Food and Agriculture Organization of the United Nations

From reference levels to results reporting: REDD+ under the United Nations Framework Convention on Climate Change

2019 update

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9

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Acronyms and abbreviations

AD	activity data
AGB	aboveground biomass
BGB	belowground biomass
BTR	biennial transparency report
BUR	biennial update report
CBIT	Capacity-Building Initiative for Transparency
COP	Conference of the Parties (to the UNFCCC)
DRC	Democratic Republic of the Congo
DW	deadwood
EF	emission factor
ER	emission reduction
F&CMS	forest and carbon monitoring system (Colombia)
FL–FL	forest land remaining forest land
FRA	Global Forest Resources Assessment
FREL	forest reference emission level
FRL	forest reference level
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	greenhouse gas
HFLD	high-forest-cover, low-deforestation
ICA	international consultation and analysis
INDC	intended nationally determined contribution
IPCC	Intergovernmental Panel on Climate Change
ITAP	Independent Technical Advisory Panel (GCF)
L	litter
Lao PDR	Lao People's Democratic Republic
LULUCF	land use, land-use change and forestry
MPGs	modalities, procedures and guidelines
MRV	measurement, reporting and verification
NDC	nationally determined contribution
NFI	national forest inventory
NFIS	national forest information system
NFMS	national forest monitoring system
NS/AP	national strategy/action plan
PMSB	National Program for Monitoring and Follow-up of Forest Ecosystems (Colombia)

PNG	Papua New Guinea
RBP	results-based payment
REDD+	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
SAE	stratified area estimate
SC	soil carbon
SMF	sustainable management of forest
TA	technical assessment/technical analysis
TATR	technical report of the technical analysis (of REDD+ results)
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar(s)

Chemical formulae/units

CO_2	carbon dioxide
CO_2eq	carbon dioxide equivalent
ha	hectare(s)
MtCO_2eq/yr	megatonne(s)/million tonne(s) of carbon dioxide equivalent per year

Executive summary

This report provides an update on forest reference (emission) levels (FREL/FRLs) and Reducing Emissions from Deforestation and Forest Degradation Plus (REDD+) results submitted to the United Nations Framework Convention on Climate Change (UNFCCC), and relevant developments under the Green Climate Fund concerning REDD+ results-based payments. It illustrates the choices countries have made when constructing their FREL/FRLs and areas for improvement identified during technical assessments. Such information can help countries to learn from each other's experiences and thus facilitate South–South knowledge exchange on REDD+.

As of early July 2019, the following REDD+ measurement, reporting and verification milestones had been achieved:

- Thirty-nine countries had submitted 45 FREL/FRLs to the UNFCCC for technical assessment.
- Eight countries had reported REDD+ results to the UNFCCC through ten submissions (in the REDD+ technical annex of their biennial update reports), totalling more than 8 billion tonnes of carbon dioxide equivalent (CO_2eq) in emission reductions. Most of these reductions were reported by Brazil.
- The UNFCCC had published 37 FREL/FRL technical assessment reports, and five technical analyses of REDD+ results.
- Two funding proposals (Brazil and Ecuador) for REDD+ results-based payments had been approved by the Green Climate Fund.

Particularly striking is the increased reporting on uncertainty in forest-related emissions estimates: six out of the seven countries that submitted FREL/FRLs in January 2019 provided uncertainty estimates around their activity data and emission factors, while five out of seven included an aggregate uncertainty estimate. This is an important development for increasing transparency in REDD+.

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1. Introduction

Building on the considerable amount of work invested in 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+) over the past decade and beyond, significant progress has been observed in recent years. REDD+ is mentioned in Article 5 of the 2015 Paris Agreement on climate change,[1] and forests and land-use mitigation measures are mentioned in many nationally determined contributions (NDCs).[2]

The aim of this paper is to inform countries about recent developments in the measurement, reporting and verification (MRV) of REDD+ activities under the United Nations Framework Convention on Climate Change (UNFCCC). It provides an update on submissions on forest reference (emission) levels (FREL/FRLs) and REDD+ results reporting; a summary of experiences with the UNFCCC technical assessment and technical analysis (TA) processes; and progress made on results-based payments (RBPs) through the Green Climate Fund (GCF) pilot programme for REDD+ results-based payments, launched in October 2017.

This report complements and updates *From reference levels to results reporting: REDD+ under the UNFCCC* (FAO, 2017; 2018a) and builds on four previous UN-REDD/FAO publications: *Technical considerations for forest reference emission level and/or forest reference level construction for REDD+ under the UNFCCC* (FAO, 2015a); *Strengthening national forest monitoring systems for REDD+* (FAO, 2018b); *National forest monitoring systems: monitoring and measurement, reporting and verification (M&MRV) in the context of REDD+ activities* (FAO, 2013); and *Emerging approaches to forest reference emission levels and forest reference levels for REDD+* (FAO, 2015b).

1.1 STATUS OF REFERENCE LEVEL AND REDD+ RESULTS SUBMISSIONS

As of July 2019, 39 countries had submitted 45 FREL/FRLs to the UNFCCC,[3] comprising 12 countries in Africa, 13 in Asia and the Pacific and 14 in Latin America and the Caribbean (Figure 1). Collectively, the countries that submitted their FREL/FRLs to the UNFCCC are home to a forest area of approximately 1.49 billion ha (37 percent

[1] The Paris Agreement on climate change was adopted on 12 December 2015 at the Conference of the Parties (COP 21) to the UNFCCC. It represents a commitment by the international community to limit the rise of global average temperature to well below 2 °C, and requests countries to communicate their climate actions, known as their nationally determined contributions (NDCs).

[2] FAO (2016a) assessed that 89 percent of countries cover agriculture and/or land use, land-use change and forestry (LULUCF) in their mitigation contributions of their intended NDCs.

[3] The 39 countries comprise 25 percent of the UNFCCC's 154 non-Annex I countries (Annex 1 includes the industrialized countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition (EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European countries).

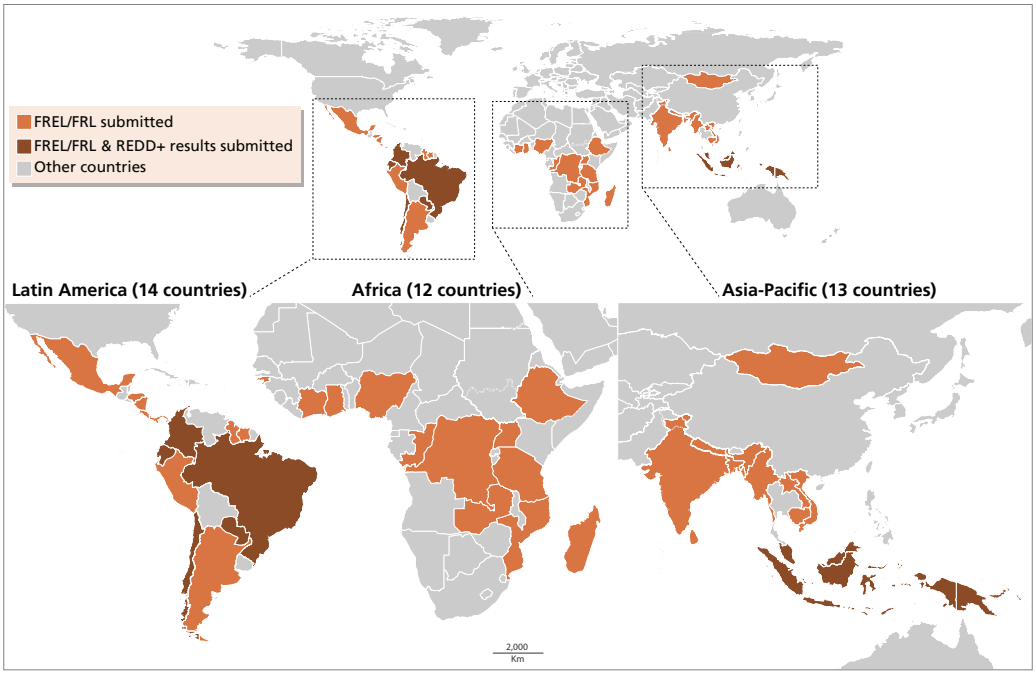

Figure 1. Geographical distribution of countries that have submitted a FREL/FRL (orange) and those that subsequently submitted REDD+ results (brown) to the UNFCCC

of the global forest area) and contribute to around 70 percent of global forest area loss.[4] Those countries that submitted REDD+ results to the UNFCCC subsequent to the FREL/FRL submission collectively account for a forest area of 744 million ha (19 percent of the global forest area) and total around 35 percent of global forest area loss. For the 45 FREL/FRL submissions, 37 TA reports had been published by June 2019.

Eleven[5] submissions of REDD+ results were included in the technical annexes of the biennial update reports (BURs) of eight countries. Of these, technical analyses were completed on five submissions by early July 2019 as part of the international consultation and analysis (ICA) process (Figure 2).

Four countries have submitted FREL/FRLs more than once (see Section 2.1). Brazil and Colombia submitted more than one technical annex with REDD+ results. Brazil submitted results in its BUR 1, 2 and 3 for three reporting periods for the Amazon region, and results for the Cerrado region in BUR 3. Colombia submitted results for two reporting periods for the Colombian Amazon.

[4] Forest area and forest area loss estimates are derived from FRA2015 (FAO, 2015c); the estimates are not based on forest area or deforestation estimates in the FREL/FRL submissions since these are not consistently reported in the FREL/FRL submissions. For subnational FREL/FRL submissions the national areas are considered. Global forest area loss refers to the sum of net loss of forest area at country level, to which the FREL/FRL and REDD+ results-submitting countries contributed 73 percent and 39 percent respectively 1990–2015, and 69 percent and 34 percent respectively 2000–2015.

[5] Brazil's latest BUR contains a technical annex with REDD+ results for the Amazon (2016–2017) and a technical annex with REDD+ results for the Cerrado (2011–2017), which here is considered as one REDD+ results submission.

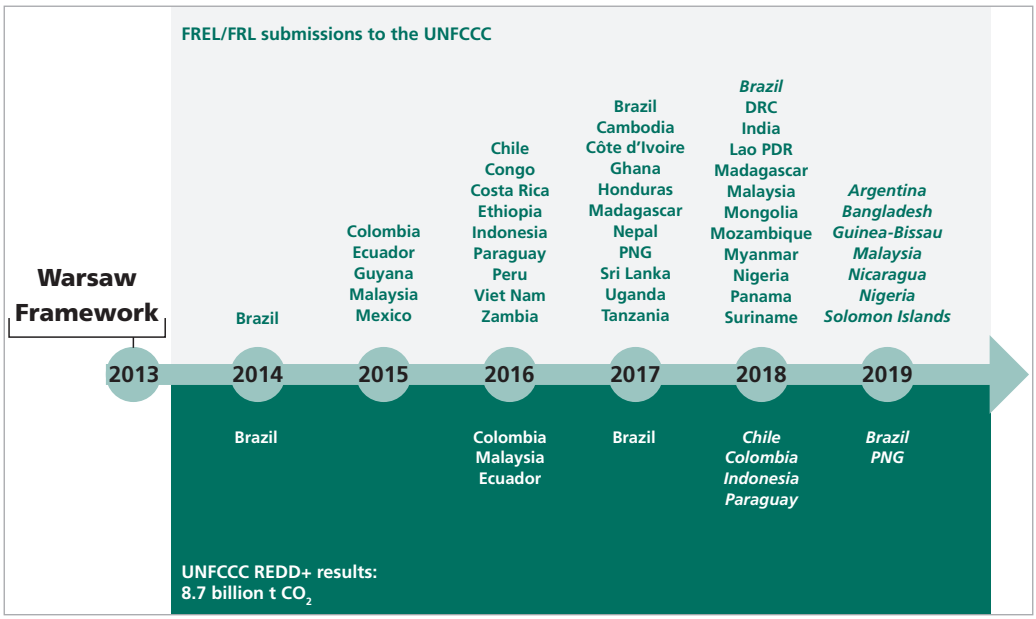

Figure 2. Overview of FREL/FRL and REDD+ results submissions to the UNFCCC

Notes: COP 19, held in November 2013 in Warsaw, Poland, adopted the seven decisions of the Warsaw Framework for REDD+ (UNFCCC, 2013).
Country names in italic indicate that their TA is ongoing. Brazil's 2019 BUR includes two REDD+ results technical annexes, one for Amazon C and one for Cerrado.
DRC = Democratic Republic of the Congo; Lao PDR = Lao People's Democratic Republic; PNG = Papua New Guinea.

Finally, Brazil and Ecuador's funding proposals to the pilot programme for REDD+ results-based payments were approved by the Green Climate Fund (GCF) board. The GCF is the official financing mechanism of the UNFCCC (for more information see Chapter 4).

