WWF GUIDE TO BUILDING REDD+ STRATEGIES

Tracking REDD+

REFERENCE LEVELS

DOWNLOAD THIS CHAPTER

© JENNIFER FERGUSON-MITCHELL/WWF

Key Messages

- Robust and transparent REDD+ reference levels (RLs) are the benchmarks for assessing a country's performance in implementing REDD+, and so are a vital part of a REDD+ national or subnational strategy. RLs also ensure climate integrity in an international REDD+ system. At the same time, REDD+ RLs may be a yardstick for the amount of effort needed to reduce emissions, thus signalling the level of resources that a country will need to successfully implement REDD+.

- RLs are methodologically linked to forest monitoring, measurement, reporting and verification (MMRV) systems, because they seek to answer whether REDD+ is performing quantitatively. As countries strengthen their MMRV programmes and move through the Intergovernmental Panel on Climate Change (IPCC) tiers, RLs will be important guideposts for what countries will need to monitor, measure, report and verify.

- To build an RL, these five key elements must be considered:

  - Boundaries: geographic and temporal;
  - Classifications: how land and forest types are classified;
  - Activity data: rates of loss per land-use type;
  - Emissions factors: net CO_2e losses per hectare of forest types, including allometric equations;
  - Attention to uncertainty and transparency.

INTRODUCTION

Reference levels provide three key functions for the implementation of REDD+. First, they are the benchmark against which future REDD+ performance can be measured. RLs are therefore critical to ensuring the overall integrity of our climate system.[1] One of the fundamental pillars of REDD+ is to link measurable reductions in emissions from deforestation and forest degradation to payments. Clear, transparent and robust RLs are a cornerstone of this process.

Second, RLs are an important yardstick for the level of additional effort countries will need to undertake to reduce emissions from the forest sector. In this regard they provide signals to developing countries about what programmes and policies may be needed and will help benchmark the level of finance a country may need to successfully implement REDD+.

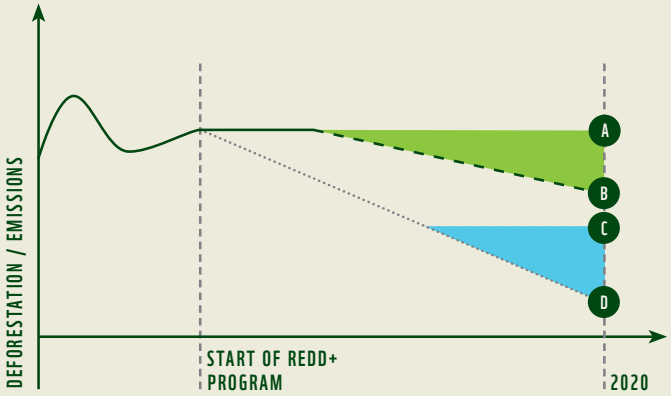
Finally, RLs are important for forest monitoring, measurement, reporting and verification (MMRV) systems (e.g. in the sourcing of data, development of field measurements and choice of allometric equations) (see *MMRV* chapter). For example, if an RL in a country uses certain forest classes, MMRV platforms should try to use comparable forest classes to allow for consistency in the measuring of emissions reductions.

For these reasons, RLs have become a central component of the REDD+ discussion, both under the United Nations Framework Convention on Climate Change (UNFCCC) and within the voluntary carbon markets, voluntary certification schemes and the multilateral funding institutions.

RLs also span multiple disciplines: At one end of the spectrum, they have a very technical component with the need for strong capacity in remote sensing, GIS, statistics and carbon accounting. At the other end, RL discussions can be highly politicized as they can potentially determine the scale of finance that a country (or jurisdiction) can access. RLs can also overlap with econometrics, socioeconomics and economic development when determining the correct and appropriate use of modelling to determine RLs.

It is important to note that the term *reference level* is often used interchangeably with other key terms, including *baselines*, *reference emissions levels* and *compensation baselines*. For the purpose of this report, we will use the UNFCCC definition of the term reference level from the 17th UNFCCC Conference of the Parties (COP 17) as the amount of forest-based emissions—expressed in tonnes of CO_2 equivalent per year—that are the benchmarks for assessing a country's performance in implementing REDD+[2] (see Figure 1).

