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REDD+ MONGOLIA

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REDD+ ACADEMY

REDUCING EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION

LEARNING JOURNAL

5

NATIONAL FOREST MONITORING SYSTEMS (NFMS) FOR REDD+

Director of UNREDD Mongolia National Programme
Tungalag.M

Dear Learner,

Welcome to the Mongolia REDD+ Academy journals, providing you with an overview of REDD+ planning and implementation, developed by some of the world's leading REDD+ experts. It has been designed to accompany you in your learning journey, covering all the main REDD+ topics, from the basics to the finer points of setting reference levels, monitoring, allocation of incentives and stakeholder engagement.

The modules presented in this journal will equip you with the necessary knowledge to better understand the various components of Mongolia's work on REDD+ readiness and in determining policies and measures to contribute towards the countries Forest and Climate Change National Strategy.

I encourage you to apply this knowledge and do your part to make REDD+ a success in Mongolia!

GOVERNMENT OF MONGOLIA

REDD+ MONGOLIA

BRIEF INTRODUCTION OF THE UN-REDD MONGOLIA NATIONAL PROGRAMME

Mongolia became a partner country of the UN-REDD Programme in June 2011 and National REDD+ Readiness Roadmap officially adopted by the Ministry of Environment and Green Development and Tourism. UN-REDD Mongolia National Programme based on National REDD+ Readiness Roadmap started to implement in September 2015 approved by the Programme Policy Board.

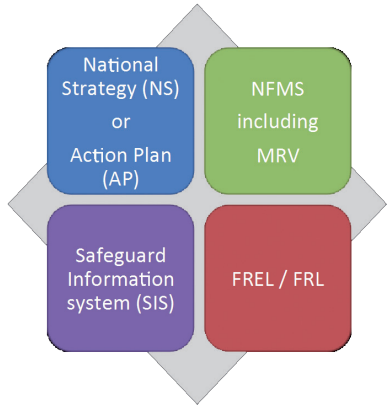
UN-REDD is a United Nations collaborative initiative on Reducing Emissions from Deforestation and Forest Degradation (REDD+). The Programme was launched in 2008 to assist developing countries prepare and implement national REDD+ strategies. It builds on the expertise of the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP). The program is currently working in over 74 countries, mainly in tropical developing countries. Mongolia is the only country with significant amounts of boreal forest and being the most northerly country and faces unique climate change and ecological issues that are not observed in other countries.

In addition, support to Cook Islands, Gambia, Kribati, Marshall Islands, Niger, Palau, Senegal, Sierra Leone, Tongo and Tuvalu.

MAIN GOAL

The overall goal of the UN-REDD Mongolia National Programme is to support the Government of Mongolia in designing and implementing its National REDD+ Strategy or Action Plan and in meeting the requirements under the UNFCCC Warsaw Framework to receive results-based payments. The UN-REDD Programme supports nationally-led REDD+ processes and promotes the informed and meaningful involvement of all stakeholders, including Indigenous Peoples and other forest-dependent communities, in national and international REDD+ implementation.

This comprises work on the four design elements for REDD+, 1 National Strategy &/or Action Plan, 2 National Forest Monitoring System, 3 Safeguards Information System, 4 Forest Reference Level.



The National Programme also counts on key national counterpart institutions and development partners to play active roles and take on specific responsibilities in maintaining the momentum in the REDD+ management processes and prioritizing and implementing those strategic options identified through the Programme.

REDD+ Mongolia

As a signatory to both the UN Framework Convention on Climate Change (UNFCCC, in 1992) and the Kyoto Protocol (1997), Mongolia is fully aware of the causes and potential impacts of climate change. Mongolia is therefore striving to reduce its greenhouse gas (GHG) emissions while maintaining its path of economic development. Mongolia's vast surface area includes approximately 17 million hectares of forest – an area roughly the size of Nepal. These forests can be categorised into two broad zones: northern boreal forests and southern Saxaul forests. The northern boreal forests cover approximately 13.2 million hectares and the southern saxual forest, which is largely an arid zone shrub vegetation covers 4.6 million (Ministry of Environment and Tourism, Mongolia, 2015). M ongolia's forests have great potential to contribute towards the country's sustainable development goals and innovative policies on Sustainable Development. This may arise through the provision of ecosystem services and goods, such as timber, non-timber forest products, water services, and biodiversity, provide resources for communities, such as non-timber forests products and firewood. The implementation of sustainable forest management strategies can also reduce greenhouse gas emissions from reducing forests degradation and deforestation and enhance services and carbon stocks.

REDD+ ACADEMY

The REDD+ Academy is a coordinated REDD+ capacity development initiative led by the UN-REDD Programme and the UNEP Environmental Education and Training Unit, which seeks to match the scale of the global climate change mitigation challenge and enable systematic, focused capacity development to deliver REDD+ on the ground.The REDD+ Academy is a comprehensive response to capacity building needs identified by the countries receiving

support from the UN-REDD Programme. The main aim of the REDD+ Academy is to empower potential "REDD+ champions" with the requisite knowledge and skills to promote the implementation of national REDD+ activities.The REDD+ Academy is also available (in English) on the following website and can do online tests and collect a certificate for completed courses:

http://unccelearn.org/login/index.php

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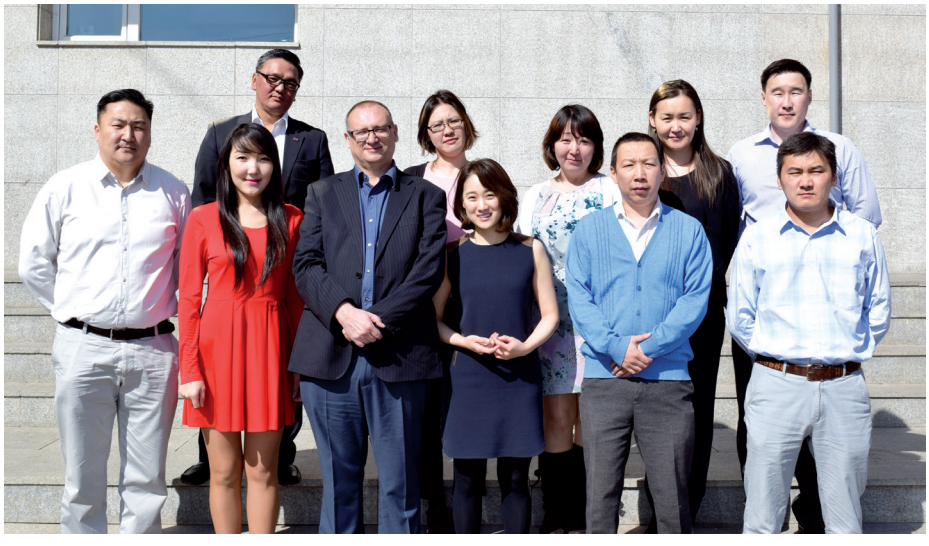
The United Nations Institute for Training and Research (UNITAR) is a principal training arm of the United Nations, working in every region of the world. We empower individuals, governments and organizations through knowledge and learning to effectively overcome contemporary global challenges. Our training targets two key groups of beneficiaries: the delegates to the United Nations and others who develop intergovernmental agreements establishing global norms, policies, and programmes, and the key national change agents who turn the global agreements into action at the national level.