1.2 GUIDANCE AND MODALITIES

FREL/FRLs to the UNFCCC are generally submitted at the beginning of the year to meet the deadline set by the UNFCCC. REDD+ results are included in a technical annex to the biennial update report (BUR), which can be submitted at any time, after which the UNFCCC secretariat has a maximum of nine months to organize an ICA process. Usually, up to two sessions are held during the year for the ICA of BUR submissions and technical analysis of the REDD+ results (if submitted) in the technical annex.

Countries voluntarily submit FREL/FRLs to the UNFCCC for technical assessment (TA). In doing so, they may apply for results-based payments under the financing mechanism of the UNFCCC (Green Climate Fund). The UNFCCC provides guidelines and modalities through its Conference of the Parties (COP) decisions for FREL/FRL

construction. The TA will evaluate the extent to which the FREL/FRL submission is in line with the guidelines contained in the relevant COP decisions. Once a TA has been completed, countries can submit REDD+ results in an annex to their BURs for technical analysis (Figure 3).

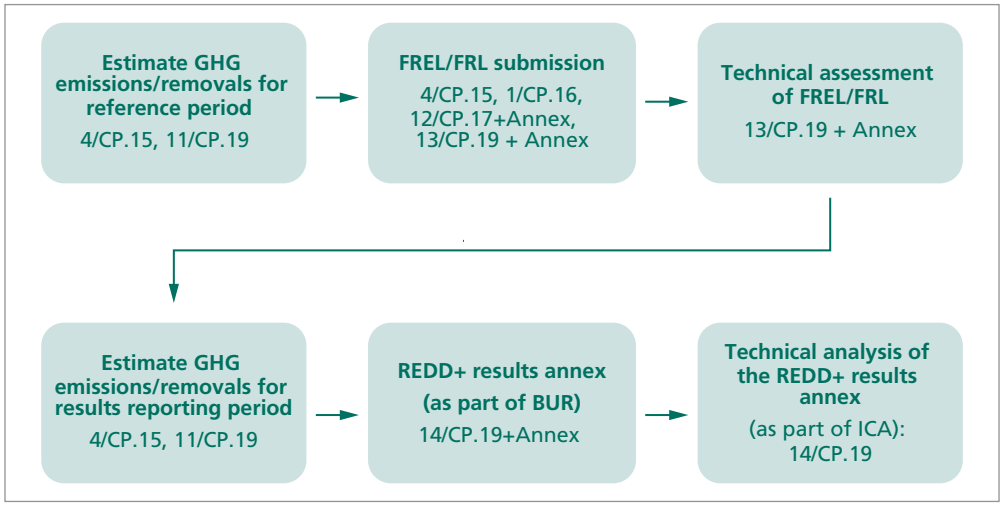

Figure 3. Measurement, reporting and verification for REDD+, and the most relevant decisions of the UNFCCC

Preceding FAO publications (2015a; 2017; 2018a) provide a more detailed explanation of UNFCCC guidance and modalities for FREL/FRL and REDD+ results submissions.

2. Summary of submitted reference levels

2.1 WHAT'S NEW FROM REFERENCE LEVEL SUBMISSIONS

In 2019, an additional seven countries submitted a FREL/FRL to the UNFCCC. Five of these were submitting for the first time (Argentina, Bangladesh, Guinea-Bissau, Nicaragua and Solomon Islands) whereas two countries submitted for the second and third time, Nigeria and Malaysia respectively (see also Figure 2).

Submissions show **increased reporting of uncertainty** around activity data, continuing the trend from previous years (Figure 4). Out of the seven new submissions, five included an estimate of aggregate uncertainty of the FREL/FRL (see Section 2.3).

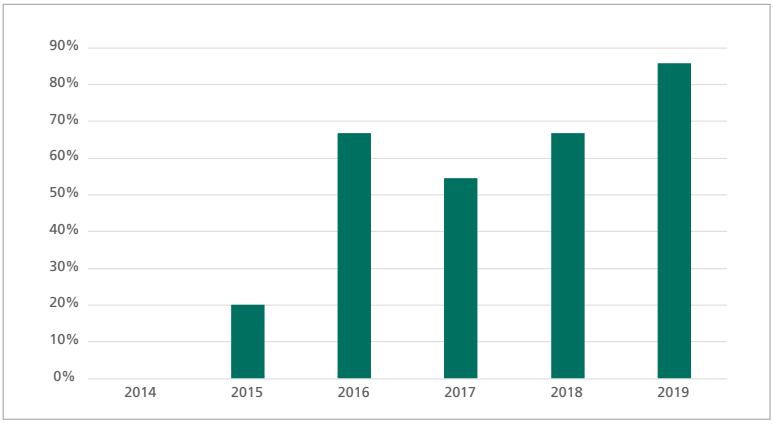

Figure 4. Percentage of submissions that include uncertainty estimates (i.e. confidence intervals) around activity data used for FREL/FRLs

Note: Some countries provided uncertainty estimates without actually calculating them. For example, one country estimated uncertainty and another derived an uncertainty estimate based on overall map accuracy (which is not necessarily a good estimator for AD uncertainty (Olofsson *et al.*, 2013).

In initial FREL/FRL submissions (2014–2016), no country considered the **carbon contents in post-deforestation land use** for the emission estimations. They assumed full carbon loss in the year deforestation was measured from the aboveground biomass (AGB), belowground biomass (BGB), litter (L) and deadwood (DW) carbon pools without considering subsequent removals in vegetation growing in post-deforestation land use. Since 2017, this trend is changing and technical assessments commend countries for

considering the carbon content in post-deforestation land use. Of the 2019 submissions, 57 percent took into consideration post-deforestation carbon in their emission estimations.

Four countries (Brazil, Madagascar, Malaysia and Nigeria) have submitted **more than one FREL/FRL** to the UNFCCC, for various reasons: to expand the geographic scope (Brazil added the Cerrado biome, Nigeria went from subnational to national coverage); to cover more REDD+ activities (Malaysia added conservation and reduced deforestation); to add an additional results reporting period (Brazil added "Amazon C" for results in 2016–2020); and to update the FREL with new, improved data and updated reference period (Madagascar).

2.2 TRENDS IN THE TECHNICAL ASSESSMENT

Almost all countries submitted a modified FREL/FRL during the technical assessment (TA). Sometimes these modified FREL/FRL submissions only include more and better information (i.e. explaining more clearly how the measurements were made) without changing the FREL/FRL value, but for **81 percent of the modified FREL/FRL submissions the FREL/FRL value has changed**. Of the FREL/FRL values expressed in (net) emissions, 46 percent reduced net emissions while 35 percent increased them. Of the modified FRL values expressed in (net) removals, 45 percent increased net removals while 36 percent reduced them.

Some countries **change the scope of their FREL/FRL** during the technical assessment, for example Myanmar added enhancement of forest carbon stocks; Madagascar (2017), Brazil (Cerrado) and Suriname added emissions from non-CO_2 gases; Madagascar (2018) added the soil carbon pool; Uganda removed forest degradation, sustainable management of forest (SMF) and conservation; and Chile, Guyana, Mongolia and Panama removed the soil carbon pool as a result of the TA. The most common reason for omissions of activities or carbon pools during the TA is related to concerns around the accuracy and reliability of the data.

The TA reports frequently highlight assessment of uncertainty as an area for improvement and **more in-depth assessments of uncertainty** are mentioned over time, including capturing all sources of error and using higher approaches (e.g. Monte Carlo simulation).

The TA may also comment on the FREL/FRL **construction approach** and **reference period**. For example, as a result of their technical assessments, Malaysia changed its reference period, Ghana changed its initially proposed linear projection FREL to a historical average, and Myanmar (Box 2) substituted a zero FRL for enhancement with average removals over the reference period.

2.3 CHOICES MADE BY COUNTRIES ON REFERENCE LEVEL ELEMENTS

FAO (2018a) provides a comprehensive overview of UNFCCC guidance on each of the FREL/FRL elements, an overview of country choices and in some cases an explanation of why countries made these choices, and a summary of responses that countries received from the technical assessment. This report provides a brief summary of country choices per FREL/FRL element, in some cases illustrated with examples from new FREL/FRL submissions.

2.3.1 Forest definition

Most countries include references to **threshold parameters** and the use of the land (Figure 5). The majority choose a minimum area threshold of 0.5 ha or 1 ha, a minimum height of 5 m, and a minimum canopy cover of either 10 percent or 30 percent. Seven out of 39 countries use all the FAO's Global Forest Resources Assessment (FRA) thresholds: a canopy cover of 10 percent; a tree height of 5 m; and an area of 0.5 ha.

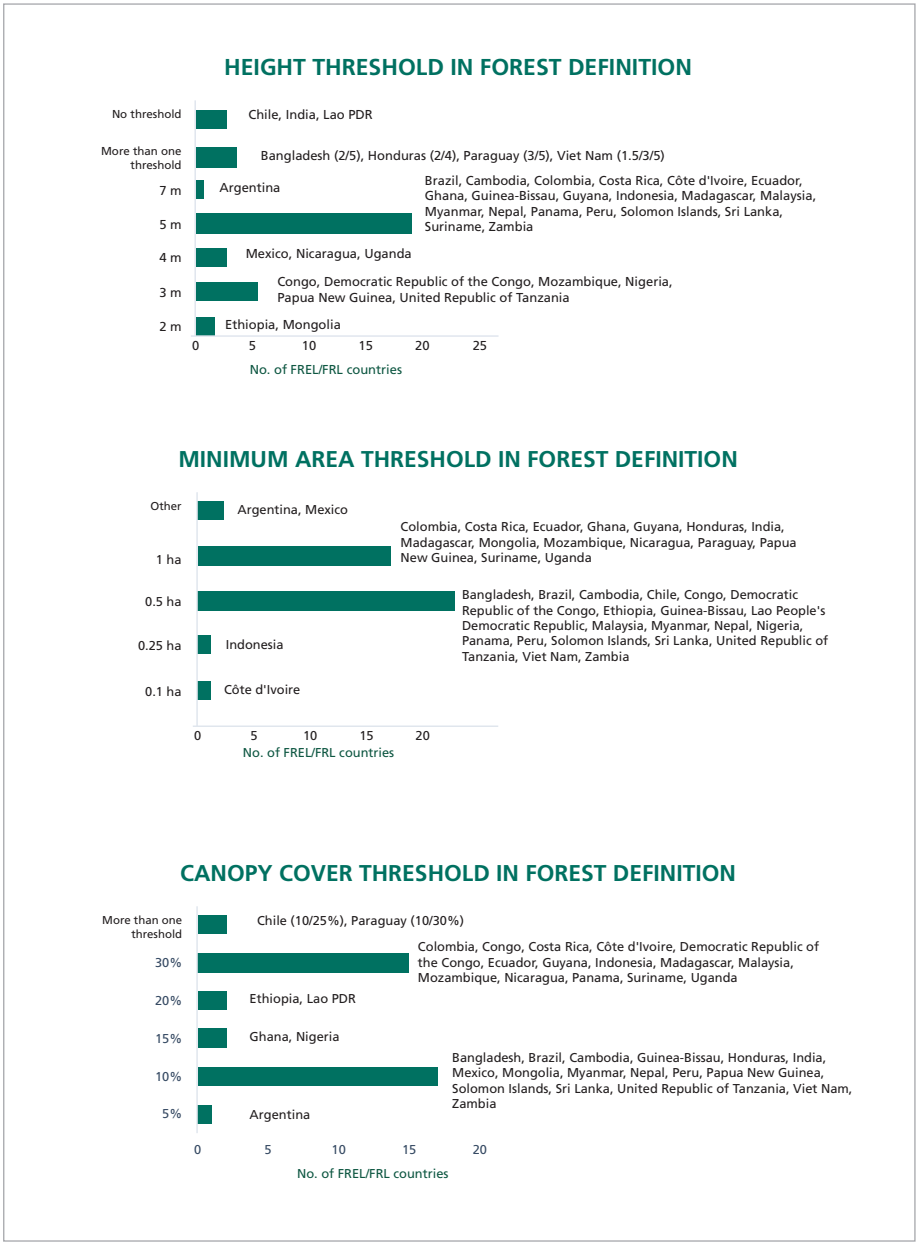

Figure 5. Threshold values for REDD+ forest definitions, by country

Some countries diverge from the forest definition they adopted for REDD+ and use an **operational forest definition**, generally because of technical limitations with their measurement, reporting and verification. For example, Indonesia uses a legal definition for management purposes of 0.25 ha but a working definition for MRV of 6.25 ha. Similar differences in minimum area apply to Brazil and Nepal, which both have 0.5 ha in their forest definitions but apply 6.25 ha and 2.25 ha respectively, due to technical limitations in the (historical) data. In view of possible displacement of emissions, the TA asked these countries to monitor small-scale deforestation, as large-scale deforestation can be reduced whereas small-scale deforestation may increase. Another area for technical improvement raised for several countries is the exclusion of temporarily unstocked forest land in the deforestation area estimate.