FIGURE 1: A GRAPHIC DEPICTION OF A REFERENCE LEVEL (RL) AND RELATED BENCHMARKS



A Country Reference Level
B Benchmark to trigger international support
C Benchmark to trigger crediting of emissions to be sold in the offset markets
D Country REDD+ achievements

© MICHEL ROGGO / WWF-CANON

INTERNATIONAL POLICY CONTEXT

RLs are being negotiated under several key international forums. The UNFCCC has been discussing and negotiating RLs for around five years within the discussions under the Subsidiary Body for Scientific and Technical Advice (SBSTA). Over this period UNFCCC parties and observers have developed and submitted a wide range of views, participated in multiple workshops and generated pages of decisions and texts (Foundation for International Environmental Law and Development (FIELD), 2013), which will be summarized below. The voluntary carbon markets also provide a signalling body for the development of REDD+ RLs. For example, the Verified Carbon Standard (VCS) has developed the Jurisdictional and Nested REDD+ methodology as well as several other REDD+-specific methodologies under the Agriculture, Forestry and other Land Use (AFOLU) working group.[3] Other voluntary certification schemes (e.g. American Carbon Registry, CarbonFix, Gold Standard) have provided guidance on REDD+ RLs (see *Further resources* for details), and several multilateral financial institutions are now beginning to develop guidance on REDD+ RLs. Most notably, the Forest Carbon Partnership Facility (FCPF) is now developing guidance under its Carbon Fund and is expected to have a framework in place by mid-2013. Finally, some countries have already defined their RLs as part of bilateral REDD+ funding agreements (for example, Guyana as part of the Guyana-Norway REDD+ agreement).[4]

The following sections will summarize the major decisions that have been achieved under the UNFCCC on RLs.

COP 13: Bali, 2007

In 2007, at COP 13 in Bali, parties agreed on a framework for developing the methodological elements of REDD+ in an Annex to the Decision on REDD+.[5] In this Annex it was stated that "subnational approaches, where applied, should constitute a step toward the development of national approaches, reference levels, and estimates".

COP 15: Copenhagen, 2009

The first substantive decision on RLs came in 2009 at COP 15 in Copenhagen, where it was agreed that "developing country parties in establishing [RLs] should do so transparently, taking into account historic data and adjusting for national circumstances, in accordance with relevant decisions of the Conference of the Parties".[6] This decision sent an important signal to parties that RLs could be adjusted and might not be a purely historical average or trend of emissions over a given period.

COP 16: Cancun, 2010

In 2010, at COP 16 in Cancun, developing country parties wishing to engage in REDD+ were invited to develop a "national [RL] or, if appropriate, as an interim measure, subnational [RLs]".[7] It was further stipulated that national RLs could be a combination of subnational RLs. This invitation was the first of its kind under the UNFCCC and provided a signal to developing countries that they should begin the development of their REDD+ RLs.

COP 17: Durban, 2011

In 2011, at COP 17 in Durban, parties reached a landmark decision on RLs.[8] This decision provided the following key guidance for countries submitting REDD+ RLs:

- RLs are the benchmarks for assessing a country's performance in implementing REDD+.
- Invited countries are to submit their proposed RLs and accompanying information and rationale when they are ready and on a voluntary basis.
- RLs are an iterative process (they would not be a one-time submission), and subnational RLs could be used as an interim step toward national RLs.
- RLs should be expressed in tCO_2e/year.

The decision also detailed guidance in an Annex for how countries should develop RLs:

- Information should be transparent, complete and accurate;
- Information should include data sets, methods, models, assumptions, descriptions of changes from other submitted information, pools, gases and activities;
- Information should include forest definitions that are consistent with UNFCCC national inventories or submissions to other international organizations, and if there is an inconsistency, provide an explanation as to why.

At COP 17, parties also established a process for *assessing* RLs. The decision for the assessment process is still ongoing.

NATIONAL AND SUBNATIONAL OPTIONS

Practitioners developing national and subnational RLs must address the following five key elements:

- **Boundaries:** What are the geographic boundaries and timeframes of the RL? Will it be national or subnational? Over what period will the RL be constructed?
- **Classification:** How will land and forest types be classified? What are the emissions factors associated with these classes?
- **Activity data:** What activities will be included in the RL (e.g. deforestation, degradation, enhancement)?
- **Emissions factors:** Which pools and gases will be included in the RL? How will activity data be converted into emissions data?
- **Uncertainty and transparency:** How is uncertainty calculated? How will this be communicated?

In addition to these questions, developers of national or subnational RLs may also consider:

- **Connection to national forest monitoring systems:** How will this tie in with a national forest monitoring system?
- **Adjustments:** How will national circumstances be taken into account?

Before diving into these issues, it is worth sketching out the basic elements of an RL calculation.

