



Accounting of the land-use sector in nationally determined contributions (NDCs) under the Paris Agreement

 **Öko-Institut e.V.**

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On behalf of:



Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

of the Federal Republic of Germany

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Accounting Rules for the Achievement of the Mitigation Goals of Non-Annex I Countries

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ABBREVIATIONS

ADP	Ad Hoc Working Group on the Durban Platform for Enhanced Action
AFOLU	Agriculture, Forestry, and Other Land-Use
APA	Ad hoc Working Group on the Paris Agreement
BAU	Business-as-usual
COP	Conference of the Parties
CDM	Clean Development Mechanism
C pool	Carbon pool: aboveground biomass, belowground biomass, dead wood litter, mineral soils, organic soils
FAO	Food and Agriculture Organization of the United Nations
FM	Forest Management
FMRL	Forest management reference level
FREL	Forest reference emission levels
FRL	Forest reference level
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HWP	Harvested wood product
NDC	Nationally determined contribution
IPCC	Intergovernmental Panel on Climate Change
lCER	Land-term certified emission reduction
LU	Land-use
LUCF	Land-Use Change and Forestry
LULUCF	Land-Use, Land-Use Change and Forestry
NFREL	National forest reference emission level
NFMS	National Forest Monitoring System
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
RMU	Removal unit. Unit under the Kyoto Protocol
tCER	temporary certified emission reduction
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard



SUMMARY

The international community of states adopted the Paris Agreement at COP 21 in December 2015 (UNFCCC 2015). The Paris Agreement includes a diverse spectrum of “nationally determined contributions” (NDCs) for all Parties which comprise a variety of different types of commitments for Parties at different levels of economic development. More than 190 NDCs were submitted until May 2017. Given the large diversity how these NDCs have been expressed due to a lack of specific guidance, it will be challenging to establish a system in which the implementation and achievement of the NDCs are tracked in a transparent and comparable way that allows conclusions on the aggregate impacts related to the objective to keep the global temperature increase below 2°C.

Article 4, paragraph 13 of the Paris Agreement requires Parties to account for their NDCs in a way that they promote environmental integrity, transparency, accuracy, completeness, comparability and consistency, and ensure the avoidance of double counting.

Due to the bottom-up approach of NDCs and the lack of a common agreed accounting rules countries can use different definitions, accounting approaches and methodologies for the determination of the contribution of the land-use sector in their NDCs. In the development of NDCs all Parties are facing challenges related to the decision how to include the land use sector in their mitigation target. Parties had to take certain assumptions related to accounting elements such as reference levels, the type of activities included, definitions used or monitoring methodologies which they apply when they determined their first NDC.

This document is directed at policy makers and experts involved in the preparation, discussion and implementation of NDCs, also including experts outside the land-use sector, in particular also experts in developing countries. It describes the specific challenges of the land-use sector related to the estimation of emissions and the accounting towards mitigation targets. It provides an overview of existing accounting modalities for the land-use sector and supplements those by possible new approaches in a way that readers will get an overview of available options for the accounting of the land-use sector.

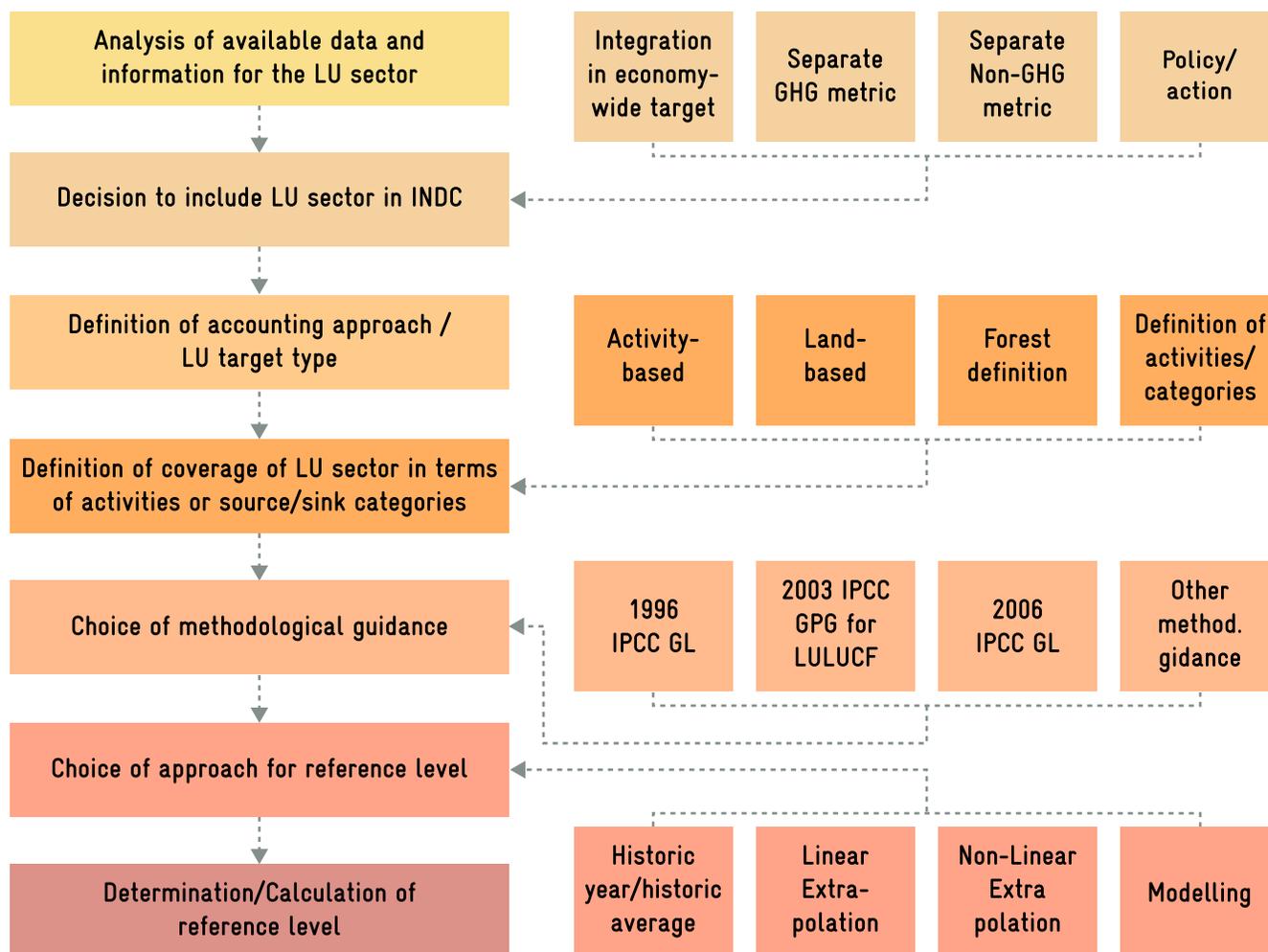
At the same time, a wealth of experience have been gained related to the estimation and accounting of emissions and removals from the land-use sector, land-use targets under the Kyoto Protocol and the Convention, the implementation of CDM, REDD+ activities and NAMAs. This paper intends to use the available experiences to provide guidance related to the key choices of accounting elements for the land-use sector in countries’ NDCs in the absence of any agreed guidance and rules at the international level.