2.3.2 Scale

Most FREL/FRL submissions (80 percent) are national scale (Figure 6). Of the nine subnational submissions, seven are from Latin American countries and two from African countries. One country (Nigeria) first submitted a subnational FREL and subsequently a national FREL.

For some countries, national FREL/FRLs comprised the sum of subnational jurisdictional FRELs/FRLs, such as provinces (e.g. in the case of the Democratic Republic of the Congo and Madagascar). Other countries (e.g. Zambia) indicated their intention to disaggregate national estimates in the future. Such disaggregation would provide countries with information on performance at the subnational jurisdictional level, which may be of particular value if jurisdictions move at different speeds in REDD+ implementation.

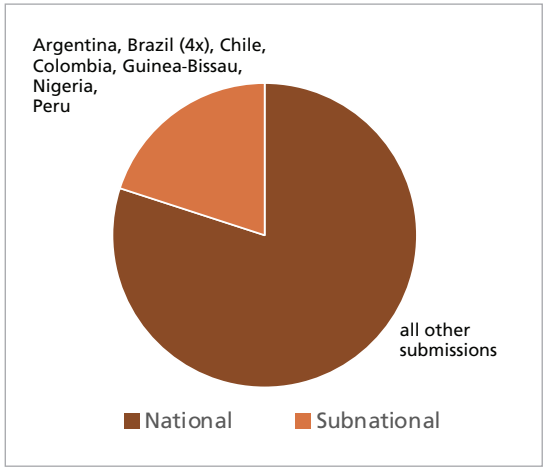

Figure 6. Scale of FREL/FRL submissions

Note: All other submissions include Nigeria, which is the only country to date that has submitted both a subnational and a national FREL.

2.3.3 Scope: REDD+ activities, pools and gases included

Concerning the scope of REDD+ activities, deforestation remains the most frequently included REDD+ activity in FREL/FRL submissions, with 96 percent of the submissions including the activity (Figure 7).

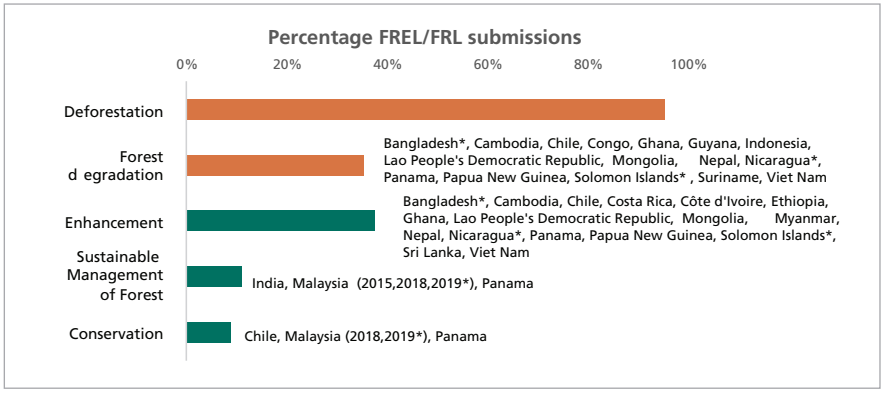

Figure 7. REDD+ activities included in FREL/FRL submissions

Notes: With the exception of Malaysia (2015) and India, all submissions included deforestation.
*Countries with ongoing TAs; scope may still change.

Several countries submitted a FRL with the activities deforestation, forest degradation and enhancement indicating that **all greenhouse gas (GHG) fluxes** from the forest have been covered. Lee, Skutsch and Sandker (2018) explain how the "plus" activities of enhancement, sustainable management of forest (SMF) and conservation of forest carbon stocks were added in the negotiations to ensure that a wide range of activities was covered by REDD+, without considering fully how this would be reported. Figure 8 shows the overlap among the "plus" activities, where the same carbon fluxes are named differently by different countries.

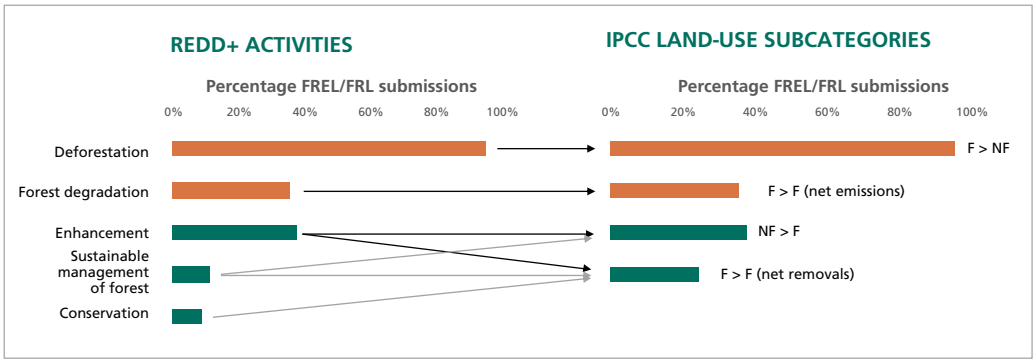

Figure 8. How the REDD+ activities included in FREL/FRL submissions correspond to IPCC land-use subcategories

Note: Chile's conservation also includes emissions from forest degradation in conservation areas, but the activity still results in net removals. Likewise, India's SMF includes afforestation, harvesting (deforestation and forest degradation), thinning (forest degradation) and forest conservation as a management practice.

Concerning the scope of carbon pools, **above- and belowground biomass** remain the most frequently reported carbon pools in the FREL/FRL submissions.

Deadwood is mostly included by countries that assessed this pool in their national forest inventory (NFI). The Intergovernmental Panel on Climate Change (IPCC) 2006 guidelines do not provide default values for deadwood, indicating there was too little coherence in the literature to propose a single value.

Litter is equally included by countries that assessed their pool in their NFI (often only measured in a subset of plots) or used IPCC default values.

To date, five countries have included the **soil** carbon pool: Ghana, India, Indonesia, Madagascar and Malaysia. Soil emissions from mineral soils are included by countries for deforestation, afforestation[6] or both. Emissions from organic soils, through peat drainage, are included for deforestation and in Indonesia's submission also for forest degradation. According to IPCC's Tier 1 approach, mineral soils are in equilibrium for forest land remaining forest land (FL–FL), meaning forest degradation on mineral soils can be assumed not to cause emissions from the soil carbon pool. Countries estimate soil carbon either using national data (e.g. India assessed soil carbon contents with its NFI[7]) or IPCC default factors (e.g. Ghana). Several countries omitted the soil carbon pool after they found it not to be significant (e.g. Nigeria's 2019 submissions assessed it as <10 percent of emissions from the biomass pools). However, most countries omitting soil carbon indicate that they have too little data to estimate it. Even an IPCC default calculation, for example, requires information on the replacing land use and management regime applied to the replacing land use. Some countries also mention challenges in reporting soil emissions as an argument for its omission, as soil emissions occur over a longer period (flowing over from the reference period into the results reporting period). Indonesia and Malaysia, the only two countries including emissions from peat drainage, do not include emissions from mineral soils. Malaysia only includes inherited emissions from cleared forest on peatlands drained during the 1960s and 1970s, claiming that no drainage is currently occurring.

Ghana includes soil emissions using IPCC default values (equation 2.25, IPCC, 2006) applying a **"committed emissions" approach**, meaning that it assumes all emissions to occur at the time of conversion. Ghana explains that, in the context of reference levels, delayed emissions (as the IPCC requires) lead to errors because the reference period is 15 years. A historical average of emissions over the reference period would therefore underestimate emissions, as only 5–75 percent of the total emissions over 20 years would be included. For this reason, Ghana uses the committed emissions approach for the reference level, arguing that it more accurately reflects the reality on the ground. The AT does not include an area for technical improvement related to the soil emission estimation for Ghana.

All submissions include **CO_2** and 20 percent of the submissions include **non-CO_2** emissions, mostly from fire but also from drainage of peatland (Malaysia). Submissions

[6] India includes non-forest converted to forest land under sustainable management of forest.

[7] The AT comments, however, that the use of a single value for soil carbon in forest overestimated the removals for newly planted forest over the reference period.

that included non-CO_2 emissions are: Brazil (Cerrado), Chile, Costa Rica, Ghana, Madagascar (2017 and 2018 submissions), Malaysia (2018 and 2019 submissions) and Panama (Figure 9).

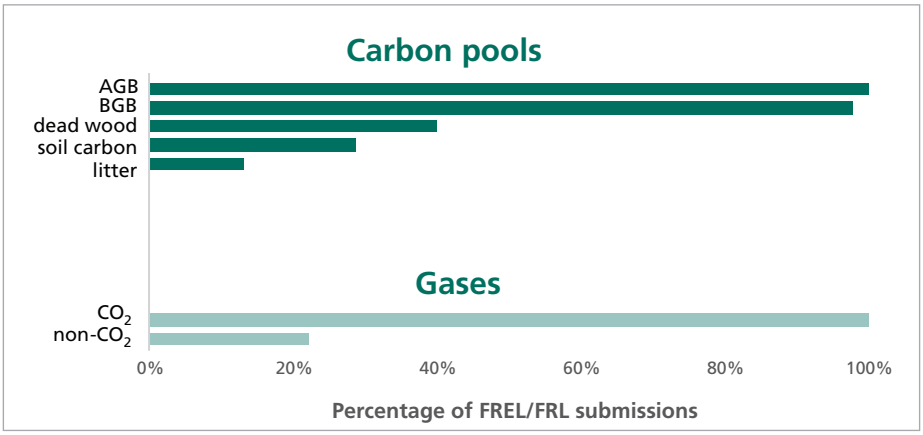

Figure 9. Scope of carbon pools and gases chosen by countries for their FREL/FRL submissions

Note: ABG = aboveground biomass, BGB = belowground biomass

2.3.4 Data selection for activity data

For **deforestation** (and in some cases afforestation), countries used three methods for generating activity data: (1) areas extracted directly from wall-to-wall change maps (referred to as pixel counts); (2) areas from samples that are stratified using wall-to-wall maps (referred to as stratified area estimates and described by Olofsson *et al.*, 2014); and (3) areas from systematic sampling. These methods and their differences are explained in detail in FAO (2018a).

Figure 10 shows that stratified area estimation and systematic sampling are becoming more common, whereas initial submissions relied on pixel counts only. Assessing and reporting uncertainty is a requirement for participating in the Green Climate Fund's results-based payment pilot programme. Pixel counts do not allow for an assessment of the associated confidence interval around the deforestation estimate (GFOI, 2016, Section 5.1.5). Systematic sampling is sometimes used in countries where mapping approaches are not well developed or where the country intends to obtain estimates for multiple land-use categories.

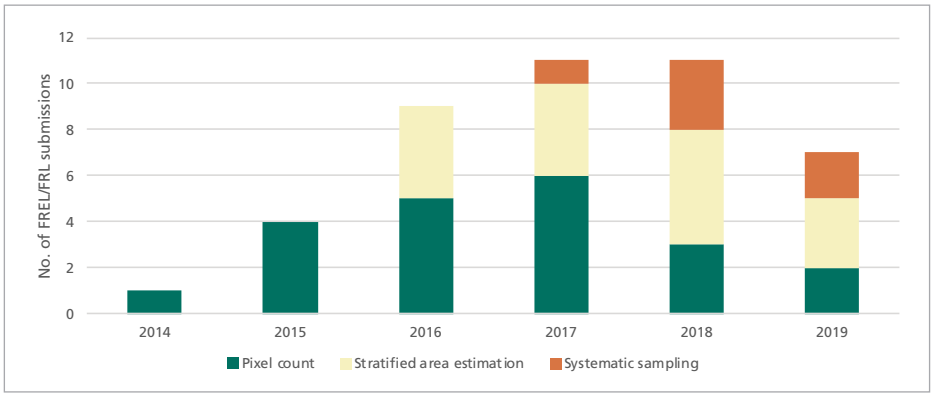

Figure 10. Methods used to assess deforestation (and in some cases also afforestation)

Stratified area estimation is a relatively new approach to area estimation. New findings underline the importance of the quality of reference data (sample points, which also applies to systematic sampling) and the distribution of reference data over the map strata (see Box 1).

Box 1
Lessons learned for stratified area estimation

The stratified area estimation approach consists of four steps: (1) map data; (2) sampling design; (3) response design; and (4) analysis (FAO, 2016b). Sampling design refers to all decisions on how the sample is distributed and what sample size to use, response design refers to the sample unit interpretation, and analysis refers to the error matrix comparing the map classes against the sample interpretations (reference data).