First, at its simplest level,[9] a historical RL can be expressed as the average CO_2 emissions resulting from forest degradation and deforestation over a number of years, as shown in the equation below:

$$\textit{Reference Level} = \frac{\sum Em_{def} + \sum Em_{deg} - \sum Em_{rem}}{y}$$

Where $\sum EM_{def}$ is the sum of emissions from deforestation over "y" years, $\sum EM_{deg}$ is the sum of emissions from degradation over "y" years, $\sum EM_{rem}$ is the sum of emissions removals over "y" years and is the total number of years.

The emissions can be calculated simply as the product of activity data (i.e. the change in land cover or forest cover) and the emissions factor for that activity (i.e. how much CO_2 is emitted when a hectare of forest is lost), expressed by the following equation:

$$\sum Em = \sum \textit{activity data} \bullet \textit{emissions factors}$$

Activity data are expressed in hectares changed per year (ha/yr), and emissions factors are expressed in tonnes of carbon dioxide per hectare (tCO_2/ha). By multiplying emissions factors and activity data, we can estimate the emissions in tCO_2/year. The key thing to understand is that both activity data and emissions factors must use the same land cover classifications. If activity data uses one type of classification and emission factors use a different type of classification, then multiplying the two terms together would not produce a logical result.

With these simple equations in mind, let us now look at the individual steps for constructing a RL.

Boundaries

Scale

The Durban decision (made at COP 17 in Durban) clearly allows countries to submit interim subnational RLs and also permits countries to update their RL in light of improved data or technologies. The first question a country will need to answer is whether it will choose to submit a national or a subnational RL (as an interim step toward a national RL). This decision could be based on a range of factors, including a country's political position on subnational RLs as well as its capacity and data to implement an RL at the national level. The government of Nepal, for example, is developing both national and subnational RLs. Because Nepal has substantially more data for the lowland forests bordering India (called the Terai) than for the high mountain forests, it is developing an interim subnational RL for the lowland region first and will use this to inform the national RL (see *Focus*).

A further consideration in the selection of scale is the alignment with jurisdictional boundaries within a country. In countries like Brazil, for example, where states can cover areas the size of countries, the alignment of subnational RLs with state boundaries might be a logical choice. In countries with smaller jurisdictional authorities (e.g. Nepal, which has 76 districts), other options may be more appropriate that are based on physiological (e.g. altitudinal) or ecological (e.g. based on endangered species' habitats) boundaries.

© KEVIN SCHAFER / WWF-CANON

A final consideration for the choice of scale of subnational RLs is whether the proposed boundary is representative of deforestation patterns in the region (e.g. choosing an area that has little or no historical deforestation would not be a representative sample of larger deforestation trends). Increasing the scale of RLs will eliminate some of these risks and errors that subnational RLs can introduce.

Time frame

UNFCCC decisions have clearly stated that RLs should be based on historical data (i.e. data from a period in the past).[10] When selecting historical data, however, very little guidance has been given on what length of time is appropriate and how recent a period should be. As a general rule, many countries are exploring data for either the past five or 10 years, but this system is open to interpretation. Countries that have decreasing rates of deforestation (e.g. Brazil) would benefit from an RL that goes further back in time (i.e. that incorporates the country's higher rates of deforestation), whereas countries that have higher recent rates of forest loss (e.g. Bolivia) may choose to use shorter, more recent time periods for their proposed RLs.[11]

While emissions from fossil fuels within a country tend to vary only incrementally from a statistical mean, emissions from deforestation show larger year-to-year fluctuations. These are often the result of regional climate patterns and other stochastic events (e.g. spikes in land clearing triggered by increases in food prices). It will therefore be important, in determining an RL, to choose a period of time that is long enough to reduce the random noise from yearly variations.

Another key factor for governments in choosing time periods will be the availability of data. As historical activity data will primarily be taken from satellite data, the time period will depend largely on the availability of satellite imagery over historical periods (see *Focus* for an example in Nepal). While there is plenty of free data and software available, there are also capacity, time and other constraints that will influence how many years of data to include in RL calculations.

Forest classification

As referred to above, after a country decides which activities to include in the RL, it must choose appropriate land and forest classifications. While this appears to be a simple task, it can be challenging both technically and politically as many countries have different and often competing versions of

classifications and maps of land cover in concurrent use. The challenge of establishing a common metric to allocate land cover into classes is one of the thorniest initial challenges that countries will face. The IPCC Guidelines for National GHG Inventories provides some guidance on how to approach this task (see Focus, right), but ultimately countries will need to balance competing interests, varying resolutions and different interpretations of what types of land a country possesses. A combination of stratification and sampling will be needed to best define forest classes for a given country (see *MMRV* chapter).