REDD+ Academy Journals in Mongolia

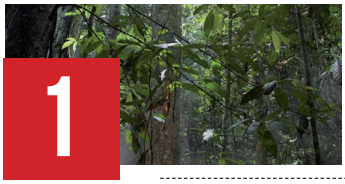
The REDD+ Mongolia journals have been developed from the REDD+ Academy journals, for more details on REDD+ National Program in Mongolia please see the following sites.

Website: www.reddplus.mn Facebook: REDD+ in Mongolia Twitter: REDD+ in Mongolia



Programme management unit, UN-REDD Mongolia national programme

LEARNING MODULES



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FOREST, CARBON SEQUESTRATION AND CLIMATE CHANGE

2

UNDERSTANDING REDD+ AND THE UNFCCC

3

DRIVERS OF DEFORESTATION AND FOREST DEGRADATION (DDFD)

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NATIONAL STRATEGIES AND ACTION PLANS

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NATIONAL FOREST MONITORING SYSTEMS (NFMS) FOR REDD+

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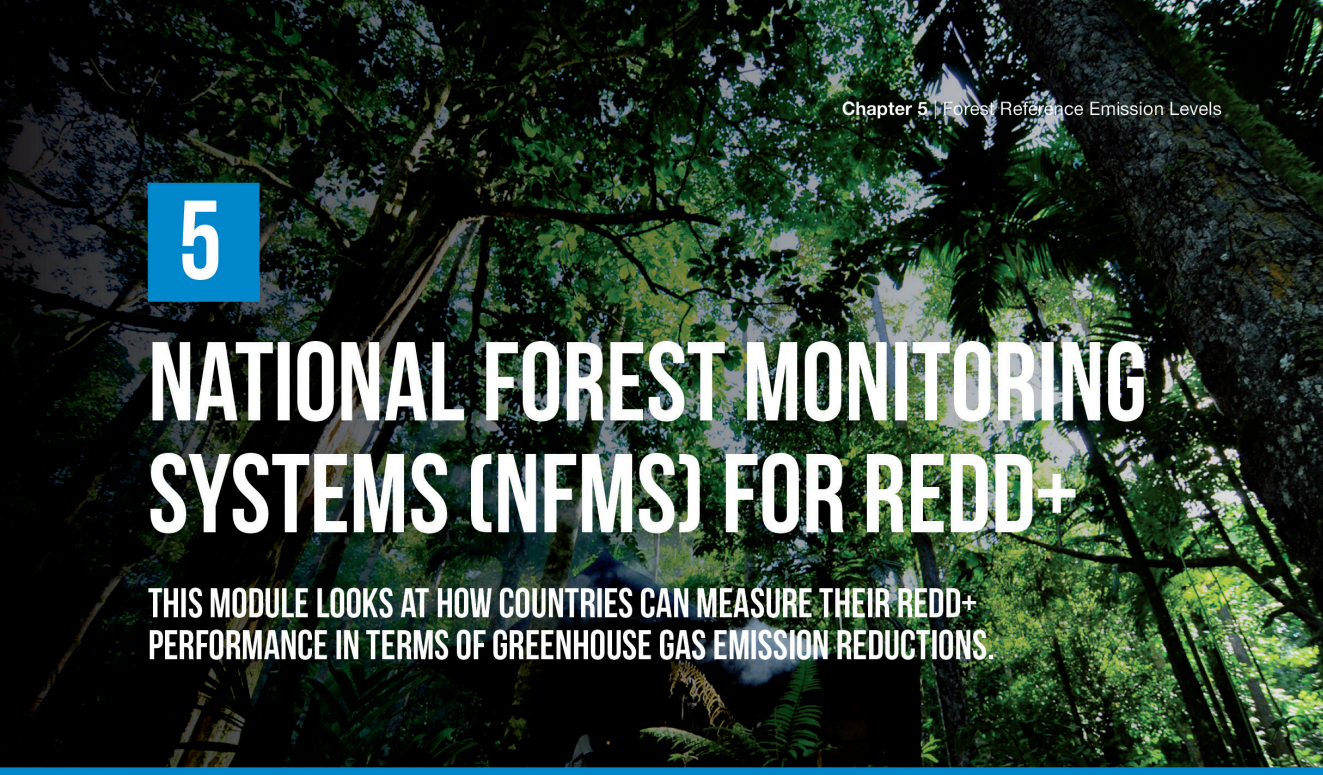
REDD+ FINANCE



5

NATIONAL FOREST MONITORING SYSTEMS (NFMS) FOR REDD+

THIS MODULE LOOKS AT HOW COUNTRIES CAN MEASURE THEIR REDD+ PERFORMANCE IN TERMS OF GREENHOUSE GAS EMISSION REDUCTIONS.

THE MODULE INCLUDES EXPLANATIONS ABOUT:

- What is meant by National Forest Monitoring Systems (NFMS)
- Why NFMS are required, by reference to the UNFCCC and relevant international agreements
- How it is done, in terms of classifying land-use, developing forest inventories, calculating emission factors, consistency with the IPCC, reporting to the UNFCCC and the subsequent verification of reports

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Key messages

- The aim of an NFMS is to assess the degree to REDD+ activities are working;
- There are two functions to an NFMS: monitoring and measuring, reporting and verification;
- An NFMS is one of the four elements that countries are required to develop in order to participate in REDD+ under the UNFCCC;
- The IPCC has developed a number of guidelines over the years which can be used to help countries implement NFMS.

Introduction

This module looks at how countries can measure their REDD+ performance in terms of greenhouse gas emission reductions.

The module includes explanations about:

- What is meant by National Forest Monitoring Systems (NFMS)
- Why NFMS are required, by reference to the UNFCCC and relevant international agreements
- How an NFMS is developed and implemented, in terms of classifying land-use, developing forest inventories, calculating emission factors, consistency with the IPCC, reporting to the UNFCCC and the subsequent verification of reports.

What is an NFMS?

In the context of REDD+, an NFMS is a system for recording and monitoring how land is used in a country, and to develop data which shows the levels of Greenhouse Gas (GHG) emissions and removals related to forests.