This paper organizes its analysis and key recommendations around the five decisions that are to be taken when defining an NDC:

1. The determination whether the NDC includes the land-use sector and the definition of the target type for the land-use sector
2. The definition of the coverage of the land use sector
3. The choice of methodological guidelines
4. The definition of a reference level, base year or baseline

Prior to such decision-making, it is necessary to analyse the data and information available for the land-use sector and whether the regular and available data collection will allow tracking progress of the planned activities or whether additional data and information will be necessary. It is also important to consider the availability and quality of historical information which determines the feasibility of a robust reference level and therefore the inclusion of some actions.

► **Figure 1-1: Decisions and options related to the inclusion of the land-use (LU) sector in an NDC**



Source: Öko-Institut

Although being organized along those key decisions related to the definition of the NDC, the document can also be applied after the NDC has been submitted because relatively few Parties have already determined all accounting aspects of their NDCs in the land-use sector. In addition there are specific accounting elements and challenges to track progress with mitigation actions in the land-use sector which are relevant during the implementation of the NDC (see also → [Figure 1-1](#)):

1. the monitoring, reporting and verification of emissions/ removals from the land-use sector compared to the reference level, base year or target assumptions,
2. the tracking of progress of mitigation measures in the land-use sector,
3. the accounting related to market-based activities in the land-use sector,
4. the accounting of natural disturbances and the accounting for harvested wood products.

The second part of the document addresses the implementation phase of NDCs and the specific challenges in the land-use sector. Key recommendations are summarized at the end of the document.



1. INTRODUCTION

The international community of states adopted a new and comprehensive climate change agreement, the Paris Agreement, at COP 21 in December 2015 (UNFCCC 2015). The Paris Agreement is designed for the period after 2020 under the United Nations Framework Convention on Climate Change (UNFCCC). The key approach of the agreement is to go beyond the previously limited participation of Parties in the Kyoto Protocol as it should be “applicable to all Parties”. The Agreement includes a diverse spectrum of “nationally determined contributions” (NDCs) for all Parties which comprise a variety of different types of commitments for Parties at different levels of economic development. More than 190 NDCs were submitted until May 2017. Together these countries cover 99% of global emissions and more than 95% of the global population. Given the large diversity how these NDCs have been expressed due to a lack of specific guidance, it will be challenging to establish a system in which the implementation and achievement of the NDCs are tracked in a transparent and comparable way that allows conclusions on the aggregate impacts related to the objective to keep the global temperature increase below 2°C.

Article 4, paragraph 13 of the Paris Agreement requires Parties to account for their nationally determined contributions in a way that they promote environmental integrity, transparency, accuracy, completeness, comparability and consistency, and ensure the avoidance of double counting. This paragraph also provides a mandate to elaborate and adopt accounting guidance under the Paris Agreement. This discussion is still ongoing under the Ad hoc Working Group on the Paris Agreement (APA) with the objective to adopt a related decision at the end of 2018, but so far progress in the negotiations has been rather slow.

The agriculture and land-use sector has played a key role in the past for both, developing and developed countries with large agriculture and forestry sectors in their mitigation (and adaptation) policies. It will continue to be important in the future, also with regard to effectively limiting total global emissions to meet the 2 degree target. For many developing countries and countries with emerging economies with low emissions from industry, the agriculture and land-use sector bears a significant and often cost-effective potential for greenhouse gas (GHG) mitigation. However, issues of land tenure, conflicting land use options, governance and administrative frameworks in the forest sector and limited technical monitoring capacities often need to be tackled to implement this potential.

There is a history of processes under the UNFCCC that advanced the discussions on the treatment of this sector in mitigation targets and have triggered the development of detailed methodologies and rules for monitoring and accounting towards mitigation targets:

- the development of IPCC guidelines for GHG inventories including the land-use sector that resulted in improved GHG inventory reports by countries under the UNFCCC;
- the development of specific accounting approaches for LULUCF activities under the Kyoto Protocol;
- the development of the REDD+ rules and modalities for result based payments;
- and the inclusion of afforestation and reforestation activities under the Clean Development Mechanism of the Kyoto Protocol.

These processes sometimes resulted in complex rules and provisions for the reporting and accounting of emissions and removals from agriculture, forestry and the land-use sector.