The Durban decision allows countries to use different definitions or classifications of forest than previous international communications. The submission of an RL is an important opportunity for countries to propose their best data for their forest inventories. If a country chooses to use different definitions from its previous national communications, however, it must explain why these different definitions were used.

Activity data

Activity data is normally derived from remote sensing (satellite or airplane-mounted) products that estimate how many hectares of a certain forest type are lost, degraded or enhanced. Countries will have various remote sensing platforms that they already use to varying degrees, and government agencies are often complemented by academic and NGO support (see *MMRV* chapter).

UNFCCC decision 12/CP.17 requested that parties submit information on "Pools and activities... which have been included in [RLs] and the reasons for omitting a pool and/or activity from the construction of [RLs], noting that significant pools and/or activities should not be excluded". The choice of activity can include deforestation, degradation and enhancement,[12] and countries will need to justify which of these activities they are including and why.

The first point of assessment for countries when choosing scope is, whether they will be doing land-based accounting or activity-based accounting. Following the rationale from Kyoto-based land-use accounting, we can apply the following general rules (IPCC, 2000).

Land-based accounting

Under a land-based accounting approach, accounting begins with the total carbon stock change on land units subject to REDD+ activities. Implementing this rule involves first identifying land units on which applicable activities occur. Next, the total change in carbon stocks on these land units is determined. Adjustments can then be made to reflect decisions that the parties may adopt regarding baselines, leakage and timing issues. Aggregate emissions or removals are the sum of stock changes (net of adjustments) over all applicable land units.

Activity-based accounting

An activity-based approach begins with the carbon stock change attributable to designated activities. First, each applicable activity's impact on carbon stocks is determined per unit area, which is then multiplied by the area on which each activity occurs. This equation may also include adjustments to reflect policy decisions by the parties. Aggregate emissions or removals are calculated by summing across applicable activities. To avoid a given area of land being counted more than once if it is

FOCUS

IPCC APPROACHES FOR LAND-USE CHANGES

Adapted from IPCC, 2006

The IPCC Guidelines for National GHG Inventories describes three approaches to represent areas of land use with six broad categories: (i) Forest Land (ii) Cropland (iii) Grassland (iv) Wetlands (v) Settlements (vi) Other Land. These are presented below in order of increasing information complexity.

Approach 1: Total land-use area, no data on conversions between land uses

Approach 1 is the simplest and uses land-use area totals within a defined spatial unit, which is often defined by political boundaries such as a country, province or municipality. Under Approach 1 only net changes in land-use area can be tracked through time. Consequently, the exact location or pattern of land-use change and the exact changes in land-use categories cannot be ascertained.

Approach 2: Total land-use area, including changes between categories

Approach 2 provides an assessment of both the net losses and gains in specific land-use categories as well as what these conversions represent (i.e. changes both from and to a category). Tracking land-use conversions in this manner will normally require estimation of initial and final land-use categories for all conversion types (e.g. Forest Land converted to Cropland), as well as estimation of total area of unchanged land by category (e.g. Forest Land remaining Forest Land). The final result of this approach can be presented as a non-spatially-explicit land-use conversion matrix.

Approach 3: Spatially-explicit land-use conversion data

Approach 3 uses spatially explicit observations of land-use categories and land-use conversions, often tracking patterns at specific point locations and/or using gridded map products such as those derived from remote sensing imagery. The data may be obtained by sampling, wall-to-wall mapping techniques, or a combination of these two methods. The main advantage of spatially explicit data is that analysis tools such as GIS can be used to link multiple spatially explicit data sets (such as those used for stratification) and describe in detail the conditions on a particular piece of land prior to and after a land use conversion. This analytical capacity can improve emissions estimates by better aligning land use categories (and conversions) with strata mapped for classification of carbon stocks and emission factors by soil and vegetation type.

subject to multiple activities, each land unit can contain no more than one activity. In this case, the combined impact of multiple practices applied in the same area would be considered a single activity.

Under either a land-based or activity-based approach, parties should attempt to identify and include the major activities that are causing emissions reductions or removals and include these in the RL calculation.

Emissions factors

Emissions factors describe how much carbon is in a given unit of a particular forest type. These are generated by combinations of default values (IPCC Tier 1 default values for broad classes of land throughout the world) or more precise estimates that could be generated using plot data, field measurements and allometric equations that convert plot measurements to biomass or carbon estimates.

The IPCC recognizes six carbon pools and three gases (IPCC, 2006). The six carbon pools are:

- Above-ground biomass
- Below-ground biomass
- Deadwood
- Litter
- Soil organic matter
- Harvested wood products

The three greenhouse gases associated with land-use change are:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)

There are two fundamentally different and equally valid approaches to estimating stock changes in these pools: (1) the process-based approach called the "Gain-Loss Method", which estimates the net balance of additions to and removals from a carbon stock, and (2) the "Stock-Difference Method", which estimates the difference in carbon stocks at two points in time (see *Focus*).