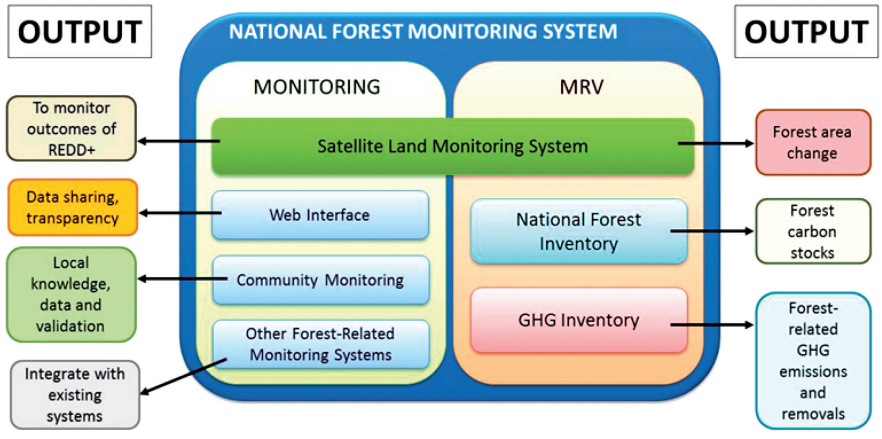
The aim of an NFMS is to assess the degree to which REDD+ activities are working. NFMS for REDD+ should be implemented in phases, as follows:

- Phase 1: Gathering initial data; developing capacity, institutions and infrastructure;
- Phase 2: Piloting NFMS with REDD+ demonstration activities;
- Phase 3: Full implementation of NFMS with REDD+ policies and measures.

By combining information about how land use patterns are changing, through, for example, deforestation or afforestation, with information from a national forest inventory, it is possible to make estimates about overall GHG emissions related to the forest sector.

There are a number of different elements to an NFMS as summarised in Figure 5.1

FIGURE 5.1 ELEMENTS OF AN NFMS



Source: UN-REDD Programme

An NFMS has two functions,

1. The monitoring function
2. The measurement, reporting and verification (MRV) function.

The MRV function is specific to REDD+, while the Monitoring function is important for REDD+, but also for non-REDD+ purposes in the forestry sector.

There are two aspects of Measurement under the MRV function of an NFMS for REDD+:

1. Information on changes in extent, quality or type of forestland, usually measured through satellite-based remote sensing technology, is referred to as Activity Data (AD). For the purposes of REDD+, the AD must be transparent and freely available.
2. Information on forest carbon stocks, usually measured through a ground-based National Forest Inventory (NFI), is used to produce Emission Factors (EF). An EF is a coefficient that indicates the GHG emissions that will result from a unit of change (e.g. 1 hectare of deforestation) to a particular type of forest or species of tree plantation.

Emissions of all GHGs are important, but most emissions from the Land Use, Land Use Change and Forestry (LULUCF) sector are Carbon Dioxide (CO_2), so EFs are measured in tonnes of CO_2 equivalent (t CO_2e).

Forests and other terrestrial ecosystems sequester carbon in biomass and soil. The rate at which a particular forest type sequesters carbon is known as a Removal Factor (RF).

The combination of AD and EFs (and RFs) can be used to develop a national estimate of GHG emissions over a particular period of time. This estimate is part of a country's Greenhouse Gas Inventory (GHG-I).

REFLECTION POINT

What challenges do you envisage with the measurement of Activity Data and Emission Factors?

Why is an NFMS necessary?

An NFMS is one of the four elements that countries are required to develop in order to participate in REDD+ under the UNFCCC (see ***Module 2: Understanding REDD+ and the UNFCCC***). The evolution of guidance on NFMS under the UNFCCC is provided with the Bali Action Plan (2007), and Decisions under the Copenhagen (2009), Cancun (2010), and Warsaw (2013) Conference of Parties (Table 5.2).

The term "MRV" comes from paragraph 1 (b)[1], which refers to mitigation actions in general, not just REDD+. The Bali Action Plan encourages all countries to reduce their GHG emissions, according to national circumstances, in a way that is:

- **Measurable** – i.e. country can calculate estimates of GHG emissions reductions and carbon sink enhancements
- **Reportable** – i.e. country can produce a GHG-I that is transparent, accurate and complete
- **Verifiable** – i.e. third parties can access all information required to verify the GHG-I

NFMS are expected to form part of international mechanisms (including REDD+) that provide payment for environmental services. Under these mechanisms, developing countries will receive financial compensation for the successful implementation of sustainable pro-forest policies. In many programmes, the corresponding payments

[1] Decision 1/CP.13: The Bali Action Plan

will be strictly performance-based and released only when credible evidence exists that the agreed and announced goals have been achieved. This evidence is largely generated by forest-monitoring efforts (Box 1).

TABLE 5.2 SUMMARY OF COP DECISIONS REGARDING NFMS

Agreement	Summary
The UNFCCC: Text of the Convention (1992), Article 4: Commitments:	Parties will publish and make available national inventories of anthropogenic sources and removals by sinks, using similar methods.
The Bali Action Plan (2007)	All parties are encouraged to reduce their GHG emissions in ways that are measurable, reportable and verifiable. Capacity building should be supported and reporting using the latest IPCC guidelines encouraged.
Copenhagen (2009)	Emissions from forests should be reduced according to the latest IPCC guidelines and national forest monitoring systems should be established according to using consistent methodologies.
Cancun (2010)	A National forest monitoring system is one of the four key elements of REDD+ and it should be developed through a phased approach.
Warsaw (2013)	Formalises earlier guidance into decisions, describes the quality of national forest monitoring systems required for measurement of REDD+ results, and the methods of reporting and verification.

BOX 1 : FOREST-RELATED INFORMATION IS INCREASINGLY VALUED

For a long time, national-level forest inventory and monitoring was viewed exclusively as a forestry issue and received little attention from other sectors and governments. In developing countries, governments provided only minimal efforts or investments, and national forest inventory and monitoring was implemented mostly through technical cooperation projects via international or bilateral cooperation. This took the form of projects rather than programmes, which were limited in time and scope and not institutionalized within national systems.

This situation has changed considerably. Many countires now recognize forests as national as well as global assests, about which they need up-to-date data and information in order to monitor status and changes over time, as a basis for informed decision-making on a wide range issues.

National forest monitoring may be considered as standard survey activity similar to other information-gathering activities undertaken by governments to remain informed (e.g. population census, community and economic surveys).

Implementing an NFMS

To implement an NFMS for REDD+, it is essential to consider the methodological guidance from the IPCC. The IPCC has developed a number of guidelines over the years which can be used to help countries implement NFMS. These include the following:

- 1995 IPCC Guidelines
- Revised 1996 IPCC Guidelines
- Good Practice Guidance (GPG) 2000 (non-LULUCF)
- Good Practice Guidance (GPG) 2003 (LULUCF)
- 2006 IPCC Guidelines

The detailed guidelines can be found on the UNFCCC website at the following address: https://unfccc.int/land_use_and_climate_change/redd_web_platform/items/6734.php

Non-Annex I Parties are encouraged to use GPG 2003 and the more recent 2006 IPCC Guidelines.