In the development of NDCs for the Paris Agreement, all Parties were facing challenges related to the decision how to include the land use sector in their mitigation target, because no decisions were available prior to COP 21 in Paris related to any methodologies that will be used under the agreement for the accounting of emissions and removals from this sector. Therefore, Parties had to take their own assumptions and decisions related to what will be the reference to show progress, the type of activities covered, definitions or monitoring methodologies used. Many Parties assumed that after the adoption of the Paris Agreement development of further rules and methodologies for this sector will happen. Yet this creates uncertainties about whether the approach chosen by countries at national level will continue to be in line with potential future international guidance under the Paris Agreement.

This document is directed at policy makers and experts involved in the preparation, analysis or implementation of NDCs on a national or international level, in particular also experts in developing countries. It describes the specific challenges of the land-use sector related to the estimation of emissions and removals and the accounting towards mitigation targets. To achieve this objective, the document provides an overview of existing methodologies and accounting modalities for the land-use sector available under the UNFCCC and describes the options that Parties could take and have taken in the development of their NDCs in this sector. Due to the limited experiences in the accounting of the land-use sector emissions and removals in developing countries, the analysis draws mostly from existing accounting rules only applicable to developed countries, but also takes into account the guidance available for REDD+ and the guidance on the reporting of GHG inventories, biennial reports, biennial update reports and national communications under the UNFCCC.

Chapter 2 starts an overview of the role of agriculture, forestry and land use in the NDCs under the Paris Agreement. Chapter 3 explains the general options so far developed under the UNFCCC and its Kyoto Protocol for accounting elements related to the land-use sector. Chapter 4 describes the steps and considerations that build the accounting approach of NDCs in the land-use sector while chapter 5 is dedicated to specific accounting issues in the land-use sector.

This document refers generally to the land-use sector when describing possible approaches for including the sector in NDCs. The terms LULUCF and AFOLU are used when referring to the existing definitions under the UNFCCC. The terms monitoring/ measuring are used related to methodologies used for the determination and estimation of emissions and removals from the land-use sector. Reporting addresses the presentation of the estimates of emissions and removals from the land-use sector and the progress with mitigation commitments to a national audience as well as in reports agreed under the UNFCCC, in particular in GHG inventories and specific reports defined to present

1. INTRODUCTION

progress with mitigation objectives in a comparable way under the UNFCCC. The term accounting is used in relation to the way how the emissions and removals from the land-use sector are included in the mitigation targets, thus with regard to the decision how exactly the emissions and removals count towards a national mitigation target and how the progress towards the target is tracked. Accounting summarizes the steps needed in the process for quantification of NDCs when demonstrating progress towards mitigation commitments. This addresses for example choices related to the reference against which the emissions/ removals in a target period are accounted, which sources/ sinks or activities are included in the target, how these are defined or at which point in time emissions/ removals are accounted towards the target and whether they are summarized and averaged over a certain period or whether only emissions and removals in single years count. Accounting builds upon a measurement/ monitoring and reporting framework; together, they constitute the essential elements for the implementation of the NDCs. Accountability is the acknowledgement of responsibility for the implementation of the nationally determined contributions (NDCs) in accordance with agreed guidance and the methodological and accounting choices made.

The land-use sector also plays an important role for adaptation to climate change and is therefore also included in the adaptation components of many NDCs submitted by Parties. While the authors recognize this important function of the sector and potential co-benefits between mitigation and adaptation in the land-use sector, this paper does not analyse the role of the land-use sector in the adaptation component of the NDCs because adaptation actions are strongly driven by country-specific needs and national circumstances. Therefore, guidance related to general approaches or methods to specifically implement the contribution of the land-sector as part of adaptation commitments is considered as very difficult to develop and would require considerable additional analysis.

Where this specific characteristic is relevant, this paper focuses on the LULUCF sector and not on the agriculture sector as defined in GHG inventories¹: The activities and land areas that can be carbon sinks are a specific feature of the LULUCF sector in the UNFCCC inventory reporting where the concept of a wider AFOLU sector as presented in the 2006 IPCC Guidelines has so far not yet been implemented in a mandatory way. Thus, all sequestration activities are currently allocated to the LULUCF sector in GHG inventories.

¹ The AFOLU sector has been introduced by the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, but this merged sector has not been implemented in the revised UNFCCC inventory reporting guidelines which adopted the 2006 IPCC Guidelines, because Parties preferred to continue with a separate reporting of the agriculture and LULUCF sector. Previous IPCC guidelines (the Revised 1996 Guidelines and the Good Practice Guidance for Land Use, Land-Use Change and Forestry) provide methodological guidance on the LUCF or LULUCF sector and are currently being used by non-Annex I Parties to the UNFCCC for the preparation of their inventories.

2. ACCOUNTING OF EMISSIONS AND REMOVALS FROM THE LAND-USE SECTOR

2.1 WHY IS THE LAND-USE SECTOR DIFFERENT FROM OTHER SECTORS?

A key difference of the land-use sector in terms of accounting is the fact, that the sector is not only an emission source, but **can also sequester CO₂ (i.e., store carbon in the above- and belowground biomass, dead organic matter as well as soils)**. This feature makes the sector distinct, both in terms of its relevance for mitigation policies as well as in terms of monitoring, reporting and accounting of emissions and removals from sources and sinks. Mathematically, a removal corresponds to a negative emission. Carbon pools always generate both types of fluxes, positive and negative, either when they are at equilibrium (and such fluxes average out) or when a net emission/removal determines a net C stock increase or a net C stock decrease.

The sinks in the sector however do not remove CO₂ permanently from the atmosphere. Carbon stored in biomass, litter, or soil can be released relatively quickly. Thus, both a single emission and a single removal at a particular point in time cannot be considered permanent a priori i.e. without knowing whether it contributes to a decrease or an increase in the long-term average C stock of the C pool.