Error reporting and transparency

Given the uncertainty around forest-based emissions, RLs should be reported transparently and with indications of statistical uncertainty. UNFCCC decisions have repeatedly requested that developing countries use the IPCC Good Practice Guidelines (GPG) as the basis for developing RLs. While the IPCC GPG were not designed specifically for REDD+, they do provide a map for countries to evolve from simplified estimates of GHG inventories to more nuanced national and statistically robust descriptions of GHG emissions from various sectors. Finally, countries should, where possible, use statistics and error propagation to communicate not only mean estimates of emissions but also confidence intervals and descriptions of uncertainty within RLs.

The Durban decisions also called for countries to create RLs in a way that makes the data, methods, models and calculations transparent and reproducible by others. While the Durban decision calls for transparency, it does not give clear guidance on how data, methods, maps and potentially many gigabytes of data can be publically shared for others to use and validate proposed RLs. Countries have many options, such as making supporting data available on government websites, public portals, peer-reviewed publications and

FOCUS

DEVELOPMENT OF A REFERENCE LEVEL IN NEPAL

The Government of Nepal, in collaboration with WWF, is developing a subnational RL for the Terai Arc Landscape (TAL). The RL will have the following key assumptions:

Scope
The RL for the TAL includes deforestation, degradation and enhancements using IPCC Approach 3 (i.e. spatially explicit changes in land area). Data has been derived from a combination of Landsat data with ground plots.

Forest classification
The TAL has been classified into three forest classes (shorea robusta—commonly known as sal, mixed hardwood and riverine). The RL calculations will use a combination of these forest types with a further stratification based on canopy density in order to show changes in the area of strata that have meaningful differences in carbon.

Scale
The RL will be subnational for the TAL, based on the jurisdictional boundaries of 12 districts. The reason for this is primarily to enable REDD+ implementation at a jurisdictional level, because these districts are in the best position to implement policies to control deforestation and degradation and also to ensure safeguards are respected and any distribution of benefits has appropriate oversight. Additionally, implementing REDD+ at the jurisdictional level will minimize the risk of leakage because rural migration is less common between districts.

Time frame
The RL will be calculated for the period 1999–2011 with an option to extend back to 1994. To maintain consistency with previous national communications, the period 1994–2011 would be preferable; however, Landsat images between 1994 and 1999 will not have the same quality and level of consistency as the period from 1999 to present day.

Pools and gases
The RL will include all the major pools, including above-ground and below-ground biomass. Due to the uncertainties in measurement and the relatively small fluctuations in carbon emissions, however, soil carbon will not be included in the RL. Given the lack of other dominant sources, only CO2 emissions will be considered in the RL.

supplementary materials. A more direct approach would be for countries to submit all the relevant files to the UNFCCC and request that the secretariat make all files available to the international community.

Adjustments

Recognizing that historical RLs may not be an appropriate or fair benchmark for some countries (such as countries with historically low deforestation rates), the UNFCCC decisions allow for countries to make adjustments to their historical data. These adjustments have never been defined but could reflect projections of future threats or future growth in a particular sector of the economy that causes deforestation (e.g. palm oil). For any adjustments to historical data, countries will need to state and defend their assumptions.

A variety of proposals have been put forward to elaborate how RLs might be adjusted to accommodate for high-forest cover, low-deforestation (HFLD) countries (Fonseca et al., 2007). These include adjustments against global averages, payments for carbon stocks, and projections based on models that describe or predict future threats (Busch et al., 2009, Griscom et al., 2009). The use of modeling will introduce the need for more complex RL submissions to the UNFCCC and will almost certainly require additional technical capacity (see Figure 2).

As a historically low deforestation country, Guyana provides an example of how this might work in practice (Gutman and Aguilar-Amuchastegui, 2012).[13] Under the terms of the bilateral agreement with Norway, Guyana will receive REDD+ payments based on a twofold criteria:

- One part of the payments will be for Guyana's reduction of its annual deforestation rate below its historical RL of 0.03 per cent a year.
- The other part of the payments will pay for Guyana to maintain its deforestation rates below the global historical RL of tropical countries, reported by FAO to be 0.52 per cent a year for 2000–2010.

Payments would be drastically reduced if Guyana's annual deforestation rate goes above 0.056 per cent (the 2010 deforestation rate) and stopped altogether if the deforestation rate reaches 0.09 per cent.