Lesson concerning sampling design: sample size and distribution

The sampling design should be as close as possible to the proportional distribution of the land-use change map. This recommendation builds on the facts that omission points of change (classified in the map as stable forest or stable non-forest and interpreted as change) usually have a very high weight (change is usually a very small area compared with stable classes) and that reference data are more than often of sub-optimal quality (no high-resolution imagery available for the different time periods to confidently assess the change status of a given point). Proportional sampling often cannot be achieved in practice, due to budget/time restrictions, but the recommendation is to try to allocate as many points as possible to the stable classes while maintaining a minimum per class (usually of change) at the scale of interest. This will mitigate the impact of

omission points of change on overall statistics. For example, if results are to be reported at district level, it should be ascertained that the minimum number of points per change strata are drawn at that scale and then the remaining points allocated to stable classes. This case has been examined and summarized by Pagliarella, Corona and Fattorini (2018).

Lesson concerning response design: quality of reference data

The response design should also account for the fact that interpretation is never bias-free, even when the reference data are of the best available quality. McRoberts *et al.* (2018) showed that the interpretation of land cover by a set of several interpreters was better than interpretation carried out by single individuals. The random distribution of sample units between a set of well-trained, well-informed interpreters is recommended, in order to balance the effects of subjective interpretation. This is even more relevant to interpretation of change, for which reference data are less available and interpretation rules are more complex (Foody, 2010).

Lesson concerning subsequent assessments (e.g. results reporting)

The change maps for the consecutive periods (either within the reference period or for the results reporting period) should be progressively amended as new activities are being recorded. Suriname provides a good example of this practice, with an initial deforestation map for the FREL with stratified area estimation and an approach that progressively integrates more recent changes, builds on the existing interpreted points, draws new points on the new change classes and updates the calculations for the whole set of classes. This approach ensures that all variables add up at any update point (forest area at the end of a given period will be exactly the same as the area at the beginning of the next period), contrary to approaches where stratified area estimation is performed on independent maps, which systematically leads to inconsistencies between areas reported in different periods. However, with each additional assessment period, historical values will be updated slightly.

As regards forest degradation, 36 percent of the FREL/FRL submissions included this activity (Figure 7). Countries propose a variety of methods for generating activity data (Table 1). The choice of method may depend on the type of degradation and data availability. The high rate of omissions of this activity is in most cases said to be due to the lack of reliable and accurate data.

TABLE 1.
Methodologies proposed in FREL/FRL submissions for assessing forest degradation

Methodology	Country
Combination of remote sensing and ground inventories	Cambodia, Chile, Indonesia, Lao People's Democratic Republic, Viet Nam
Multiple national forest inventory cycles	Viet Nam
Stump counts from national forest inventories	Lao People's Democratic Republic
Official timber extraction statistics	Congo, Ghana, Guyana, Suriname
Sample data interpretation of disturbance or changes in forest subdivisions and ground inventories	Mongolia, Nicaragua*, Panama, Papua New Guinea, Solomon Islands
Modelling supply/demand balance (WISDOM)	Ghana, Nepal
Proxy statistics (monitoring log truck numbers)	Ghana
MODIS (satellite sensors) burned area and IPCC default values	Ghana, Chile

Notes: Sixteen submissions (out of 45) included forest degradation.

*Countries with ongoing TAs; scope may still change.

For **enhancement of forest carbon stocks**, 38 percent of the FREL/FRL submissions included this activity (Figure 7); all those submissions included afforestation but only a few included enhancement of carbon stocks in FL–FL. For afforestation, activity data come either from satellite imagery analysis (samples, maps or a combination) or from official data on planted areas. Myanmar used data from a plantation database managed by the Forest Department, pointing out challenges in identifying forest gain with remote-sensing technologies (see Box 2).

There are several challenges associated with assessing removal results from carbon stock enhancement against a FRL, mainly – but not only – related to the UNFCCC requirement to use historical data in the FRL and the delayed removals resulting from growth. These challenges are explained in more detail in Lee, Skutsch and Sandker (2018).

For **conservation of forest carbon stocks** and **sustainable management of forest**, 9 percent and 11 percent respectively of the submissions included these activities. Countries that included these activities tend to report net removals (often consisting of emissions and removals) in areas subject to conservation and SMF. Basically, these countries assess the forest carbon fluxes and consequently consider additional administrative information to determine what REDD+ activity it corresponds to. For example, if the flux is happening in a national park it may be considered conservation, or if in a production forest concession it may be considered SMF. As discussed above, various other countries explain that these carbon fluxes are already covered under enhancement (and to some extent forest degradation and deforestation).

Box 2
Afforestation/reforestation in Myanmar's modified FRL

During the TA, Myanmar included enhancement of forest carbon stocks by reforestation/afforestation in its modified FRL submission. Enhancement also occurs in FL–FL, but this is not included due to data limitation. The decision by Myanmar to include reforestation/afforestation in the FRL is in line with the mitigation ambitions announced in its NDC and the involvement of the country in nationwide mitigation projects, such as the Myanmar Reforestation and Rehabilitation Programme. The inclusion is also in line with the country's REDD+ strategy.

Myanmar defined enhancement of forest carbon stocks through reforestation/afforestation as "the establishment of new carbon sequestration capacities resulting from the change of non-forest land use to forest land use".

Myanmar describes in its modified FRL submission that during the TA it had proposed a zero FRL for including enhancement from forest planting, arguing that removals from the past bear no influence on removals from newly established forest areas during the results period. The assessment team responded to Myanmar that a zero FRL would be inaccurate and fail to take into account historical data, as required in the COP decisions. Myanmar therefore calculated historical removals during the reference period and used this in its FRL.

Myanmar found that satellite imagery analysis was incapable of providing accurate estimates of newly established forest plantations, if the exact location of these plantations is not known. Forest plantation areas are recorded through the administration of the government's Forest Department. Annual data have been available for plantation areas disaggregated by public and private use since 1980. However, 2000 has been selected as the starting year to track removals from afforestation/reforestation because of a lower level of reliability of data collected before the 1990s and a higher possibility that the areas planted before 2000 have disappeared, been converted to other land uses, or exist but without a clear forest management plan. The removal factors are selected from the IPCC 2006 guidelines, for which the most conservative values for the region had been selected. The assessment team proposed to stratify growth rates by age classes in future submissions.

Myanmar's submission is an example of how countries' mitigation ambitions and REDD+ strategy have encouraged the inclusion of enhancement of forest carbon stocks in the FRL. It also illustrates that countries can change the scope of their FRL in the course of the TA and how the assessment team can influence the way in which the FRL is established. Finally, it shows how a country can evaluate the accuracy of different data sources before a final decision on the data used to calculate emissions in the FRL is made.

2.3.5 Data selection for emission factors

For **deforestation**, countries mainly use inventory data to estimate the associated emission factor (EF), either from the national forest inventory (NFI) or from local inventories. Of the 39 countries that have submitted one or more FREL/FRLs, 56 percent had completed at least one NFI cycle and 28 percent were implementing an NFI at the time of the latest FREL/FRL submission (Figure 11).

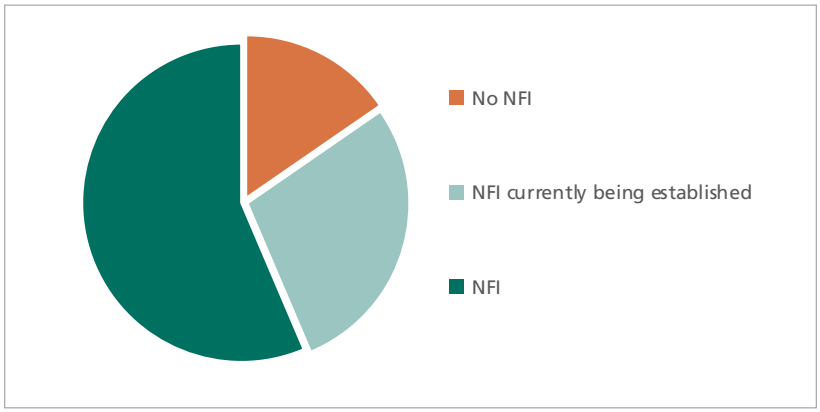

Figure 11. Share of countries submitting a FREL/FRL that had undertaken or were establishing an NFI (*n* = 39 countries)

Most countries, in accounting for **post-deforestation carbon contents**, subtract the average carbon contents in replacing land-use from the average forest carbon stock of the forest type that is being deforested, but some (e.g. Côte d'Ivoire and Papua New Guinea) apply a growth rate to post-deforestation carbon stock. This may be considered in line with the IPCC guidelines, as the emissions from deforestation mainly occur in the year of conversion but the replacing land-use carbon stock grows over several years. This does pose some challenges on carbon accounting, as shown in Box 4. In the case of Côte d'Ivoire, the delay in removals of vegetation growing in post-deforestation land use causes the net FREL value to drop from 41 million tCO_2 in the first year of the reference period to 21 million tCO_2 in the last year. This decrease is almost entirely due to growth in post-deforestation land use (mostly perennial crops), as the deforestation area estimate does not change over the reference period.

For **forest degradation**, the data needed to estimate emissions largely depend on the type of activity taking place. Several countries assessing activity data through (high-resolution) satellite imagery approximate the associated emissions with the difference in average carbon stock of intact and degraded/disturbed forest. Countries that consider logging to result in forest degradation sometimes use harvested volumes or other logging statistics to estimate emissions from forest degradation. In some cases, countries assess collateral damage from timber extraction (e.g. as assessed in Pearson, Brown and Casarim, 2014) to approximate the emissions from the activity.

For **enhancement**, this can occur in FL–FL and other land uses converted to forest land (afforestation/reforestation).

To estimate the enhancement of forest carbon stocks in **forest land remaining forest land**, countries estimated removals by the difference in average carbon stock of forest types (e.g. between open and dense forest), used data on age structure applying growth models, or used data from multiple NFI cycles.

For estimating removals associated with **afforestation/reforestation**, some countries have applied either country-specific increment values from the NFI, in-country studies, or IPCC default growth rates. Several countries have proposed "committed" removals, where all expected future removals are accounted for the year that afforestation was detected, which was subsequently included as an area for technical improvement in the TA reports.

2.3.6 Uncertainty analysis

Of the 2019 FREL/FRL submissions, six out of seven submissions included an uncertainty estimate around activity data (AD) (Figure 12) and six out of seven around emission factors (EF), while five out of seven submissions included an aggregate uncertainty estimate around the submitted FREL/FRL value, meaning that they combined AD and EF uncertainties. For all three types of uncertainty reporting (AD, EF and aggregate) the frequency with which countries included this for 2019 are above the average percentages of uncertainties reported for all FREL/FRL submissions to date, but by far the greatest progress is seen in reporting on **aggregate uncertainties**, which was included in 40 percent of the total 45 FREL/FRL submissions and 71 percent of the 2019 FREL/FRL submissions (and this percentage could increase with the modified submissions). The aggregate uncertainties around the FREL/FRL values reported in 2019 range between 20 percent and 32 percent (with the exception of Nicaragua). Not all of these estimates are fully comparable, however, because there are differences in the sources of error that countries include. This lack of comparability makes it difficult to judge the accuracy of emission estimates based on available uncertainty. Moreover, information on individual error sources would be more useful than aggregate uncertainty estimates in the identification of potential areas for improvement.

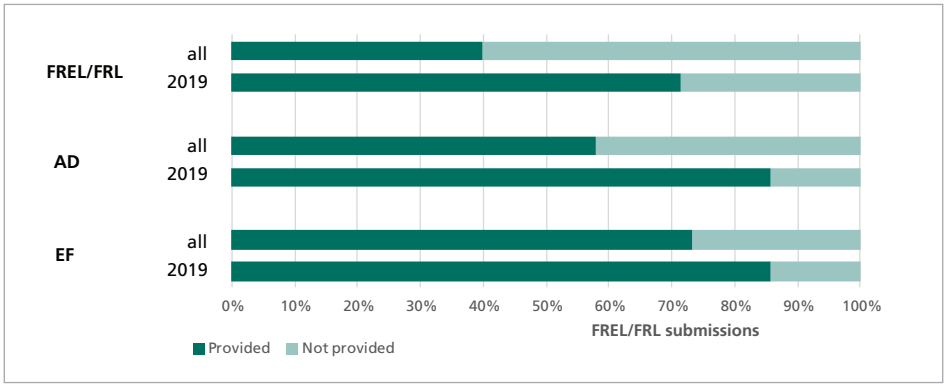

Figure 12. Percentage of submissions that provide uncertainty estimates around emission factors, activity data and overall emissions in FREL/FRLs for all 45 submissions and the 2019 submissions

FAO (2018a) illustrates the multitude of potential sources of error and how uncertainty analyses often do not include all sources of error, making it difficult to compare FREL/FRL uncertainty estimates. Uncertainties in estimating emissions greatly depend on the error sources considered. Sampling is the most commonly reported source of error, but interpretation (or measurement) errors can be equally significant. Where models are employed, such as allometric equations, root-shoot ratios, soil-carbon stock-change factors, etc., model errors will necessarily affect the estimate (see FAO, 2018a). Not all countries include the same sources of error in their analysis. In fact, an improved assessment of uncertainties is likely to result in a higher aggregate uncertainty (see Box 3) because more sources of error are captured in the uncertainty assessment.