Legacy effects which are C stock changes resulting from anthropogenic disturbances in the past represent an ‘inherited’ anthropogenically induced change are also considered as a particular characteristic of the land use sector.

A more general particularity of the sector is the **data uncertainty** and the large variability for C stocks and C stock changes when certain carbon pools such as soils are measured. Small changes in large C stocks (e.g. in soils) are difficult to measure and the dynamic nature of complex biological processes involved makes it difficult to capture exact transfers of C between different pools. Average uncertainty ranges reported by the EC-15 countries² that are associated with estimates of the level of emissions and removals from LULUCF are relatively high (32 per cent) e.g., compared to emissions from fossil fuel combustion (1 per cent) (Iversen P. et al. 2014).

Many developing countries have gaps in the reported emissions and removals in the land-use sector in their GHG inventories, e.g. within this group few countries have estimated the emissions and removals from soil and dead organic matter pools so far. Many developing countries have not yet estimated emissions and removals from cropland management or grassland management, but only reported such emissions and removals for forest management. But also developed countries still have gaps in reported pools (e.g. dead organic matter and soils) or certain land-use types

² 15 EU countries that joined the European Union before 2004.

2. ACCOUNTING OF EMISSIONS AND REMOVALS FROM THE LAND-USE SECTOR

(e.g. wetlands, settlements or grassland areas). Such countries with gaps in the land-use sector in the GHG inventory face high uncertainties as they have no information on trends of GHG emissions and removals for other land use categories apart from forest management as a basis for the development of their NDCs.

The changes in C stocks are the result of direct human actions (such as harvest) but also of biologically controlled processes. Such natural changes of the C stocks which may be outside the control of humans (e.g. storms, wildfires) taking place in parallel to anthropogenic changes are also a particular characteristic of the land use sector. The Convention only covers **anthropogenic** emissions by sources and removals by sinks. This distinction of anthropogenic emissions and removals can have considerable impacts on the land-use emissions accounted by a Party. The 2006 IPCC Guidelines use the “land managed proxy”, this means all emissions and removals on managed lands are considered as anthropogenic due to the encountered difficulties to find a better methods to separate anthropogenic emissions from non-anthropogenic emissions. However, in managed lands emissions resulting from natural disturbances such as from wild fires and storm damage can play an important role in the land-use sector emissions’ in particular years and counteract human activities to increase carbon sinks. Different methodological approaches have been developed on how the effects of natural disturbances can be taken into account or how anthropogenic can be distinguished from natural emissions and removals. These approaches are discussed in → [chapter 5.2](#).



3. ACCOUNTING OF THE LAND-USE SECTOR AS PART OF AN NDC

3.1 STEP 1: DEFINITION OF THE TARGET TYPE FOR THE LAND-USE SECTOR

There are different ways how the land-use sector can be part of an NDC. This choice will depend to a large extent on the general choice of the type of mitigation target of the NDC (e.g. an absolute emission limit or absolute reduction compared to a base year, an emission reduction compared to a BAU (Business-as usual) projection, intensity targets). The analysis presented in this chapter is therefore differentiated in accordance with specific target types. For the first NDC most Parties have taken this decision already, but for 42 countries this information is not available.

3.1.1 INTEGRATION IN AN ECONOMY-WIDE MITIGATION TARGET

In this approach, the land-use sector is integrated in an economy-wide target that covers all emissions and removals as reported in national GHG inventories and based on the scope of source categories in the GHG inventories. The land-use sector is accounted against the same baseline or reference level as the emissions from other sectors.

For example, when a country has chosen a target of an emission reduction against a Business-as-Usual (BAU) projection, the land-use sector emissions and removals can be integrated into the BAU projection with their relevant assumption and driving forces. Or when a country has chosen a target of an emission reduction against a base year, the total net emissions and removals including the land-use sector are compared to this base year.

This approach is simple and straightforward because it treats the reference for the land-use sector in the same way as all other sectors. Nevertheless, it is possible that the country choosing such approach elects some additional specific accounting rules for the LULUCF sector (e.g. related to harvested wood products).

3.1.2 SEPARATE LAND-USE TARGET NEXT TO AN NDC COVERING THE REMAINING SECTORS OF THE ECONOMY

This approach defines an economy-wide target for all sectors of the economy (as included in the GHG inventory) except for the land-use sector for which a different target type is formulated (there may even be separate sub-sectoral targets in the land-use sector).

3. ACCOUNTING OF THE LAND-USE SECTOR AS PART OF AN NDC

The choice of such approach can have different reasons: In some countries - in particular countries with large forests areas – net emissions and removals from the LULUCF sector often show strong variations across the time series.

→ **Figure 3-1** and → **Figure 3-2** show two examples, one from Finland and another from Canada. In Finland, the LULUCF sector is a net sink across the period 1990-2012, however in some years such as 2009, the net sink is much larger (-39 Mt CO₂e) than in neighbouring years (-29 Mt CO₂e in 2008 or -24 Mt CO₂e in 2010). In Canada (→ **Figure 3-2**) the LULUCF sector even shifts between contributing as a net sink or a net source in individual years which leads to considerable fluctuations in the total net emissions including LULUCF while the emissions from other sectors don't show such strong year-to-year changes. This variability will potentially increase by future impacts of climate change.

Such strong year-to-year fluctuations of net emissions and removals from the LULUCF sector imply high uncertainties when integrating the LULUCF sector in an overall economy-wide target as this is measured at one end-point year such as 2030. If this end-point year shows as a high net sink, the country might have no problems with achieving its target; *vice versa*, if the end-point year would be a year with a net source, the target would become very ambitious or even unachievable depending on the importance of LULUCF-related emissions in the overall emissions profile. In a nutshell, strong year-to-year fluctuations and a large impact of the LULUCF emissions on overall emissions may be a reason for defining a separate target for the land-use sector or at least a separate reference level for the land sector.