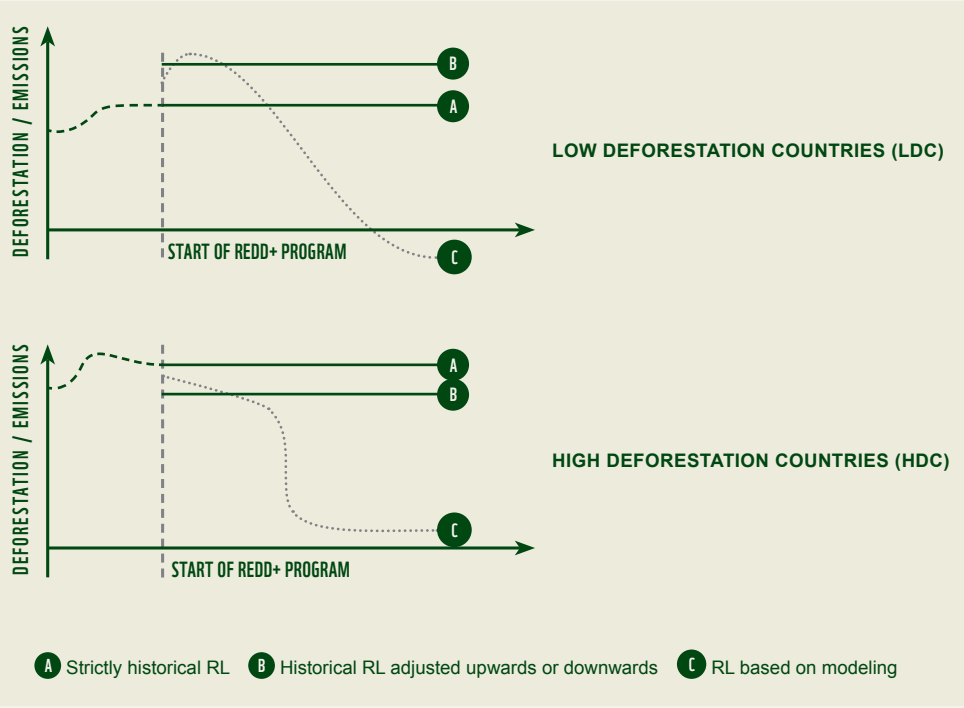
It should be noted that project-level initiatives have gravitated toward projected RLs (to try to attribute additional reductions to projects), whereas the UNFCCC-linked processes have gravitated more toward historical RLs (including adjustments) as this is more comparable to an Annex I commitment of X per cent reduction below a base year.

Connection to other forest monitoring systems

There are several ways in which RL development can tie in with forest monitoring systems. First, countries can link up their RL data with national forest inventories (NFIs). The choice of whether or not to do so will largely be a question of the levels of certainty within the existing data and the extent to which it covers appropriate geographic regions within the country. Many REDD+ countries, however, already have the NFI as the main way of generating their emissions factor data, and tying in this data with emerging RL data will be an important consideration for countries with advance NFIs.

Second, RLs do not have to be about just carbon. Indeed, one of the most active debates within the UNFCCC is whether REDD+ is about just carbon or whether it is a system for encouraging positive outcomes for civil society, communities, biodiversity, ecosystem services and other related benefits. Countries are not restricted in what they may include in their RLs and may also wish to communicate other quantitative data on their historical forest cover. Finally, as outlined in the introduction, RLs will be important references for MMRV systems, and data between these systems should be comparable and consistent. The design of RLs should therefore take into consideration the costs and data-processing requirements of future MMRV systems.

FIGURE 2: EXAMPLES OF POSSIBLE RL IN COUNTRIES WITH LOW OR HIGH LEVELS OF DEFORESTATION



FOCUS

ESTIMATING CHANGES IN CARBON POOLS VIA THE GAIN-LOSS OR THE STOCK-DIFFERENCE METHODS

There are two fundamentally different and equally valid approaches to estimating stock changes in carbon pools: (1) the process-based approach called the "Gain-Loss Method", which estimates the net balance of additions to and removals from a carbon stock and (2) the stock-based approach called the "Stock-Difference Method", which estimates the difference in carbon stocks at two points in time.

Gain-Loss Method
Annual carbon stock changes in any pool can be estimated using the Gain-Loss Method, which uses the following simple equation:

Where ΔC = annual carbon stock change in the pool, ΔCG = annual gain of carbon, ΔCL = annual loss of carbon, expressed in tonnes C yr-1.