Box 3
Contrasting effects of improving quality of uncertainty estimates

Improving the quality of data collection and analysis may lead to lower uncertainties, yet it may increase the uncertainty in cases where more sources of error are included in the analysis. This contrasting effect is illustrated by examples in FREL submissions by Nigeria and Madagascar.

Nigeria's subnational FREL submission for Cross River State reports AD based on sampling imagery through augmented visual interpretation. The estimates in the initial submission were based on 428 sampling points, but during the TA Nigeria increased the sample size to 1 021 points in an attempt to improve the accuracy of the AD estimate. As a result, the uncertainty around the deforestation area estimates decreased from 34 percent to 24 percent. These improvements were a direct result of an increased effort in data collection and proved the readiness of the country to tackle uncertainties and increase precision in activity data.

Nonetheless, increased reporting efforts may also lead to counterintuitive results, by which an increased effort to improve data-quality reporting may trigger increases in uncertainties (the so-called uncertainty paradox, see Birigazzi *et al.*, 2019). This effect is mainly due to adding compounded errors from different error sources. An example is visualized in Madagascar's 2017 and 2019 FREL submissions. The country provided EF estimates with associated errors from both sampling and allometric models, disaggregated by forest categories (combinations of forest type and land use). The compounded errors, when model error was added to sampling error, increased up to fourfold in forests with higher tree density (such as moist forest), and twofold in the rest of forest types/land uses (Figure 13). The compounded errors were still larger in percentage in areas less represented or sampled, such as those in the mangrove ecoregion (20–60 percent), while inland forests had compounded errors of 15–20 percent.

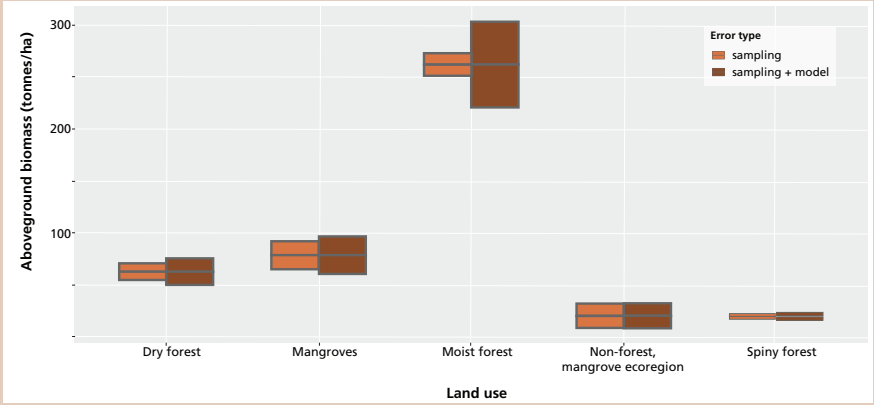

Figure 13. Emission factor estimates and their associated sampling and propagated (sampling + model) errors in different forest/land uses of Madagascar

These examples present the two sides of the uncertainty paradox. As a rule, increasing sampling points will decrease sampling error and uncertainty, but increasing error components will produce larger propagated uncertainties.

In sum, the information currently included in countries' FRELs and BURs on uncertainties cannot easily be compared. This may be exacerbated because details of estimation approaches and scope of uncertainty analysis are not always provided. Overall guiding principles for transparent reporting can be found in Birigazzi *et al.* (2019).

2.3.7 Construction approaches and adjustments

Most countries (82 percent) choose a simple historical average as the construction approach for their FREL/FRLs (Figure 14). This does not always result in a FREL/FRL value that is equal to the average annual emission/removal over the reference period in the case of delayed emissions, or removals that stem from activities during the reference period but continue into the results period (see Box 4), such as the "inherited" emissions from peatland for Indonesia.

Ghana changed from linear projection to simple historical average as a result of the technical assessment, making this the first case where a country changed its construction approach for that reason.

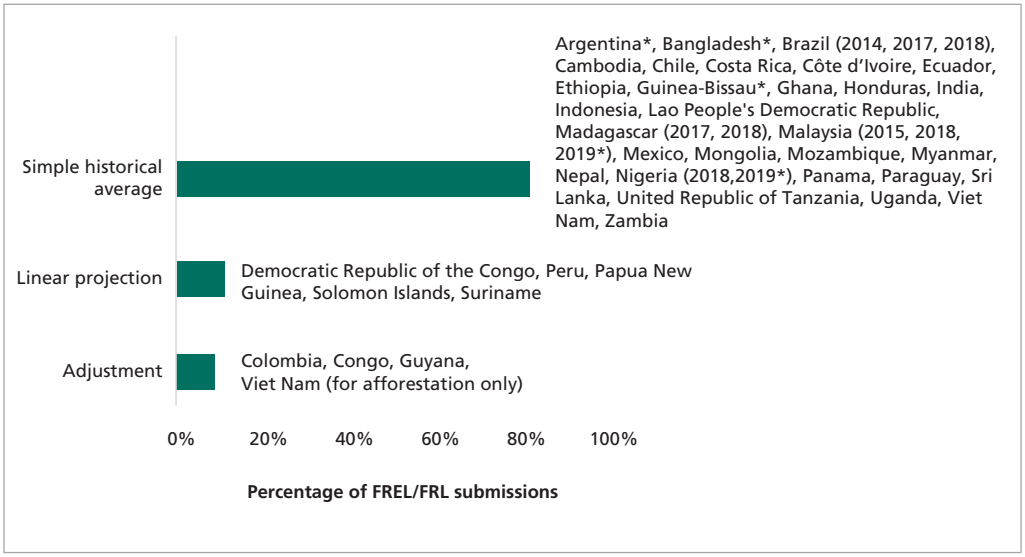

Figure 14. Construction approaches chosen for FREL/FRLs

Note: *Countries with ongoing TAs; construction approach may still change.

Box 4
Consideration of delayed emissions/removals in the FREL/FRL

With disturbance events such as deforestation and forest degradation, most of the emissions are assumed to occur in the same year that the activity is detected ("fast out"). However, decay on site or soil organic carbon emissions can occur over decades ("slow out"). Likewise, most removals (afforestation, post-disturbance regrowth or growth in FL–FL) occur over several years or decades ("slow in"). The legacy effect of "slow" emissions and removals pose a challenge to countries in terms of REDD+ accounting, because emissions/removals associated with activities that occurred during the reference period continue to emit/remove carbon from the atmosphere over the results period. As this effect is cumulative for countries that begin to account for these long-lasting emissions/removals from the first year of the reference period onwards, emissions/removals will systematically be higher during the results period. These "inherited" emissions/removals can have an impact (positive or negative) on the calculation of REDD+ results if not correctly included in the FREL/FRL, as illustrated by the REDD+ result submissions of Indonesia and Papua New Guinea.

Indonesia explains in its submission that delayed emissions from peat drainage that happened over the reference period were approximated by a linear regression, but this linear regression was based on average values, which results in "improper

emission projections" that underestimate actual emissions. Because emissions from peatland drainage are cumulative, they will never be below emissions in the reference period unless drained peatlands are rewetted. However, as illustrated in a graph included in Indonesia's BUR TA (see Figure 15), the last year in the reference period is well above the first year in the FREL, indicating that the FREL projection underestimated peat emissions. Peatland emissions reduce Indonesia's REDD+ results by 46 percent, part of which is due to the "improper emission projections".

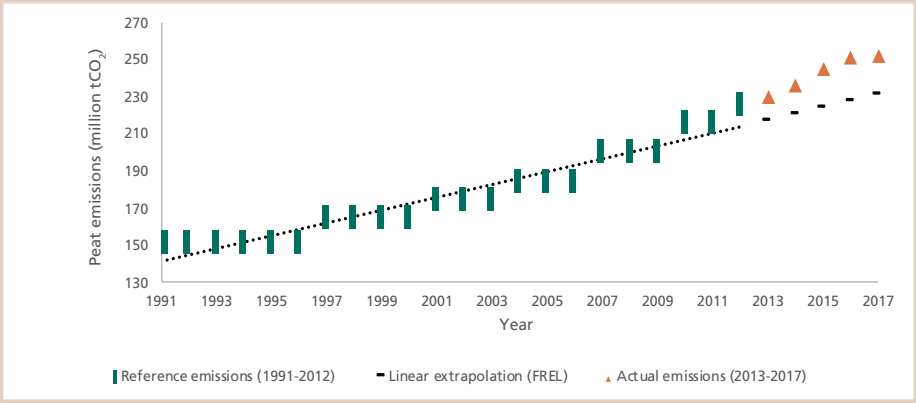

Figure 15. Indonesia's historical peatland emissions, those included in the FREL and actual emissions over the results period (MoEF, 2016)

Note: Emissions after 2012 will not be below the 2012 level, showing that the FREL was too modest in its peatland emission projection.

Papua New Guinea included a correction for post-deforestation removals in its BUR TA due to a simplification in projected removals following deforestation that took place during the reference period. As post-deforestation removals are cumulative and Papua New Guinea's deforestation area shows a linear increase, post-deforestation removals increase faster than linearly – with the result that the projected FRL underestimated (inherited) removals. Papua New Guinea's BUR TA provides more details on this correction. This downward correction consists of 16 percent of REDD+ results.

2.3.8 Consistency of FREL/FRLs with GHG inventories

There are some fundamental differences between GHG inventories and FREL/FRLs. GHG inventories are intended to provide comprehensive estimates of GHG fluxes, while FREL/FRLs are benchmarks for assessing REDD+ performance, often in the context of receiving finance. GHG inventories are entirely based on IPCC guidance and guidelines, and therefore should neither overestimate nor underestimate GHG fluxes. However, the IPCC is not specific about setting a reference level against which to measure results and FREL/FRLs seeking funds may consider the concept of conservativeness.[8] GHG inventory reporting is based on land-use (sub)categories, while FREL/FRLs report by REDD+ activities. Although in some cases IPCC (sub)categories may coincide with REDD+ activities, they do not necessarily match (as discussed in Section 2.3.3). Generally, GHG inventories aim to be as complete as possible (filling data gaps with Tier 1 estimates), while FREL/FRLs may use a step-wise approach (only including pools and activities for which robust and reliable data are available) or, in the interim, report at the subnational scale. For these reasons, overall net emissions/removals from forests may not be the same in GHG inventories and FREL/FRLs, although this does not necessarily imply that they are inconsistent. Since many NDCs take the GHG inventory as a reference or starting point for projections, they may be subject to similar differences, as mentioned above, between the FREL/FRL and GHG inventory.

[8] When accurate estimates cannot be achieved, the concept of conservativeness suggests that countries should provide estimates that do not overestimate emission reductions or reduce the risk of overestimation.

3. Summary of reported REDD+ results

3.1 WHAT'S NEW FROM REDD+ RESULTS SUBMISSIONS

As of early July 2019, the UNFCCC had received 12 REDD+ results submissions from eight countries: this is double the number of countries reporting results since July 2018. Together, the results reported add to 8.66 billion tCO_2 of emission reductions (ERs) obtained between 2006 and 2017. The large majority of these ERs (94 percent) are from one country: Brazil (Table 2). Unlike the initial submissions that covered two REDD+ activities only (deforestation and sustainable management of forest), by the end of 2018 all REDD+ activities had been covered in the reported results (yet no single country covers all activities).

The net annual ERs reported consist on average of a 32 percent reduction against the FREL, meaning emissions over the results period are on average 32 percent lower than emissions in the FREL. The reduction in percentage of the FREL ranges annually between zero and 69 percent. Results reported against a FRL consist of a net increase in removals of between zero and 624 percent.

Figure 16 shows a few examples of FREL/FRLs and the REDD+ results reported against them.