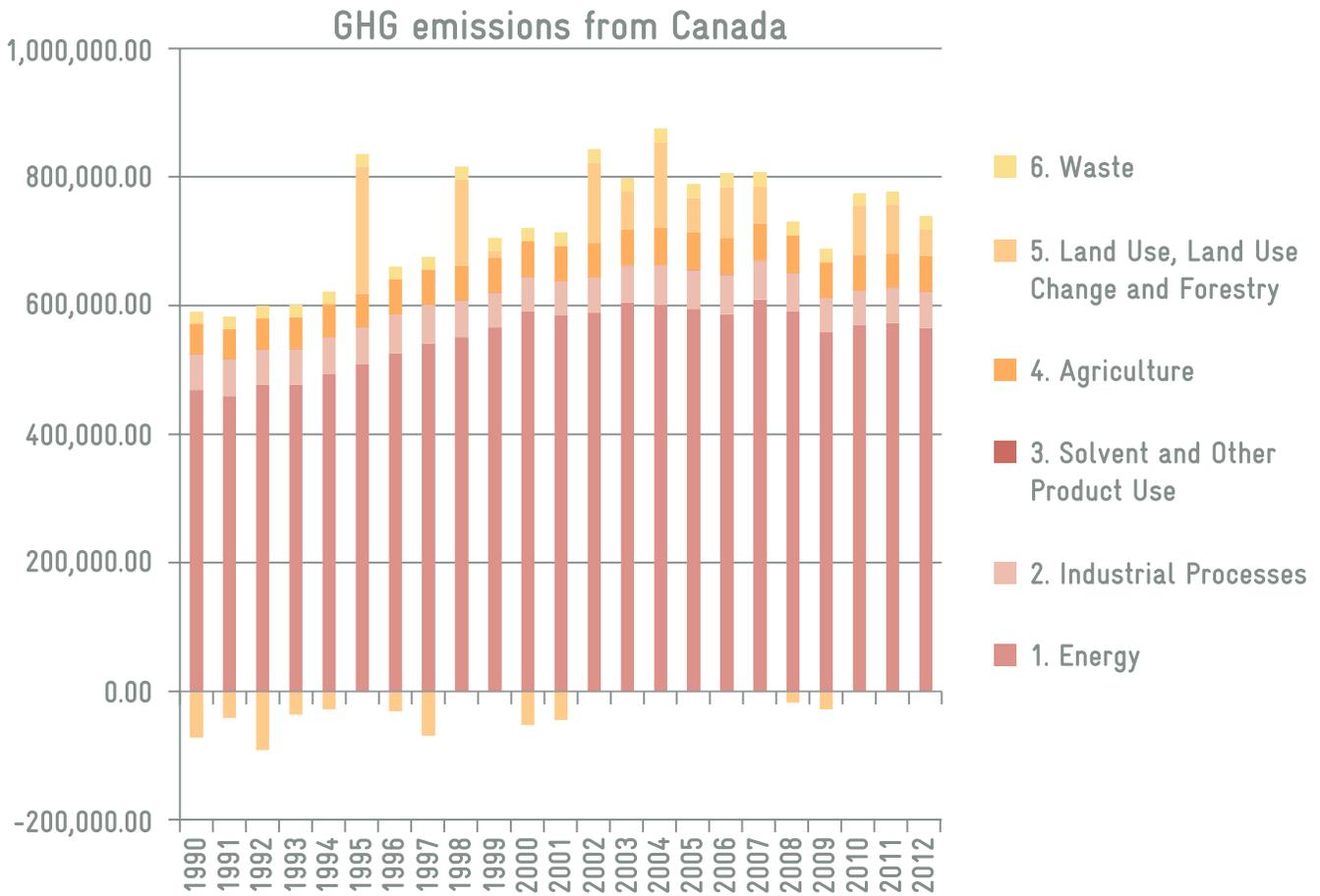
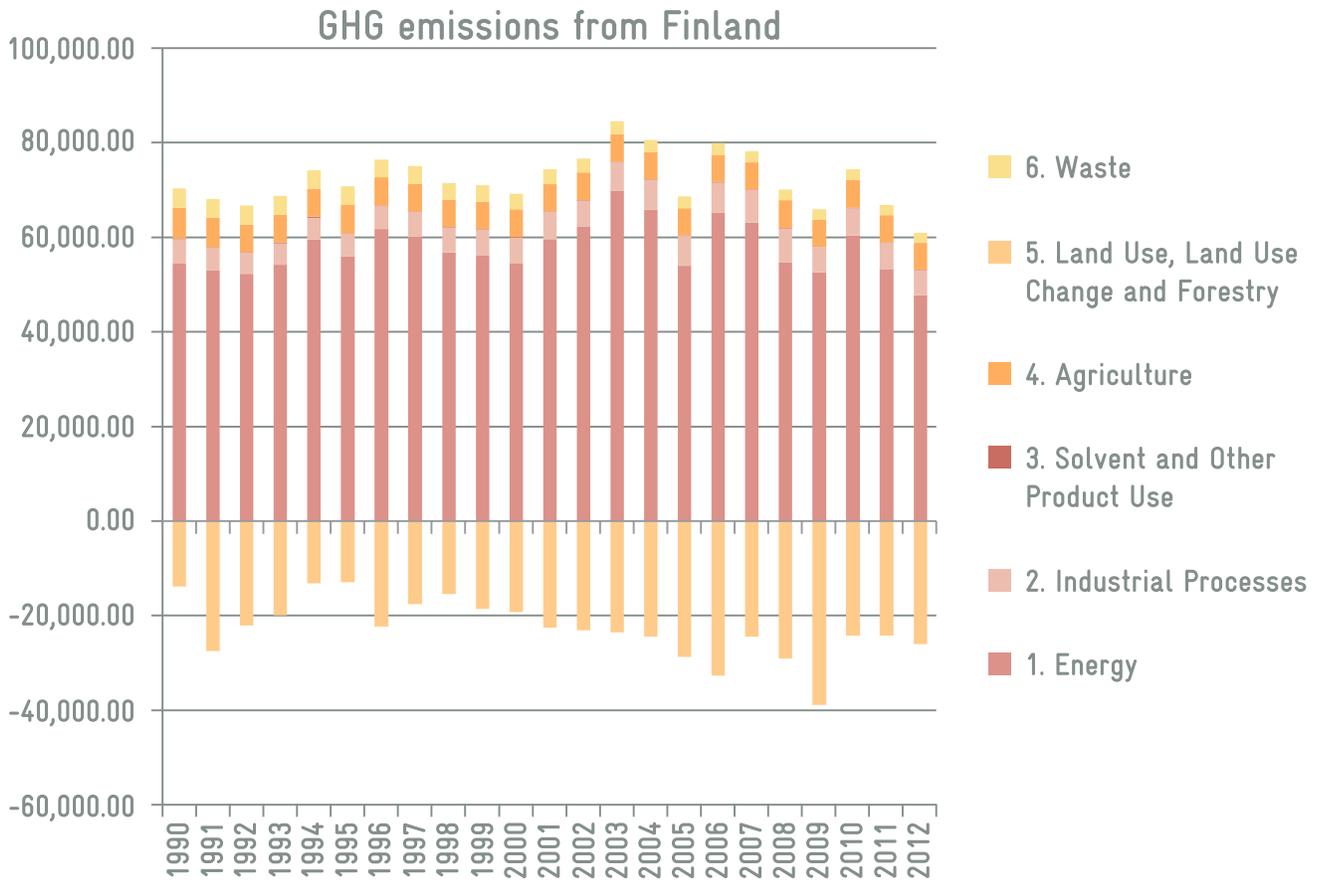
Another reason for choosing a different target type for the land-use sector can be the lack of an emission time series including the land-use sector. Such lack of understanding of the historic trend makes it very difficult to include the sector in a BAU projection.