To obtain timely and reliable forest information at different scales, clear guidance on how to collect, compile, and analyse it is needed. In this context, 21st session of the Committee on Forestry (COFO), held in September 2012, recommended that FAO continue to support countries to strengthen national forest information systems and requested FAO to "work in close collaboration with member countries and relevant organizations to prepare a set of voluntary guidelines on national forest monitoring, which takes into account the requirements for REDD+ reporting and is in line with the principles and goals of the Forest Instrument"[2]. The Voluntary Guidelines on National Forest Monitoring present a general framework and a set of decision-support tools for planning and implementing a multi-purpose national forest monitoring system. They are based on the experience and lessons learned by FAO member countries and by past and present FAO forest monitoring projects and initiatives as well as expert, stakeholder and user inputs. The latest guidelines are submitted to COFO 23 in 2016[3].

[2] FAO (Food and Agriculture Organization of the United Nations). 2012. Report on the Committee on Forestry, Twenty-First Session: COFO/2012/REP paragraph 50, page 7. Rome, Italy. Available at: http://www.fao.org/docrep/meeting/026/me988e.pdf

[3] FAO (Food and Agriculture Organization of the United Nations). 2016. Report on the Committee on Forestry, Twenty-Third Session: COFO/2016/7.2. Rome, Italy. Available at: http://www.fao.org/3/a-mq903e.pdf

Source: UNREDD Mongolia National Programme

Software tools

There are a number of software tools to support these guidelines and which can be used to help countries implement NFMS methodologies and calculate greenhouse gas emissions. For example, the Emission Factor Database (EFDB) is a repository of emission factors for use in REDD+ reporting.

These tools are available from the Internet:

1. The main IPCC website: http://www.ipcc.ch/
2. The homepage for the EFDB: http://www.ipcc-nggip.iges.or.jp/EFDB/main.php.

How the IPCC Guidelines will help

The IPCC Guidelines have been designed to help countries produce GHG inventories that are accurate, they should neither over- nor under-estimate emissions, as far as can be judged, and reduce uncertainties as far as possible.

The Guidelines help to develop GHG inventories that are:

1. Transparent

2. Well-documented
3. Consistent over time
4. Complete
5. Comparable
6. Subject to quality control and assurance

They help countries to use their resources efficiently, and to produce a GHG-I that will become increasingly accurate over time, as more information becomes available.

Categorising land-use

The IPCC divides land into six categories, based on how it is used:

1. Forest land
2. Grassland
3. Cropland
4. Wetland
5. Settlement
6. Other land

Each land-use category is further disaggregated to reflect past and current land-use. For example, under forest land there are the sub-categories:

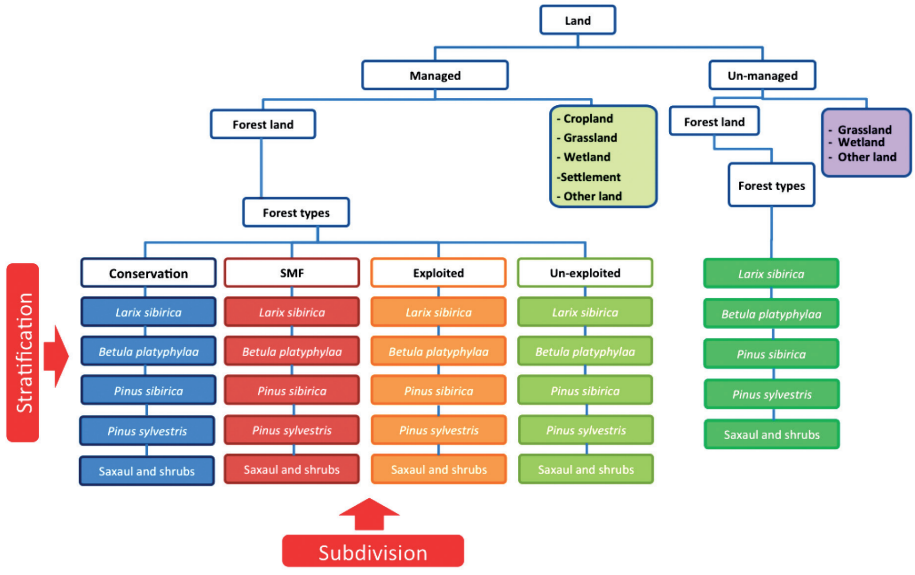
- Forest land remaining forest land
- Grassland converted to forest land
- Cropland converted to forest land, etc.

Land-use categories and sub-categories may be further sub-divided according to land-use practices or biophysical characteristics of the land. For example, forest land can be sub-divided by forest type as follows:

- Lowland tropical forest
- Mangroves, etc.

This categorisation can be represented by a land stratification 'tree' such as this one produced for Mongolia (Figure 5.3).

FIGURE 5.3 MONGOLIA CATEGORIZATION OF LAND



Source: UN-REDD Programme

It is important when designing and maintaining systems for land representation that they are:

- **Adequate**: capable of representing land-use categories, and conversions between land-use categories, as needed to estimate carbon stock changes and greenhouse gas emissions and removals;
- **Consistent**: capable of representing land-use categories consistently over time, without being unduly affected by artificial discontinuities in time-series data;
- **Complete**: that all land within a country should be included, with increases in some areas balanced by decreases in others, recognizing the bio-physical stratification of land if needed; and
- **Transparent**: data sources, definitions, methodologies and assumptions should be clearly described.

Key categories

Countries should identify land-use categories that are particularly significant in terms of greenhouse gas emissions. Categories may be regarded as key if:

- The absolute level of emissions is high in comparison to other categories;
- Emissions are increasing or decreasing fast; and

- There is a degree of uncertainty regarding the level or trend of emissions.

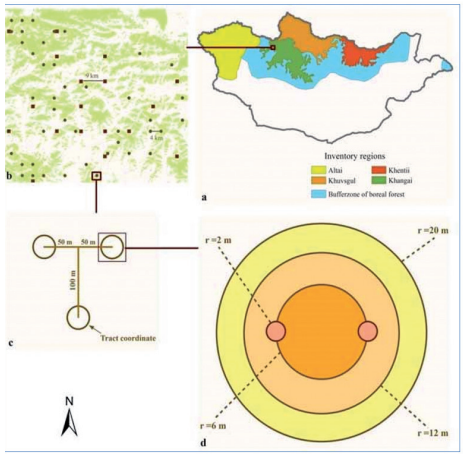
Identifying key categories helps to prioritise the allocation of effort and resources, to make sure that there is better data for these categories. There are also reporting implications for key categories in terms of which tier should be used as explained in more detail below.