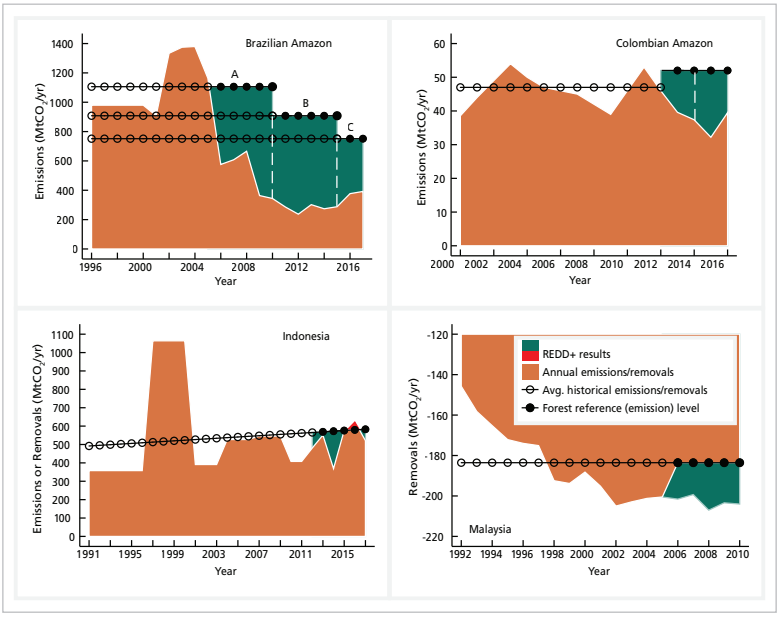

Figure 16. Examples of FREL/FRLs with REDD+ results reported against them

TABLE 2.
Overview of REDD+ results submitted to the UNFCCC

Year	Submission	Results ('000 tCO_2)	Percentage of total results	Average annual results ('000 tCO_2)	Results period	Length results period (years)	REDD+ activity
2014	Brazil (Amazon A)	2 971 022	34	594 204	2006–2010	5	Deforestation
2016	Colombia (Amazon I)	28 984*	0.34	14 492	2013-2014	2	Deforestation
2016	Ecuador	28 990	0.34	4 832	2009–2014	6	Deforestation
2016	Malaysia	97 470	1.13	19 494	2006–2010	5	Sustainable management of forest
2017	Brazil (Amazon B)	3 154 502	36	630 900	2011–2015	5	Deforestation
2018	Chile	19 362	0.22	1 614	2014–2016	3	Deforestation, Forest degradation; Enhancement; Conservation
2018	Colombia (Amazon II)	31 475	0.36	15 737	2015–2016	2	Deforestation
2018	Indonesia	244 892	2.83	16 326	2013–2017	5	Deforestation; Forest degradation
2018	Paraguay	26 793	0.31	13 397	2016–2017	2	Deforestation
2019	Brazil (Amazon C)	769 001	9	384 500	2016–2017	2	Deforestation
2019	Brazil (Cerrado)	1 274 723	15	182 103	2011–2017	7	Deforestation
2019	Papua New Guinea	9 003	0.10	4 502	2014–2015	2	Deforestation, Forest degradation; Enhancement**

Notes: *The LULUCF experts "are of the view that the changes to the national circumstances justifying the adjustment upwards by 10 per cent should not apply to the results reported for 2013–2014" and note that "the results for 2013–2014 should be considered relative to this conclusion". The reason is that the condition identified by Colombia to apply the adjustment was the ratification of the peace process prior to the results period.

**Enhancement is included in the scope of the FRL and the results, but for both the activity has been assessed at zero.

Figure 17a shows the REDD+ results reported per year by all countries that submitted results to date for the period 2006–2017. These numbers will change as new submissions come in. The annual results reported are highest over the period 2009–2017.

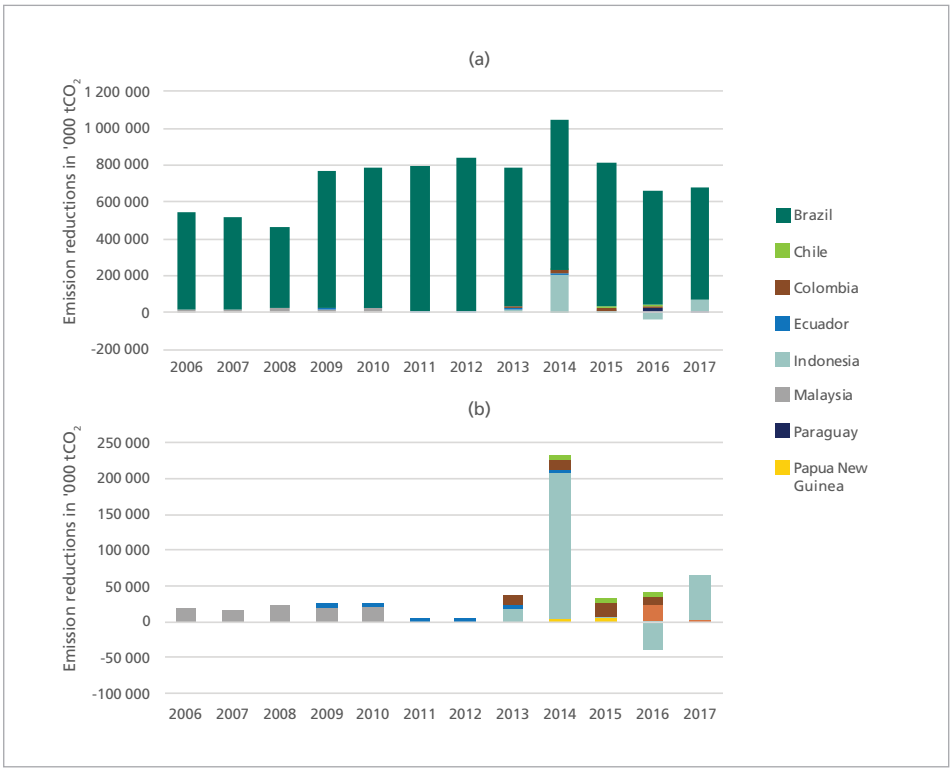

Figure 17. Cumulative REDD+ results reported (a) for all countries, (b) for all countries except Brazil

3.2 RESULTS REPORTING PERIODS AND ANNUAL VARIABILITY

Two out of eight countries assess net results over multiple years: Ecuador assesses average emissions over the period 2009–2014, comparing this against the FREL; Malaysia assesses average removals over the period 2006–2010 without assessing annual variation. All the other countries assess results annually (reporting net results for the combined years). The results periods in the submissions vary between two and seven years but overall, a two-year results period is most common.

As Figure 17 reveals, most of the annual results assessments show interannual variability. This is in line with expectations for the forest sector, as it is influenced by many factors, including annual disturbances (e.g. fires) and climatological differences (e.g. an "El Niño" year may experience more forest loss than a normal year). For some countries the interannual variability can be relatively large, with years where emissions from activities are actually above the FREL. In total, 182.3 $MtCO_2$ emission increases against the FREL are reported from deforestation and forest degradation. The majority (62 percent) of these emissions exceeding the FREL come from peat decomposition (which includes both deforestation and forest degradation, but the estimate is not disaggregated by activity), followed by emissions from forest degradation (34 percent) and deforestation (4 percent).

3.3 REDD+ ACTIVITIES INCLUDED FOR RESULTS REPORTING

Results have been reported for all REDD+ activities (Figure 18), but the majority of all reported results come from reducing deforestation (99 percent).

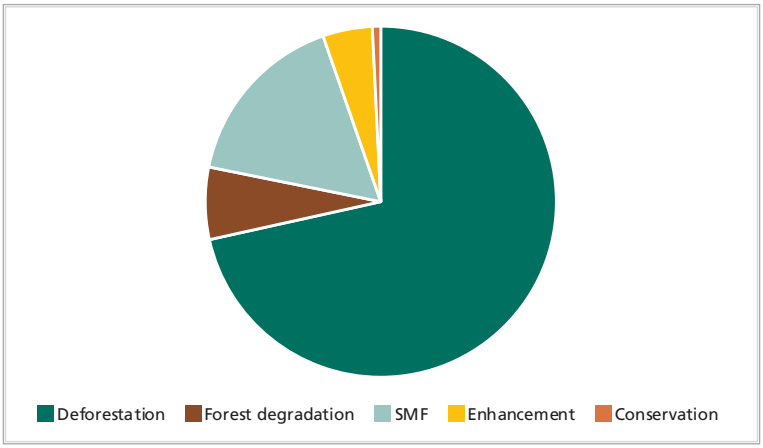

Figure 18. Contribution of REDD+ activities to total cumulative emission reductions (excluding Brazil)

Note: Emissions from peatland are excluded because they are a mix of deforestation and degradation, but not disaggregated by activity.

Without considering the results reported by Brazil, the remaining results are still mainly from deforestation (72 percent), followed by sustainable management of forest (SMF, 16.5 percent), forest degradation (6.6 percent), enhancement (4.6 percent) and conservation (0.8 percent).

Two countries (Malaysia and Chile)[9] have reported REDD+ results against a FRL expressed in net removals, i.e. a FRL for "plus" activities. For these two examples, the net removals consist of combined emissions and removals. For Malaysia the emissions are associated with timber extraction, and for Chile the emissions stem from degradation inside protected areas, while removals for both originate from growth in (degraded) forest. As such, the results can consist of emission reductions, removal increases or both. For Malaysia's SMF results, 79 percent are from ERs, stemming from reduced logging following a harvest cap. Chile's net results on forest conservation include a 105 percent increase in removals from recovering degraded forest in the conservation area and a 185 percent increase in emissions from forest degradation in the conservation area. In absolute terms, the increase in removals from recovering degraded forest is larger than

[9] Papua New Guinea also reported REDD+ results against a FRL, but the removals were assessed as zero for both the reference period and the results reporting period.

the increase in emissions from forest degradation, so the net result is positive for this activity. Chile's results on forest carbon stock enhancement consist of 1 percent from increased removals from the conversion of non-forest land to forest land, and 99 percent from increased removals in FL–FL.

3.4 UNCERTAINTIES AROUND EMISSION REDUCTIONS

Although the IPCC provides clear guidance on propagating errors for emissions calculations (AD x EF), it does not provide an explicit equation to calculate uncertainties around ERs. Some of the countries that have submitted REDD+ results provide aggregate uncertainty estimates around the REDD+ activities assessed over the results reporting period, but not around ERs (the difference between monitoring and the FREL). The expectation is that uncertainty in estimating ERs will usually be much higher than uncertainty in estimating emissions (Box 5).

Box 5
Uncertainty in estimating emissions and emission reductions

The same methodologies are used in estimating emissions for the FREL/FRL and the results period. The same sources of error are at play for estimating emissions and emission reductions, e.g. errors stemming from sampling, image interpretation and application of models. Consequently, absolute errors are expected to be similar, whereas relative errors will inflate when moving from emission to emission reduction calculations, because ERs tend to be only a fraction of emissions in the FREL. As such, uncertainty will be higher in the estimation of ERs. At the same time, estimates of historical emissions and emissions over the results reporting period tend to be correlated, e.g. in cases where the same EFs are applied, and this correlation lowers the uncertainty around the associated ER compared with a simple error propagation.

Figure 19 shows uncertainty calculations around ERs for different levels of uncertainty around emission estimates. Uncertainties in emissions are assumed to be similar for the FREL and the emissions over the results reporting period (viewed as coloured lines), and correlation between the FREL and results period emissions is assumed to be 70 percent.

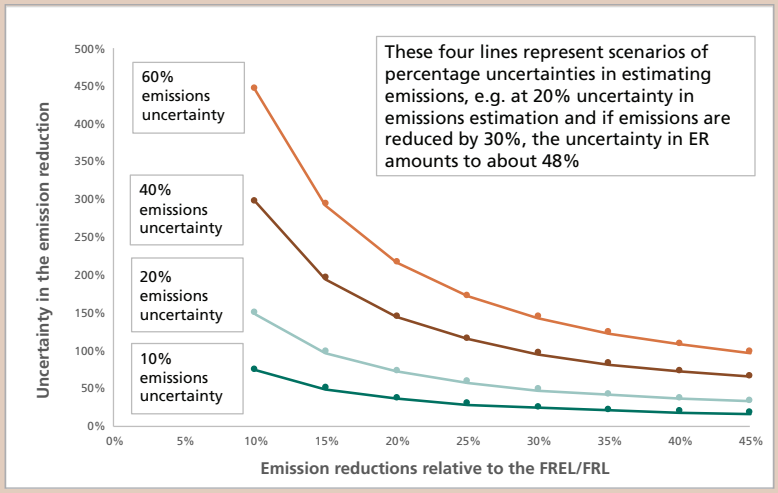

Figure 19. Simplified calculation of uncertainty in estimating emissions and emission reduction

Note: Correlation between the FREL/FRL and assessment over the results reporting period is assumed to be 0.7 for this example.

Figure 19 shows that a 30 percent ER with an emissions uncertainty of 20 percent is expected to result in an ER estimate with an uncertainty of 48 percent, if the correlation value is 0.7. If instead the correlation is 0.5 the expected uncertainty would rise to 59 percent, while with a 0.9 correlation it would fall to 32 percent. In the most recent FREL submissions, reported uncertainty of emission estimates amounted to approximately 20–32 percent (Section 2.3.6), while emissions were on average reduced by 32 percent relative to the FREL (Section 3.1).