▶ **Figure 3-1: Time series of GHG emissions from Finland** ▶

Source: GHG inventories submitted by Finland by 2014 to the UNFCCC

▶ **Figure 3-2: Time series of GHG emissions from Canada** ▶

Source: GHG inventories submitted by Canada by 2014 to the UNFCCC



3. ACCOUNTING OF THE LAND-USE SECTOR AS PART OF AN NDC

A third reason could be that the target type chosen for the other sectors of the economy does not fit very well to the land-use sector, e.g. when a country chooses an intensity target in terms of GHG emissions per GDP or per capita. GDP or population may not have a close link to the emissions from the land-use sector in countries that have large forest areas and intend to protect these forest areas, thus the inclusion in the intensity targets would establish a relationship that is useful for other sectors, but in specific national circumstances it may be less relevant for the land-use sector.

If the land-use sector is separated out and a different target type is chosen, such target types can take many different forms depending of the reasons that led to the separation:

It is also possible that the separate treatment of the land-use sector is only reflected by a different choice of reference level compared to the other sectors. This is an approach frequently chosen under the Paris Agreement.

If the countries face high **uncertainties related to the quantitative contribution** of the land-use sector to the total emissions in the target year, a minimum contribution of net removals from the land-use sector in the target year could be defined next to the economy-wide target for the remaining sectors. For example Bosnia Herzegovina put forward an obligation to keep net removals at a level of 6.470 kt CO₂e (level of 2015).

Another option would be the average net removals over an accounting period of several years and account for the average contribution of net removals and not for a specific contribution in a single target year. The target would then be to achieve an annual average net removal of X kt CO₂e in a defined period. Peaks in specific years would average out in such calculation.

A third option would be to define a range which net removals from the land-use sector are expected to reach instead of a single number. The range would reflect the higher uncertainty implied in this sector. The target in this case would be specified as a contribution of X to Y kt CO₂e as net removal in a target year.

3.1.3 SEPARATE LAND-USE TARGET IN NON-GHG METRICS

In a situation of missing data related to historic emissions and removals from the land-use sector, another option is a separate quantitative target, which is formulated in non-GHG metrics, e.g. the reduction of deforestation to a quantified level (or even to zero as indicated by some countries), a quantified level for afforestation and reforestation, a quantified level of forest cover, a quantified volume of carbon stocks in forests or a quantified increase of protected forest stocks. This list is only indicative that shows that many different types of quantified non-GHG targets are possible in the land-use sector.

Such non-GHG targets are still measurable and verifiable, but it is easier to gather the necessary data of the current status and past trends as well as factors driving changes that allows the determination of a future target. It may also be easier for developing countries to monitor progress and the implementation of such non-GHG targets during the implementation of the commitments. These targets may also be easier to communicate and be better understood in their implications at the national level. However, such non-GHG metrics should be carefully chosen and defined, e.g. a quantified level of forest cover should include a definition of the forests covered and how the forest cover is determined. Monitoring will be easier when definitions are based on already existing statistics and data collections.