National Forest Inventories

A National Forest Inventory (NFI) is important for land use categorisation. The NFI provides a record of the extent and type of forests in a country and, if two or more NFIs are conducted at different points in time, the trends of change in forest extent and type. NFIs are used to generate information for decision making (at national and sub-national levels) and for monitoring in forestry and other land use sectors (Box 2).

Box 2: Mongolian Multipurpose National Forest Inventory, 2014-2016

The Forest Policy and Coordination Department at the Ministry of Environment and Tourism and the Forest Research and Development Centre State Owned Enterprise were responsible for the implementation of Mongolia's first multipurpose NFI. The NFI was backed by GIZ, who was commissioned by the German Federal Ministry of Economic Cooperation and Development (BMZ) to support NFI methodology, capacity development and data interpretation.



The main objective of the NFI are to provide estimates the boreal forest area and characteristics of forests, also including the carbon pools in Mongolian boreal forest, and to disseminate the results at http://www.forest-atlas.mn.

The NFI is designed to continuously provide information on the state and trends of Mongolian boreal forest resources, at national and 5 regional levels.

The field inventory sampling design is developed to generate per-hectare-based forest statistics. The design covered the assessment of a total of 4211 sampling units allocated over the stocked forest areas within the Mongolian boreal forest zone. Each sampling unit is a cluster of 3 fieldplots.

Layout of sampling unit. a) NFI regions b) Spacing of sampling units c) cluster of sample plots d) sample plot design - nested circular plots

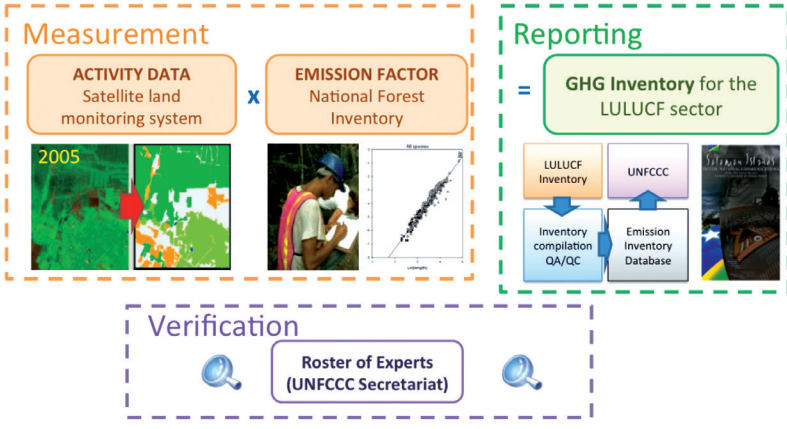
The IPCC guidance and guidelines link NFIs to GHG reporting requirements. When GHG reporting is done at Tier 2 or Tier 3 levels (note that these terms are explained in the following section on Reporting), the NFI must contain:

- Country-specific estimates of emission factors;
- Inventory data based on multiple time periods;
- Uncertainty analysis of the data within the inventory;
- Quality Assurance and Quality Control (QA/QC) measures taken to ensure accuracy, consistency and reliability of the data.

Reporting on greenhouse gas emissions and removals

Having covered some basic issues involved in NFMS, the Measurement, Reporting and Verification (MRV) function will be further examined (Figure 5.4).

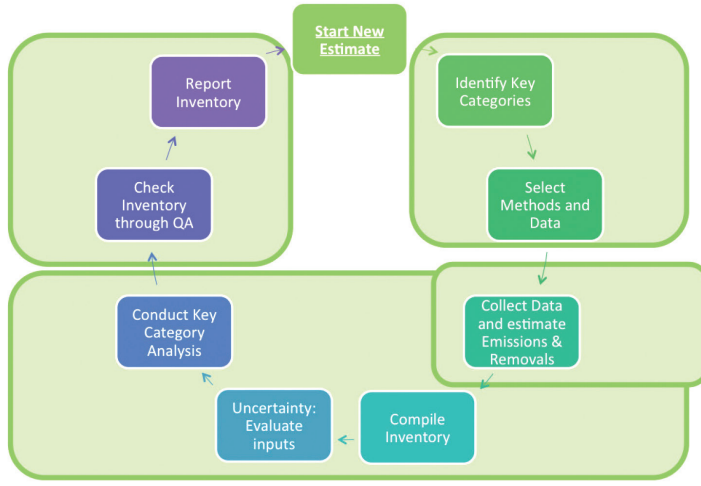
FIGURE 5.4 MEASUREMENT, REPORTING AND VERIFICIATION



Source: UN-REDD Programme

Figure 5.5 shows the MRV reporting cycle for REDD+, summarizing the process of gathering, processing, submitting and verifying forest monitoring data. This section looks at the stages of this cycle in more detail.

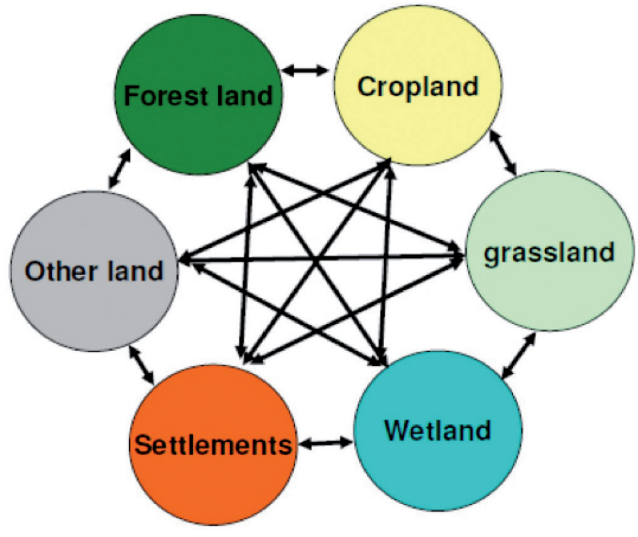
FIGURE 5.5 MRV REPORTING CYCLE FOR REDD+



Source: UN-REDD Programme

The ultimate aim of an NFMS is to make reliable estimates about amounts of greenhouse gases being emitted into and being removed from the atmosphere by a country's forests. The ongoing challenge with this activity is that land-use is constantly changing, as illustrated in Figure 5.6. As an area of land changes from one use to another its net emissions will also change, so the crucial issue with NFMS is keeping accurate records of area of each land use type.