It is a statistical fact that the relative uncertainty of ER estimates drops with larger ER relative to the FREL and lower uncertainty of emission estimates (as Figure 19 illustrates). This applies to any calculation of the difference between two data points and is not specific to REDD+.

4. Green Climate Fund pilot programme for REDD+ results-based payments

4.1 SUMMARY OF THE PILOT PROGRAMME

In October 2017 the Green Climate Fund (GCF) launched a pilot programme for REDD+ results-based payments (GCF Board Decision B.18/07). The pilot programme offers RBPs for REDD+ results achieved over the five-year period 2014–2018. The GCF requires funding to flow through accredited entities that work together with governments to develop proposed investments. Countries that wish to receive REDD+ RBPs would therefore need to engage an accredited entity in order to submit a concept note and a funding proposal to the GCF. As a minimum requirement to participate in this programme, a country needs to have certain elements related to UNFCCC requirements in place and publicly available (Table 3).

TABLE 3.
UNFCCC-related requirements to participate in the GCF RBP pilot programme and where/how these should be made available

Requirements related to UNFCCC	What should be available?
National REDD+ strategy or action plan	Link should be provided
Technically assessed FREL/FRL that is used to assess REDD+ results for which RBPs are requested	UNFCCC link to the FREL/FRL and technical assessment report should be provided
National forest monitoring system	UNFCCC link to the BUR with technical annex (including an NFMS description) should be provided
Summary of information on how all Cancun* safeguards have been addressed and respected	UNFCCC link to the summary of information should be provided
Safeguard information system to inform how the Cancun safeguards are addressed and respected throughout the implementation of REDD+	Evidence of such a system should be provided
REDD+ results in a technical annex to the BUR, including those results for which payments are being requested. The technical analysis should be completed with the report made available on the UNFCCC website by the time of submitting the complete RBP funding proposal.	UNFCCC link to the BUR should be provided

Note: *As agreed at the 2010 United Nations Climate Change Conference, held in Cancun, Mexico, from 29 November to 10 December 2010.

Of the above elements, COP decisions do not require the national REDD+ strategy and safeguard information system to be submitted to the UNFCCC, but a link to the national REDD+ strategy needs to be provided.

Concerning safeguards, there is a difference between a safeguard information system and a summary of information on safeguards. The safeguard information system can be seen as a national instrument to manage information, whereas a summary of information[10] is generally a broader document available to an international audience (UNFCCC, 2019a). The first summary of information can be submitted at any time, and thereafter should be consistent with the provisions for submissions of national communications, which are submitted at least once every four years. Summaries of information may also be submitted directly to the UNFCCC REDD+ web platform.

A description of the NFMS needs to be provided in the BUR TA with REDD+ results (see UNFCCC Decision 14/CP.19 Annex), however, countries may in addition provide a description of the NFMS as a stand-alone document and publish it on the UNFCCC website,[11] where they can share any information they feel is relevant.

Following Decision 9/CP.19, a Lima REDD+ information hub has been established on the REDD+ web platform to publish information on the results of REDD+ activities, and corresponding RBPs. The Lima REDD+ information hub aims to increase transparency of information on REDD+ results-based actions. Information is only displayed on the information hub after all the following elements have been submitted/made available: technically analysed REDD+ results, technically assessed FREL/FRL, summary of information on safeguards, link to the national REDD+ strategy and information on the NFMS (typically through the BUR TA). Furthermore, the country needs to provide the quantity of results for which payments were received, expressed in tonnes tCO_2/year, and the entity paying for those results.

Countries wishing to participate in the GCF RBP pilot programme should make sure that they do not fail any elements of the scorecard (GCF, 2017).[12] They may wish to consider the following aspects that may lead to a "fail" if not met:

- the FREL/FRL is equal to or below historical annual average emissions (Section 2a: ii);
- the FREL/FRL and/or REDD+ results submitted in or after 2019 include information on aggregate uncertainties (Section 2a: xv and Section 2b: vii);
- the FREL/FRL reference period is >5 or <20 years (Section 2a: xiii);
- the FREL/FRL reflects higher emissions/lower removals than a previous FREL/FRL submission covering the same area (Section 2a: xiv);
- all significant REDD+ activities have been included (Section 2a: viii);
- the information is guided by and aligned with the IPCC (Section 2a: xi, xii);[13]
- the FREL/FRL and/or REDD+ results are transparent, complete, consistent, accurate and in accordance with the guidelines in Decision 12/CP.17 (Section 2a: iii, iv, v, vi, vii and Section 2b: ii, iii, iv, v);
- the REDD+ results reported are consistent with the FREL/FRL (Section 2b: i);

[10] Guidance on the information that countries may wish to include in a summary of information is provided in UNFCCC Decision 17/CP.21, timing and frequency of the presentation of the summary of information is provided in UNFCCC Decision 12/CP.19.

[11] See Cambodia example: https://redd.unfccc.int/uploads/54_1_cambodia_nfms__sept_17.pdf

[12] https://www.greenclimate.fund/documents/20182/1203466/Terms_of_reference_for_the_pilot_programme_for_REDD__results-based_payments.pdf/e26651fc-e216-c8b0-55a1-8eea16a90f39

[13] IPCC guidance (2006) requires delayed emissions for soil organic carbon. It is unclear how such legacy emissions will be considered when resulting in a FREL above historical annual average emissions.

- the ERs offered for RBPs have not yet been paid for (Section 2b: viii);
- the ERs offered for RBPs are included in a registry (Section 2b: ix).

4.2 BRAZIL'S FUNDING PROPOSAL TO THE PILOT PROGRAMME

In February 2019, the first funding proposal to the GCF for REDD+ RBPs was approved with conditions on how the proceeds will be used.[14] In the decision, the GCF recommends that the accredited entity implements the following recommendations from the Independent Technical Advisory Panel (ITAP) during implementation of the project:

(a) Consider further analysis on how aggregated uncertainties affect the results and means to improve the FRELs and reporting.
(b) Taking into account that there could be significant emissions caused by forest degradation, consider the continuation of efforts to understand the effects of forest degradation in emissions reporting.
(c) Consider including information for future submissions to UNFCCC on the actions that the country is taking to prevent or minimize the displacement of emissions.
(d) Ensure the sustainability of the country's Bolsa Floresta + pilot programme with a plan around scalability, financing and expected outcomes and indicators that goes beyond the six-year initial period.

Brazil offered 25 million tonnes of emission reductions for the period 2014–2015 (which is 2 percent of the total ERs reported in its BUR for 2014–2015, amounting to 1.25 billion tCO_2 ER). Brazil scored 36 out of 48 points on the scorecard, for which the ERs offered are multiplied by 0.75, giving a payable amount of 18.75 million tCO_2 at USD 5/tonne. To this amount an additional 2.5 percent bonus is added for non-carbon benefits, resulting in an agreed payment of USD 96 million. The cap set by the GCF on the amount a country can receive is USD 150 million (30 percent of the total envelope), or approximately 30 million tCO_2 ER.[15] This cap will allow the fund to pilot several countries that wish to receive results-based payments.

4.3 ECUADOR'S FUNDING PROPOSAL TO THE PILOT PROGRAMME

In July 2019, Ecuador had its funding proposal to the GCF for REDD+ RBPs approved without specific conditions. In the decision, the GCF recommends that the accredited entity implements the following recommendations from the ITAP during implementation of the project:

(a) Strengthen the gender action plan, giving greater emphasis to the creation of economic access (through e.g. tailor-made skills-enhancement programmes, credit support) to the modalities, such as small and medium-sized enterprises, value chains and marketing of non-timber forest products.
(b) Ensure that the environment and social impact assessment is completed, as promised, during the inception stage.

[14] The conditions are set out in Annex III of the GCF decision and in the respective term sheet set out in document GCF/B.22/10/Add.17/Rev.02.
[15] Due to the 2.5 percent bonus for cobenefits, this may be a little less.

(c) Strengthen the project monitoring and reporting mechanisms to ensure that deforestation and forest degradation do not take place during the course of the project implementation, involving regular MRV opportunities and end-of-project MRV compliance.
(d) Strengthen the project governance structure by creating greater opportunities for the representation of indigenous peoples, and women's, youth and civil society organizations in project governance beyond participation in the inception level consultations.

Ecuador offered 4.8 million tonnes of emission reductions for the year 2014 (the full amount of ERs reported in its BUR for 2014). Ecuador scored 36 out of 48 points on the scorecard, thus the proposed ERs are multiplied by 0.75, giving a payable amount of 3.6 million tCO_2. To this amount an additional 2.5 percent bonus is added for non-carbon benefits, resulting in a payment of USD 18.6 million (at USD 5/tonne).

5. REDD+ reporting in the broader context

5.1 TRANSPARENCY FRAMEWORK

The Paris Agreement was adopted at UNFCCC COP 21 (2015) and entered into force at COP 22 (2016). Article 13 of this Agreement establishes the Enhanced Transparency Framework for action and support designed to build trust and confidence that all countries are contributing their share to the global effort.

- **Transparency of action** refers to information each Party has to provide regularly to track progress of the implementation of its NDCs and national GHG inventory reports, as well as information related to climate change impacts and adaptation.
- **Transparency of support** refers to clarity on support provided and received for mitigation, adaptation, finance, technology development and transfer, and capacity-building. Developed countries should provide information on support they have provided; meanwhile, developing countries should provide information on support needed and received

In December 2018 (COP 24) Decision 18/CMA.1[16] adopted the modalities, procedures and guidelines (MPGs) to make the Transparency Framework operational. The MPGs define the reporting information to be provided, the technical expert review, transitional arrangements, and a facilitative multilateral consideration of progress (Figure 20).

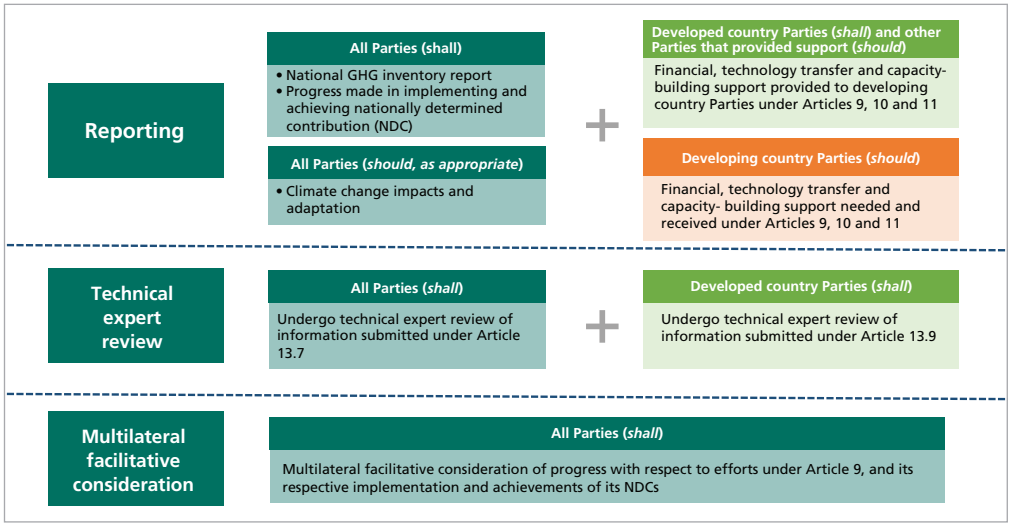

Figure 20. Transparency of action and support (UNFCCC, 2019b)

[16] CMA stands for Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.

Following Decision 18/CMA.1, countries shall submit their first **biennial transparency report (BTR)** and national inventory report following the MPGs at the latest by December 2024.[17] Under the transparency framework, REDD+ results will be submitted as an annex to the BTR. The Global Environment Facility (GEF) was requested to support developing country Parties to the UNFCCC in preparing their first and subsequent BTR and the operation of the Capacity-Building Initiative for Transparency (CBIT) as a priority reporting-related need. The CBIT is a trust fund created under the GEF to strengthen the institutional and technical capacities of non-Annex I countries to meet the transparency requirements (GEF, 2019). The last progress report indicates that 41 out of 155 non-Annex I countries (26 percent) have received support for national CBIT projects in Africa, Asia, Eastern and Central Europe (ECA) and Latin America and the Caribbean (LAC) and four global projects (GEF, 2018).

5.2 REDD+ REPORTING AT MULTIPLE SCALES AND IN DIVERSE CONTEXTS

This paper concentrates on the FREL/FRLs and BUR results annexes that countries report to the UNFCCC in the context of the Warsaw Framework for REDD+.[18] These country reports reflect national mitigation efforts and help to achieve nationally determined contributions, and they can become the basis for results-based payments, notably from the Green Climate Fund.