Gains can be attributed to growth (increase of biomass) and to transfer of carbon from another pool (e.g. transfer of carbon from the live biomass carbon pool to the dead organic matter pool due to harvest or natural disturbances). Losses can be attributed to transfers of carbon from one pool to another (e.g. the biomass lost during a harvesting operation is a loss from the above-ground biomass pool), or emissions due to decay, harvest, burning, etc. The method used is called the Gain-Loss Method, because it includes all processes that bring about changes in a pool.

Stock-Difference Method
The Stock-Difference Method can be used where carbon stocks in relevant pools are measured at two points in time to assess carbon stock changes, using the following equation:

Where Ct1 = carbon stock in the pool at time t1 and Ct2 = carbon stock in the pool at time t2, expressed in tonnes C.

If the C stock changes are estimated on a per hectare basis, then the value is multiplied by the total area within each stratum to obtain the total stock change estimate for the pool. In some cases, the activity data may be in the form of country totals (e.g. harvested wood) in which case the stock change estimates for that pool are estimated directly from the activity data after applying appropriate factors to convert to units of C mass. When using the Stock-Difference Method for a specific land use category, it is important to ensure that the area of land in that category at times t1 and t2 is identical, to avoid confounding stock-change estimates with area changes.

Gain-Loss or Stock-Difference
The Gain-Loss Method lends itself to modelling approaches using coefficients derived from empirical research data. These will smooth out inter-annual variability to a greater extent than the Stock-Difference Method, which relies on the difference of stock estimates at two points in time. Both methods are valid so long as they are capable of representing actual disturbances as well as continuously varying trends and can be verified by comparison with actual measurements.

WWF VIEWPOINT

WWF has developed several important position papers on RLs.

In 2012, in advance of COP 18, WWF produced a paper on the assessment process for REDD+ RLs.[14] This paper called for several key outcomes:

- RL assessments performed by independent LULUCF and other qualified experts are necessary to ensure robust and balanced teams.
- Experts should be allowed to submit requests to countries for clarifications or rationale for values used.
- RL assessments should be completed within six months of a party's submission of a proposed RL to the secretariat.
- Public comments should be solicited through the UNFCCC REDD Web Platform.[15]
- Clear guidance should be developed for technical review teams, including the need to assess underlying models, assumptions and the defensibility of adjustments.

In 2009, in the run up to Copenhagen, WWF's position on Forests and Climate Change Mitigation[16] stated that a country's RL involves the identification and measurement of emissions reductions in comparison to a business-as-usual (BAU) scenario. WWF suggested that broad participation should be encouraged, either through flexible RLs based on national circumstances or some other mechanism. In addition WWF provided guidance on the proposed activities and requirements for the three phases of national REDD development:

- **Phase 1:** Initial cut of national RL with identification of gaps in data, monitoring capacity and analytical capability that must be closed prior to arriving at a final RL;
- **Phase 2:** Final national RL established in a manner so that significant improvement from BAU is required prior to generation of verified emissions reductions;
- **Phase 3:** 2 Fully-functioning MRV capability operationalized. Assessment results should be independently verified and fully transparent.

More recently, WWF proposed modalities for RLs in a submission to the FCPF Carbon Fund.[17] This submission called for several key elements:

- While RLs can be either *historical* or *projected* (i.e. for national circumstances), to maintain environmental integrity, only emissions reductions below historical RLs may be used as offsets.
- RLs should be based on a historical interval (called a "reference period") of 10 years ending no sooner than 2010.
- The scale of the programme area should cover a "significant portion of the territory" with a substantial impact relative to priorities in the national REDD+ strategy.
- RLs should include reporting of accuracy and error following the most recent IPCC guidance and guidelines.
- Technical advisory panels (TAPs) should be established to evaluate RLs against guidance that the FCPF Carbon Fund develops using UNFCCC and IPCC guidance as minimum criteria.

FURTHER RESOURCES

Key internal WWF resources

Gutman and Aguilar: *Reference Levels and Payments for REDD+: Lessons from the recent Guyana–Norway Agreement*. WWF, Washington, DC, USA. Available at: *bit.ly/15EZT1n*

Durban Position Paper on RLs. Available at: *bit.ly/14NhEfG*

Key external resources

- *IPCC Good Practice Guidance for LULUCF*, available at: *www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html*
- *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, available at: *www.ipcc-nggip.iges.or.jp/public/2006gl*
- *UNFCCC Expert Working Group Report on Reference Levels*, available at: *unfccc.int/resource/docs/2011/sbsta/eng/inf18.pdf*
- *Union of Concerned Scientists (UCS) Points of Reference*, available at: *www.ucsusa.org/assets/documents/global_warming/Points-of-Reference.pdf*
- Tropical Forest Group (TFG) Submission to SBSTA, available at: *unfccc.int/resource/docs/2011/smsn/ngo/333.pdf*
- Meridian Institute: *Modalities for REDD+ Reference Levels: Technical and Procedural Issues*, available at: *www.redd-oar.org/links/RL_report.pdf*
- Meridian Institute: Guidelines for REDD+ Reference Levels: Principles and Recommendations, available at: *www.redd-oar.org/links/REED+RL.pdf*