FIGURE 5.6 LAND USE INTERACTIONS



Source : UN-REDD Programme

IPCC guidance is that countries should characterize and account for all relevant land areas consistently and as transparently as possible and the data should reflect the historical trends in land-use area

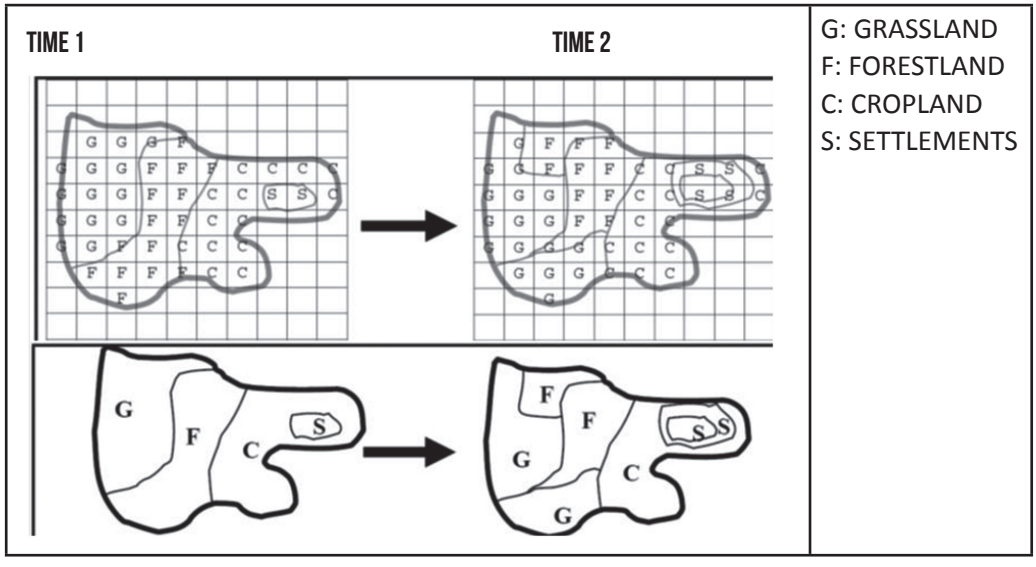
The IPCC 2003 LULUCF Guidance suggests three approaches:

- Approach 1: Basic land-use data (land-use types at both times 1 and 2)
- Approach 2: Survey of land-use and land-use change (changes from and to a category)
- Approach 3: Geographically explicit land-use data (known locations of changes between categories)

In most developing countries the only way to represent land in a consistent and transparent way with a historical time frame of 20 years is the use of satellite remote sensing data, which allows the adoption of Approach 3.

Following Approach 3, gathering geographically-explicit land-use data, requires spatially explicit observations of land-use and land-use change, for example as shown in Figure 5.7.

FIGURE 5.7 GEOGRAPHICALLY EXPLICIT LAND USE DATA



Source: UN-REDD Programme LEGEND:

This data may be obtained either by:

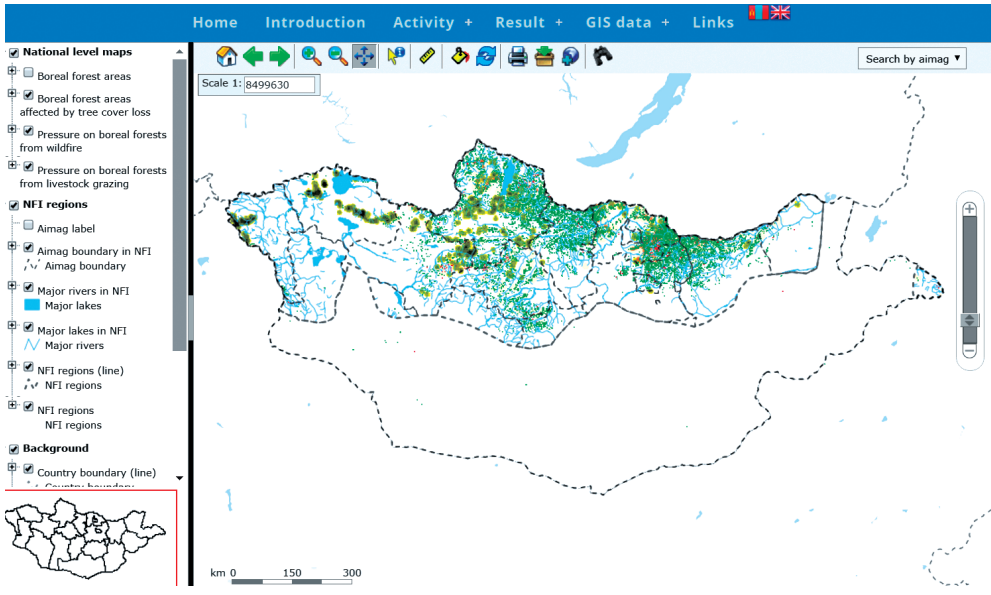
- Sampling geographically located points
- A complete tally (wall-to-wall mapping)
- A combination of the two.

This method is comprehensive and relatively simple conceptually, yet is data-intensive to implement. There are a range of tools available that can be used to gather data.

- Satellite remote sensing is cost-effective for covering large areas
- A web-GIS portal makes it possible to visualise and transparently share data.

Figure 5.8 shows an example of a portal available in Mongolia which allows a country to support REDD+ planning in Mongolia. This portal would be further developed to monitor the outcomes of the implementation of its REDD+ policies and to measure and communicate the results to the international community (as a transparent and open reporting process).

FIGURE 5.8 EXAMPLE OF A WEB-GIS PORTAL IN PARAGUAY



Source: Screen shot from the web address: http://178.33.8.119/portal/

It is possible for any user to interact with the system through a user-friendly web-interface, perhaps to provide feedback or further information on areas of deforestation. Users can also manipulate data layers, for example, to select specific areas or layers of interest, or to download statistics.

Supplementing these, community monitoring allows bottom-up validation of satellite data, and the incorporation of local knowledge into national monitoring.

It is also important to build on existing systems that are already in place, for example systems to monitor logging concessions or protected areas.

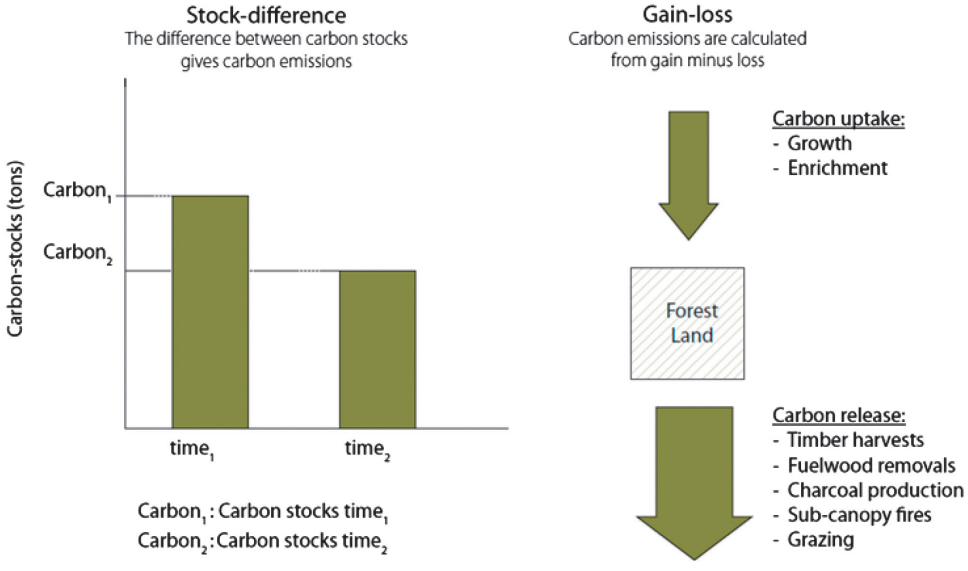
REFLECTION POINT

What technologies does your country use to support forest monitoring?