3.1.4 ACTION OR POLICY-BASED TARGET FOR THE LAND-USE SECTOR

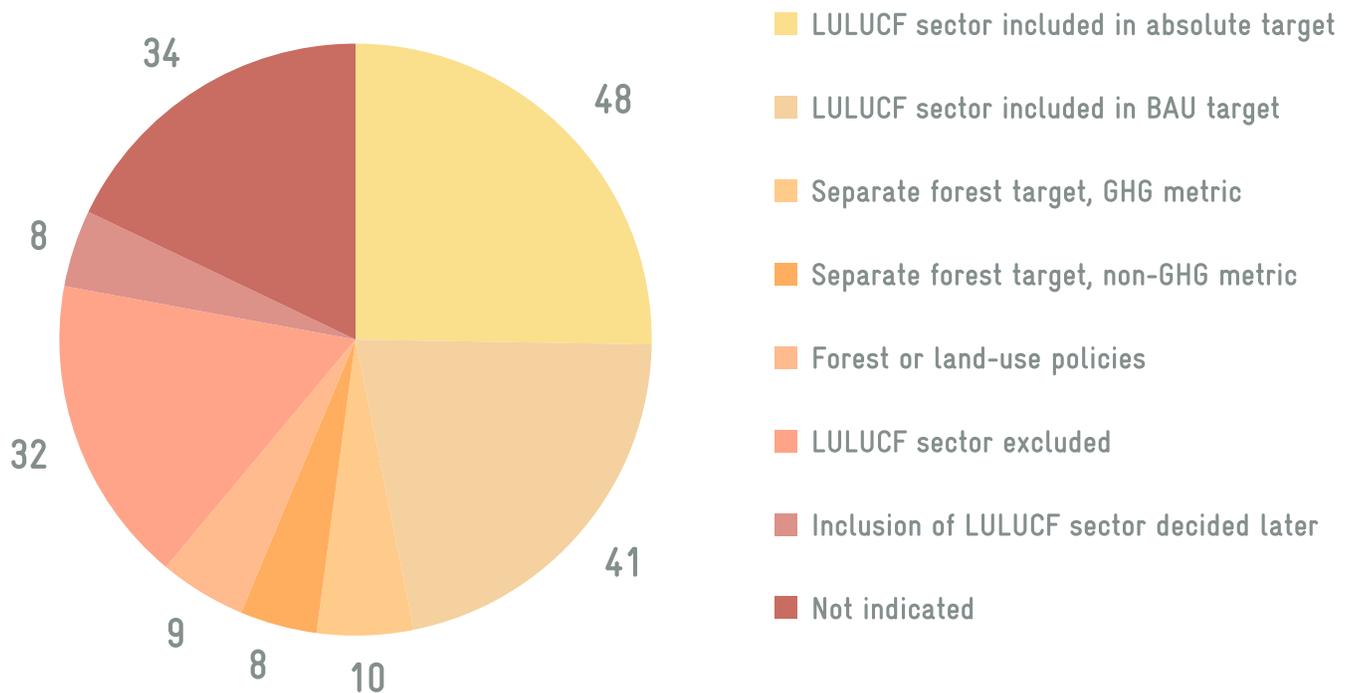
A general option for mitigation NDCs in particular for developing countries is also the determination of specific mitigation actions and policies without a quantified target for the sector. This is generally an option for countries that lack capacities or data that allows the determination of an economy-wide target. Such an action-based approach is also possible in the land-use sector. Taking into account that there is also the need to monitor the implementation of and progress with NDCs, it is recommended that such mitigation actions or policies are identified together with non-GHG indicators that allow the tracking of progress with the actions. These non-GHG indicators should be appropriate to monitor the progress with the implementation and could be similar to the parameters indicated in the previous section related to non-GHG metrics.

3.1.5 ACCOUNTING APPROACHES IN SUBMITTED NDCS

By May 2017, 190 countries submitted first NDCs under the Paris Agreement and by date of this report 174 countries ratified the Paris Agreement which entered into force on 4 November 2016. → **Figure 3-3** presents the decisions of countries whether and how the LULUCF sector is included in the first NDCs. 61% of the countries included the LULUCF sector in their NDC. Out of these countries

- 25% (48 countries) included the LULUCF sector in an absolute mitigation target relative to a base year;
- 22 % (41 countries) in a mitigation target compared to an economy-wide BAU scenario and
- 16% (17 countries) established separate LULUCF targets. Out of these countries with separate LULUCF targets
 - 10 countries chose a target in terms of net removals from the sector which they intend to achieve in the target period (e.g. Benin, Bosnia and Herzegovina, Chile, Georgia, India, Kiribati, Madagascar, Sao Tomé and Príncipe).
 - 8 countries indicated a target which was not expressed in terms of impacts on GHG emissions, but quantified in other ways, e.g. an increase in forest area to a certain share of the total land area (e.g. Belarus, Bhutan, Georgia, Vietnam) or a defined area for afforestation/ reforestation (Chile, Honduras, Senegal) or a quantified increase of forest stock volume (China).
 - 9 countries want to implement mitigation policies in the forest or land-use sector.

► **Figure 3-3: Inclusion of the LULUCF sector in first NDCs submitted under the Paris Agreement**



Source: Based on the analysis of 163 NDC submissions under the UNFCCC, analysis by Öko-Institut (EU counted as EU plus 28 Member States)

17% of the NDCs (32 countries) excluded the LULUCF sector and eight countries informed that they will take a decision on the inclusion of the LULUCF sector at a later stage. For 18% of the NDCs (34 countries), it is unclear whether the LULUCF sector is part of the mitigation target. Some countries indicated that the accounting approaches for the LULUCF sector in their NDC have not yet been determined. This is mostly because the countries expect future accounting rules for the land-use sector under the Paris Agreement and these countries would like to determine the accounting approach in line with such future guidance.

In the following sections, more specific quantitative analysis of the first NDCs are included at the end of each section to provide a link between the submitted NDCs and the issues discussed in this paper.

3.1.6 RECOMMENDATIONS

From the four options presented related to the general accounting approach for the land-use sector:

- The option of the inclusion in a **general economy-wide mitigation target** is simple and straightforward and should be considered in particular when countries opt for an economy-wide NDC for example in form of an absolute emission reduction target or a target compared to a BAU projection. Such decision includes the choice of a reference level for the land-use sector which is further discussed in → [section 3.4](#).