BIBLIOGRAPHY

BUSCH, J., STRASSBURG, B., CATTANEO, A., LUBOWSKI, R., BRUNER, A., RICE, R., CREED, A., ASHTON, R. and F. BOLTZ. 2009. Comparing climate and cost impacts of reference levels for reducing emissions from deforestation. *Environmental Research Letters*, 4.

FONSECA, G. A. B. D., RODRIGUEZ, C. M., MIDGLEY, G., BUSCH, J., HANNAH, L. and R.A. MITTERMEIER. 2007. No Forest Left Behind. *PLoS Biology*, 5, 216.

FOUNDATION FOR INTERNATIONAL ENVIRONMENTAL LAW AND DEVELOPMENT (FIELD). 2013. *Guide for REDD-plus negotiators*. FIELD, London, UK.

GRISCOM, B., SHOCH, D., STANLEY, B., CORTEZ, R. and N. VIRGILIO. 2009. Sensitivity of amounts of distribution of tropical forest carbon credits depending on baseline rules. *Environmental Science and Policy*, 12, 897-911.

GUTMAN, P. and AGUILAR-AMUCHASTEGUI, N. 2012. Reference Levels and Payments for REDD+: *Lessons from the recent Guyana–Norway Agreement*. WWF, Washington, DC, USA. bit.ly/15EZT1n

IPCC. 2000. *IPCC Special Report: Land use, Land-use Change, and Forestry*. IPCC, Geneva, Switzerland.

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme*. IPCC, Geneva, Switzerland.

END NOTES

1. Setting inflated reference levels would allow countries to claim emissions reductions that are not additional to previous efforts (known as “hot air”).
2. Under the UNFCCC discussions, the terms “forest reference level” (FRL) and “forest reference emission level” (FREL) are both still used concurrently. The distinction between these terms is twofold. First, FRELs are typically used to imply that emissions must be measured, whereas FRLs may not depend on emissions assessments (i.e. they could use simpler metrics such as forest area change). Second, FRELs are sometimes used to distinguish between activities that only cause emissions (e.g. deforestation and degradation) versus activities that conserve, sustainably manage or enhance forest carbon stocks (the + in REDD+).
3. More information on JNR and AFOLU can be found at v-c-s.org/sites/v-c-s.org/files/FactSheet%20JNRI%202012%20-%20MidRes.pdf and v-c-s.org/node/286, respectively.
4. The reference level that Guyana ultimately submits to the UNFCCC might not be the same as that used under its bilateral arrangement with Norway.
5. The Annex is at the end of Decision 2/CP.13.
6. Decision 4/CP.15.
7. Section III C of Decision 1/CP.16.
8. Decision 12/CP.17.
9. These are very simplified presentations, and most terms and equations can be further elaborated. However, by using these simple equations the reader may be able to appreciate the subsequent discussions of the key issues RLs must address. It should also be noted that some countries may choose to report only RLs for deforestation and not estimate emissions from degradation. Countries may also choose, in other RLs, to include sequestration and storage of carbon through afforestation, reforestation or carbons stock enhancement.
10. The question of adjustments to historical data will be discussed later.
11. This conundrum raises an important question of overall integrity of REDD+ RLs. Given that the UNFCCC did not make hard and fast rules for what periods could be considered, it is possible that with each country selecting the most advantageous period of time (times that capture the highest rates of deforestation), a global aggregate of REDD+ RLs some years down the road could yield inflated estimates of emissions from deforestation and degradation
12. REDD+ includes five activities, but SFM and conservation are essentially the inverse of degradation and deforestation.
13. This was established using the proposal known as the combined incentives approach developed by Strasburg et al., 2009.
14. awsassets.panda.org/downloads/rl_external_brief_11_12_1.pdf.
15. unfccc.int/methods_science/redd/redd_web_platform/items/4531.php.
16. awsassets.panda.org/downloads/wwf_redd2_paper_web.pdf.
17. www.forestcarbonpartnership.org/sites/forestcarbonpartnership.org/files/Documents/PDF/ Jan2013/WWFsubmission_CFissuepaper2.pdf.