Measuring carbon stored

There are two ways of measuring changes in the amount of forest carbon, which are summarised in Figure 5.9.

FIGURE 5.9 THE TWO WAYS OF MEASURING FOREST CARBON



Source: UN-REDD Programme

In the **Stock-Difference** method, it is required to know the amounts of carbon present at both Times 1 and 2. The change is then simply the difference between the two figures. Although this is simple, most developing countries do not have inventories of carbon at two different times, so instead they almost all use the Gain-Loss method.

The **Gain-Loss** method starts with the figure for the current carbon stock based on recent surveys, and then estimate:

- Losses due to harvesting, fuel wood removal, charcoal production, sub-canopy fires, grazing, etc
- Gains due to growth and forest enrichment.

Then, the net gain or loss to the current carbon stock figure is added.

This process, of course, relies on data held in the National Forest Inventory, which shows how important it is that NFI data contains reliable data on:

- Diverse ecological conditions and/or management regimes
- Emissions and removals due to human activity
- Changes in all five carbon pools wherever possible (above-ground biomass, dead wood, soil organic carbon, litter and below-ground biomass)

When the data on land use and changes is entered into a GHG Inventory spreadsheet (such as the one shown in Figure 5.10), and combined with relevant emission and removal factors, it is possible to calculate the implied emission or removal.

FIGURE 5.10 GHG INVENTORY SPREADSHEET EXAMPLE

Baseline			unit	2016	2017	2018	2019	2020	2021	2022	2023	2024
Area	Deforested		[ha]	86,190	86,190	86,190	86,190	86,190	86,190	86,190	86,190	86,190
	Burned		[ha]	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
	Disturbed by Pests		[ha]	95,700	95,700	95,700	95,700	95,700	95,700	95,700	95,700	95,700
Emission BAU			[t C / ha / yr]	16,634,816	16,634,816	16,634,816	16,634,816	16,634,816	16,634,816	16,634,816	16,634,816	16,634,816
			[t CO2 / ha / yr]	60,994,327	60,994,327	60,994,327	60,994,327	60,994,327	60,994,327	60,994,327	60,994,327	60,994,327
Emission Reduction - Deforestation			unit	2016	2017	2018	2019	2020	2021	2022	2023	2024
Area	Change	from base year	[ha]	0	-308	-616	-923	-1,231	-1,539	-1,847	-2,155	-2,463
Additional Se	Assumption: Reduction -2030: -5 [%]		[t C / ha / yr]	0	-10,452	-20,904	-31,357	-41,809	-52,261	-62,713	-73,166	-83,618
Emission Reduction - Fires			unit	2016	2017	2018	2019	2020	2021	2022	2023	2024
Area	Change	from base year	[ha]	0	-25,000	-50,000	-75,000	-100,000	-125,000	-150,000	-175,000	-200,000
Additional Se	Assumption: Reduction -2030: -70 [%]		[t C / ha / yr]	0	-636,666	-1,273,333	-1,909,999	-2,546,665	-3,183,331	-3,819,998	-4,456,664	-5,093,330
Emission Reduction - Disturbances			unit	2016	2017	2018	2019	2020	2021	2022	2023	2024
Area	Change	from base year	[ha]	0	-6,836	-13,671	-20,507	-27,343	-34,179	-41,014	-47,850	-54,686
Additional Se	Assumption: Reduction -2030: -100 [%]		[t C / ha / yr]	0	-69,633	-139,266	-208,899	-278,532	-348,166	-417,799	-487,432	-557,065
Totals			unit	2016	2017	2018	2019	2020	2021	2022	2023	2024
Emissions if	Deforestation reduced		[t CO2 / ha / yr]	60,994,327	60,956,002	60,917,677	60,879,353	60,841,028	60,802,703	60,764,378	60,726,053	60,687,728

Source: UN-REDD PROGRAMME

Determining emission factors

One challenge that countries face when carrying out forest monitoring activities is deciding on emission factors. The guidelines help with this by providing three tiers for reporting:

- Tier 1 – reporting uses IPCC methodology with internationally-derived emissions factors
- Tier 2 – applies country- or region-specific emission and removal stock change factors for the most important land-use categories, then uses IPCC default assumptions and methodology
- Tier 3 – uses country-specific assumptions, methodology and data (but which is internationally reviewed).

This is summarised in table 5.11.

TABLE 5.11 EMISSION FACTORS

Emission / Removal Factor	Tier 1	Tier 2	Tier 3
Annual biomass growth rate	• Default values from IPCC 1996GL and GPG2003 • Emission Factor Data Base (EFDB)	• Default values from IPCC 1996GL and GPG2003 • Country-specific data • EFDB	• National Forest Inventory or modelling approaches • Allometric equations
Carbon fraction of dry matter	• Default data of 0.5	• Default data of 0.5	• Species-specific data from laboratory estimations
Biomass Expansion Factor (BEF)	• Default values of 1.8	• Default values of 1.8 • National data for key forest types	• Species-specific data from measurements

Source : UN-REDD Programme

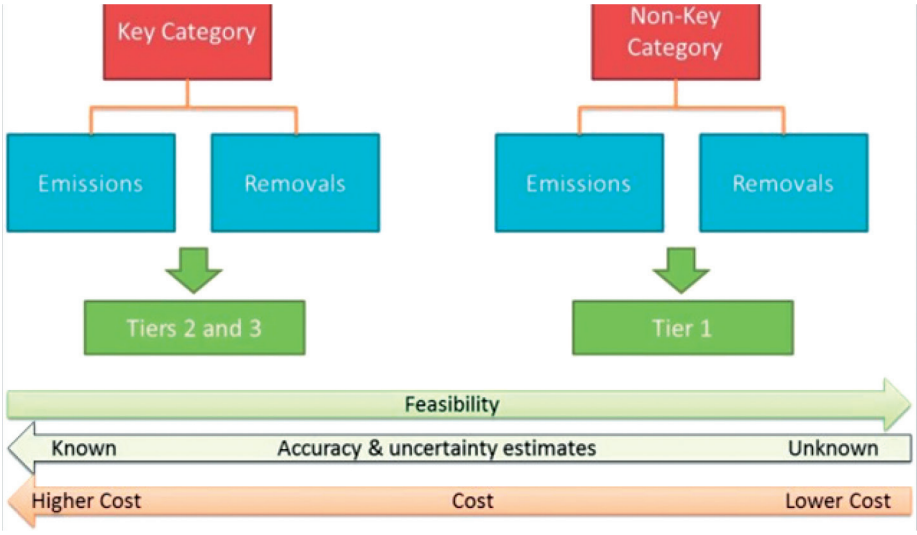
It is possible to use a combination of tiers and methods. For example, in the LULUCF sector, different tiers can be used:

- For different land-use categories (e.g. tier 2 for forest land and tier 1 for grassland); and
- Within a given land-use category for different carbon pools (e.g. tier 1 for below-ground biomass and tier 2 for above-ground biomass).

