistency / coherence with previous reports	lumpsum		1	1	1	1	4	5,000	-	5,000	5,000	5,000	5,000	20,000
c. Data analysis														
SLRS	lumpsum	1	1	1	1	1	5	200,000	200,000	200,000	200,000	200,000	200,000	1,000,000
NFI	lumpsum		1	1	1		3	100,000	-	100,000	100,000	100,000	-	300,000
GHG-I	lumpsum			1	1	1	3	50,000	-	-	50,000	50,000	50,000	150,000
d. Quality control and assurance, endorsement and dissemination of results		1	1	1	1	1	5	30,000	30,000	30,000	30,000	30,000	30,000	150,000
Subtotal Data analysis and report production									**235,000**	**335,000**	**385,000**	**385,000**	**285,000**	**1,625,000**

	Unit	Y1	Y2	Y3	Y4	Y5	Total	UNIT COST (USD)	Y1	Y2	Y3	Y4	Y5	Total
		QUANTITIES							TOTALS (USD)					
7. Definition of national and provincial activities														
a. National programmes and provincial activities / facilitation														
National workshops	workshop	1					1	30,000	30,000	-	-	-	-	30,000
Provincial workshops	workshop		19				19	10,000	-	190,000	-	-	-	190,000
Subtotal Definition of national and provincial activities									**30,000**	**190,000**	**-**	**-**	**-**	**220,000**

									Y1	Y2	Y3	Y4	Y5	Total
Sub-Total									**10,774,000**	**8,613,000**	**8,413,000**	**8,413,000**	**4,034,000**	**40,247,000**
8. Administrative Costs Overheads (7% of total costs)	per annum								754,180	602,910	588,910	588,910	282,380	2,817,290
GRAND TOTAL									**11,528,180**	**9,215,910**	**9,001,910**	**9,001,910**	**4,316,380**	**43,064,290**