Beyond this, there are other reporting streams for entities with an interest in REDD+, often at (potentially overlapping) subnational or project scales and in other contexts, for example emissions offsetting. There is a growing and diverse list of such reporting streams, for example many countries work towards RBP deals under the World Bank's engagements.

The World Bank launched the Forest Carbon Partnership Facility's Carbon Fund in 2008 and the BioCarbon Fund's Initiative for International Sustainable Forest Landscapes in 2013 (World Bank, 2008; 2013). Dozens of REDD+ countries are working towards sales of ERs to these schemes, mostly stemming from programmes at the subnational scale. Both funds were developed to pilot market-based approaches and therefore require a demonstration of the ability to transfer title to ERs such that these can be used as offsets. The measurement and reporting of ERs is governed by requirements that were developed specifically for the funds and are more restrictive than the requirements of the UNFCCC Warsaw Framework.

The voluntary carbon markets comprise carbon credit transactions that have been used largely for the purpose of corporate or individual offsetting. Credits stemming from forest carbon projects have been among the most popular types of transacted units in voluntary markets. Project developers typically register and verify GHG units under a reputable carbon standard, such as Verra's Verified Carbon Standard. Governments often play only a secondary role in these projects.

[17] Least-developed countries and small island developing states may submit the information at their discretion.

[18] https://unfccc.int/topics/land-use/resources/warsaw-framework-for-redd-plus

Boundaries of accounting areas for crediting in different contexts can occur at different scales and may overlap, creating the risk of double-counting ERs and undermining the environmental integrity of mitigation efforts. Because of this, countries with programmes aiming to implement REDD+ at different scales need to design systems and procedures for so-called "REDD+ nesting" (Lee *et al.,* 2018). Such systems and procedures can be designed to optimize the mitigation contribution at the national and jurisdictional scale, while also leveraging the unique contributions that may come from projects led by the private sector, non-governmental organizations or other entities (including government). Lee *et al.* (2018) point out some challenges in reconciling different levels of REDD+ implementation, especially if there is a lack of harmonization in the data used to estimate emissions and the FREL/FRL construction approach.

Some countries (e.g. Colombia, Lao People's Democratic Republic, Mexico) have adopted comprehensive legal instruments to accompany the implementation of a national REDD+ strategy, which have helped to harmonize national, subnational and project-level REDD+ implementation approaches. Such legal instruments define the scope of REDD+, prioritize policies, formulate principles guiding REDD+ activities, and decide the institutional set-up, and systems for the monitoring of implementation and the measurement of results. In addition, some issues are particularly important for engaging non-governmental actors and REDD+ nesting, such as the establishment of a registry system, definition of entitlement to ERs and benefits, and adoption of a protocol for project development.

5.3 NATIONAL FOREST MONITORING SYSTEM CAPACITY-DEVELOPMENT AND INSTITUTIONAL ARRANGEMENTS

The past decade has seen sharp progress in measuring and monitoring forests. This is in part due to the increasing availability of open source products, high-resolution imagery and advanced open source algorithms, and because governments are developing their forest monitoring capacity, often driven by a desire to participate in REDD+. Neeff and Piazza (2018; 2019) have evaluated progress in forest monitoring capacity in 16 countries over ten years. The overarching conclusions from the study indicate that developing forest monitoring capacities takes time. Whereas the study illustrates a steep improvement in forest monitoring capacities, it also concludes that a durable NFMS needs streamlined government processes, strengthened institutions, a better basis for trust among those collaborating on forest monitoring, capacities to develop usable information from data, and above all an awareness of the benefits of a high-quality evidence base for better decision-making. Sustained technical support is required, alongside efforts to garner the political will to make forest monitoring a priority, and to support systems development and maintenance.

As a number of ministries and agencies are involved at all levels to implement REDD+, it is crucial to have clarity on institutional arrangements:[19] the mandates that are in

[19] Although there is no universal definition of "institutional arrangements", these could be defined as a set of systems, policies and rules, and processes that public and private institutions establish and use to manage and coordinate their relations and activities, either internally or with other institutions.

place, how cross-cutting activities are coordinated, which institutions could be charged with responsibilities, whether additional capacities are needed, and what (if any) new institutions may be necessary.

In reference to the NFMS, a significant number of REDD+ countries facing data accessibility and sustainability challenges have expressed the need to adopt legal arrangements in order to guarantee the system's functioning and clarify the different roles and responsibilities of the entities involved.

Robust and transparent NFMSs are essential for countries that would like to establish effective national decision-making processes, thus complying with international procedures. For countries participating in REDD+, an NFMS represents one of the four core mandatory elements to be developed and strengthened.[20] In addition, an NFMS plays a crucial role in improving the transparency of information under the Paris Agreement and other processes such as the Bonn Challenge,[21] the Sustainable Development Goals (especially SDG 13, Climate Action, and SDG 15, Life on Land), as well as Target 5 of the Aichi Biodiversity Targets.[22]

Although a single government institution can be responsible for coordinating the various components of an NFMS, usually various governmental and non-governmental institutions are involved in operating the NFMS through contributing to such processes as a forest inventory; forest mapping, planning and management; forest and land monitoring; soil carbon measurement; species identification; GHG estimations and reporting. Such institutions may include technical divisions of ministries, state commissions and agencies, private companies, non-governmental organizations, universities, regional research centres and international cooperation partners. For example, the institution responsible for managing a country's GHG inventory for all sectors, one of the key contributions to the NFMS, is often different to the one overseeing the NFMS.

As a result, the NFMS requires clear arrangements in order to clarify the roles and responsibilities of each institution involved, as well as the processes of exchanging information. This is particularly important to ensure consistency between the information reported to the UNFCCC and the Green Climate Fund for REDD+, such as the estimate of ERs in the technical annex to the BUR and the GHG inventory results.

For most countries, a clear agreement is needed among institutions on how the data should be shared to ensure data accessibility and consistency. Weak information or data-sharing systems, on the other hand, may result in duplication of efforts (i.e. two institutions collecting the same data), inefficiency and sometimes incoherency. Transparency of data can also contribute to institutional memory.

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[20] Decision 1/CP.16, p. 71.

[21] The Bonn Challenge is a global effort to bring 150 million hectares of the world's deforested and degraded land into restoration by 2020, and 350 million hectares by 2030.

[22] The Aichi Biodiversity Targets were included in the Strategic Plan for Biodiversity for the 2011-2020 period adopted by the 10th meeting of the Conference of the Parties of the Convention on Biological Diversity. Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

For example, the Democratic Republic of the Congo has mapped the institutional sources of the data needed for its NFMS in order to consolidate a comprehensive and sustainable strategy to access these data over the long term. Similarly, Colombia has taken steps to revise its legal and institutional frameworks and draft new legislation aiming to clarify the roles and responsibilities of the different entities involved in the establishment of an NFMS (Box 6).

Box 6
Colombia's NFMS and institutional arrangements

In 2017, the Colombian Government adopted a decree to regulate and articulate the forest and carbon monitoring system (F&CMS), the NFI and the NFIS. These components are considered essential for the implementation of the National Program for Monitoring and Follow-up of Forest Ecosystems (PMSB) formulated by the Hydrology, Meteorology and Environmental Study Institute in collaboration with the Ministry of Environment and Sustainable Development, the regional environmental authorities and the national investigation institutes. This work constitutes the basis for reporting domestic decision-making and international communications to the UNFCCC. One objective of the PMSB is the adoption of forest carbon monitoring strategies to measure carbon stocks and the emissions released into the atmosphere by deforestation (Decree No. 1655/2017).


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6. Concluding remarks

Many developing countries are engaging in REDD+ as a means of reducing emissions from deforestation and forest degradation. REDD+ has strong potential to help meet the mitigation goals set by the Paris Agreement on climate change, with deforestation and forest degradation responsible for 11 percent of anthropogenic greenhouse gas emissions (IPCC, 2014).

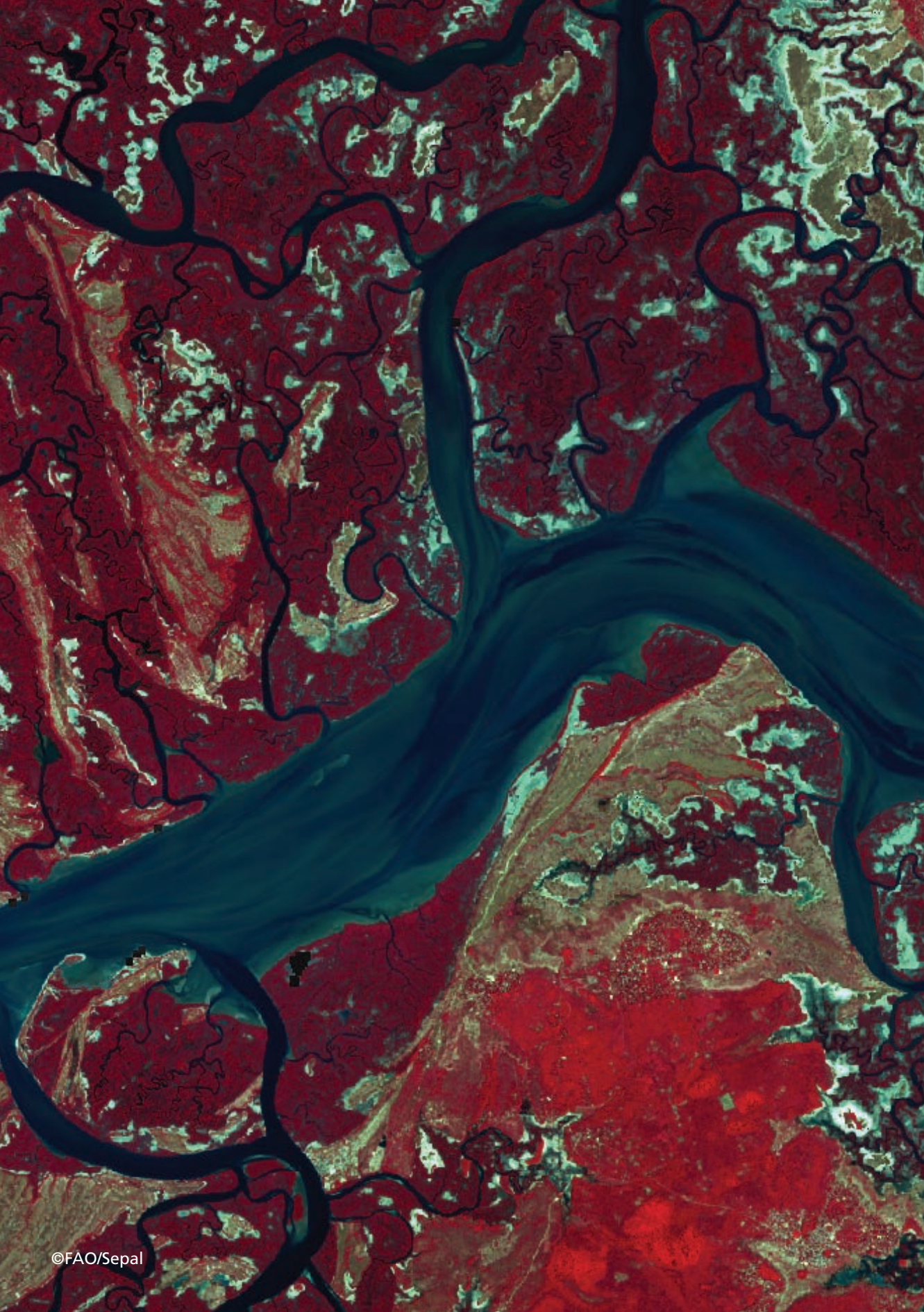
This report provides an overview of the progress developing countries have made to date on REDD+ reporting to the UNFCCC.

Reporting of uncertainties around forest emission estimates has increased steeply: while in 2014 and 2015 no country provided this, in 2019 as many as 71 percent of the reference level submissions included an overall uncertainty estimate around forest emission estimates. This is an important step in improving transparency of data in only five years.

In 2019, 39 countries have submitted a forest reference (emission) level to the UNFCCC, together covering >30 percent of global forest cover and around 70 percent of global forest loss. The total number of FREL/FRL submissions to the UNFCCC is 45, since several countries have submitted more than one FREL/FRL to expand the scope of REDD+ activities, expand the geographical coverage, propose methodological improvements or extend the results reporting period.

By July 2019, eight countries had reported REDD+ results against their technically assessed FREL/FRL, totalling more than 8 billion tCO_2 in emission reductions.

Progress in forest measurement has accelerated over the past decade, driven by the increasing availability of high-resolution imagery, advanced algorithms and open source products, allowing developing countries to access and process Earth Observation data. The improved forest data have value beyond REDD+ reporting and could support countries in their efforts to sustainably manage their forests.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