When using higher tiers, countries need to provide additional documentation to support decisions to use more sophisticated methodologies or country-defined parameters.

Higher tiers should be adopted for key land use categories (wherever possible) together with the use of country-specific and climatic region-specific emission and removal factors. Figure 5.12 summarises some of the issues associated with linking categories and tiers. Using Tiers 2 and 3 increases the accuracy and reduces uncertainty but also makes the process more expensive, whereas adopting a Tier 1 approach makes the process more feasible.

FIGURE 5.12 ISSUES ASSOCIATED WITH LINKING CATEGORIES AND TIERS



Source : UN-REDD Programme

REFLECTION POINT

What area (land use/specific area, etc.) in your country would you prioritize achieving Tier 3 information (if it were possible)? Why?

Reporting for REDD+

There are clearly defined processes for reporting on REDD+ progress. These processes have been designed to make sure that the reporting is:

- **Transparent** – there is sufficient clear documentation showing how the inventory was compiled, following good practice requirements;
- **Complete** – estimates are reported for all sources, sinks and gases;
- **National coverage;**
- **Comparable** – reporting should follow international guidance and templates;
- **Consistent** – consistent with IPCC guidance and guidelines (such as Forest Reference [Emission] Levels), and inventories should aim to reflect the real fluctuations in emissions and removals, and not be subject to changes resulting from methodological differences;

- **Accurate** – the GHG inventory contains neither under- nor over-estimates so far as can be judged, and that efforts have been made to reduce bias.

There are two ways for countries to report to the UNFCCC on progress with REDD+:

1. **National Communications** (NC), which include data and information on:
    - National circumstances
    - Vulnerability assessment
    - Financial resources and technology transfer for climate change
    - Education, training, public awareness
    - National GHG inventory
2. **Biennial Update Reports** (shortened to BUR), which may contain a Technical Annex if they want to access REDD+ finance, based on results from the implementation of REDD+ activities

The aim of a Biennial Update Report is to provide an update on the most recently submitted National Communication in the following areas:

- National circumstances and institutional arrangements;
- National GHG inventory;
- Mitigation actions and their effects, including methodologies;
- Constraints and gaps and related financial, technical and capacity needs;
- Level of support received to prepare and submit the BUR;
- Domestic measurement, reporting and verification.

There is currently no specific structure for preparing a BUR, but one is under development by GIZ[4].

Quality control of country reports

After submission, reports are subjected to a thorough quality control and assurance process.

[4] https://www.giz.de/en/html/index.html

For quality control, there are routine and consistent checks to identify and address errors and omissions, ensure data integrity, correctness and completeness. Inventory material is documented and archived, and a record is made of all QA activities.

For quality assurance, reviews should be carried out on a finalized inventory following the implementation of the quality control procedures, and this should preferably be done by independent third parties.

Verification

During the final this verification stage, two LULUCF experts assess the technical annex of the BUR following the International Consultation and Analysis (ICA) process, and they then prepare a technical report reflecting their assessment of the annex. This report will include an analysis of the results in the annex and areas identified for improvement. The technical assessment includes the possibility of discussions with the country for clarifications.

A final report by the LULUCF experts, including comments from the country, is then published on the UNFCCC REDD+ web platform.

REFLECTION POINT

The National Forest Inventory plays an integral part in the MRV process and it therefore requires reliable data, in different country contexts there are going to be different challenges.

What do you believe are the challenges associated with the National Forest Inventory and the data it requires in your country? Do you have any lessons to share from your countries experiences?

Your country may be reporting to the UNFCCC on a number of possible mechanisms. What is your country's experience with the UNFCCC reporting processes?

Exercises

Both of the following multiple choice exercises refer to COP 19: Warsaw (2013) contained in the text.

1. Multiple choice quiz – NFMS and the UNFCCC. The Warsaw Framework for REDD+. Decision 14/CP.19.

With reference to the text for Decision 14/CP.19 (Modalities for measuring, reporting and verifying) answer the following questions (complete the exercise individually then compare your answers with your neighbor)

I. What should be Measured Reported and Verified (MRV);

α. Anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks
β. Forest carbon stocks
χ. Forest carbon stock changes
δ. Forest area changes
ε. All the above

II. REDD+ MRV systems should be consistent with;

α. MRV systems for Nationally Appropriate Mitigation Actions
β. Landsat
χ. NGOs
δ. All the above

III. REDD+ MRV systems should be;

α. Transparent
β. Consistent with a countries established Forest Reference Emission Level (FREL)
χ. Used to maximize REDD+ payments
δ. Answers a and b above

Iς. REDD+ MRV reporting is;

α. Voluntary
β. Mandatory
χ. Required for results-based payments under the UNFCCC
δ. Answers a and c above

ς. REDD+ MRV reporting should be done through;

α. NGOs
β. A technical annex to Biennial update reports to the UNFCCC

χ. Wikipedia
δ. All the above

2. Multiple choice quiz – NFMS and the UNFCCC. The Warsaw Framework for REDD+. Decision 11/CP.19.

With reference to the text for Decision 11/CP.19 (Modalities for national forest monitoring systems) answer the following questions (complete the exercise individually then compare your answers with your neighbor)

1. National Forest Monitoring Systems should be guided by;

α. Intergovernmental Panel on Climate Change
β. The Kyoto Protocol
χ. The United Nations Convention on Biodiversity and Desertification
δ. All the above

2. National Forest Monitoring Systems should be;

α. Transparent
β. Consistent over time
χ. Suitable for Measurement Reporting and Verification (MRV)
δ. All the above

3. National Forest Monitoring Systems should be;

α. Applied at a regional level
β. Applied at a national level
χ. Applied sub-nationally as an interim measure (moving to a national system)
δ. Answers b and c

4. National Forest Monitoring Systems should be;

α. Built on existing systems
β. Flexible and allow for improvement
χ. Enable the assessment of different types of forest in the country
δ. Reflect the phased approach to REDD+
ε. All the above

Note

Note

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