- A **separate land-use target** is recommended, for example when the higher uncertainties related to the future emissions and removals from the land-use sector can be better accommodated through a separate land-use sector target which does not add the higher uncertainties to the achievement of the overall economy-wide target.
- A **mitigation target for the land-use sector in non-GHG metrics** is an option, in particular when countries lack data related to historic emissions and removals from the land-use sector. In such situation other quantifiable metrics should be chosen that are measurable and verifiable, but for which the monitoring of progress is easier. Such non-GHG metrics should be carefully chosen and defined e.g., drawing on existing statistics and data collection processes.
- A land-use target in the form of **mitigation actions and policies** can be a valuable option for developing countries as well, especially when there is a lack of capacities or data that allows the determination of reliable emissions and removals from the entire sector. Taking into account that there is the need to monitor the implementation of and progress with NDCs, it is recommended that such mitigation actions or policies are identified together with non-GHG indicators that allow the tracking of progress. These non-GHG indicators should be appropriate to monitor the progress with the implementation and could be similar to the parameters indicated in the previous section related to non-GHG metrics. The specific choices of the policy-based targets and non-GHG metrics should be made based on the monitoring capacities developed in the country in relation to the land-use sector as well as based on an analysis of the significant sources and sinks and the important mitigation areas.

3.2 STEP 2: DEFINITION OF THE COVERAGE OF THE LAND-USE SECTOR / ACTIVITIES

One important initial decision for the definition of an NDC is on the coverage of the land-use sector which implies decisions such as the forest definition used, covered source/ sink categories, activities, carbon pools and gases.

In the monitoring and reporting guidance provided by the IPCC, a distinction was made between activity-based accounting and land-based accounting (see → [section 3.2.2](#)). These approaches define the land area categories to be estimated and reported in GHG inventories in different ways. Therefore the determination of the coverage of the land-use sector usually implies a decision whether an activity-based or land-based approach is used.

The determination of the coverage of the land-use sector is important for most of the target types presented in → [section 3.1](#). Even policy-based targets in the forest sector should clearly define what types of forests and forestry activities they address, but such targets may not need to determine the coverage related to C pools or gases.

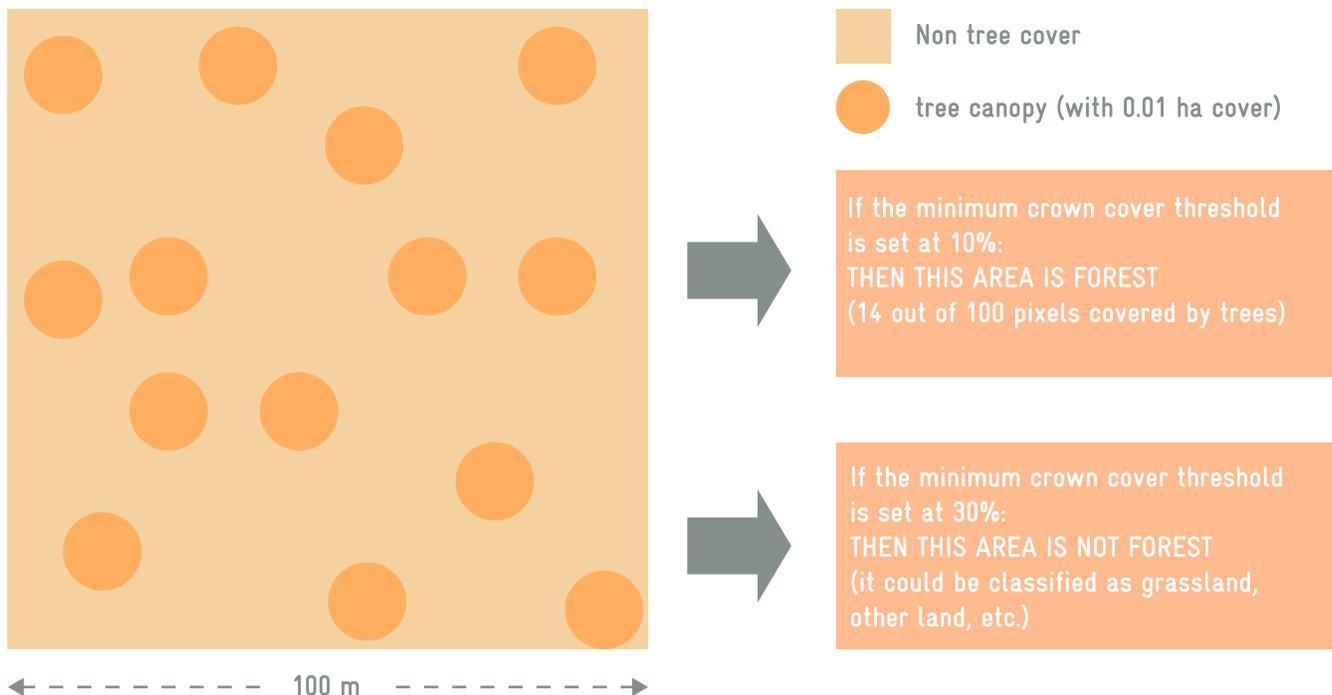
3.2.1 CHOICE OF FOREST DEFINITION

An important part of the definition of the source/sink categories in relation to forests is the selection of the forest definition. Usually countries already selected forest definitions for other purposes (e.g. forest management) than for the establishment of mitigation targets and the monitoring of emissions and removals from the land-use sector.

3. ACCOUNTING OF THE LAND-USE SECTOR AS PART OF AN NDC

Forest definitions in the IPCC guidance include the elements of minimum crown cover (>10%), minimum tree height (>5 m) and minimum area (0.5 ha). In particular the selection of the minimum crown cover as part of the forest definition can have a strong impact to which source/sink categories land areas are attributed in the reporting under the UNFCCC as shown in the example in → **Figure 3-4** from (UN-REDD Programme 2015b).

► **Figure 3-4: Implications of the choice of forest crown cover on the categorization of areas in the land-use reporting**



Source: UN-REDD Programme 2015b

The selection of minimum area will have impacts on which areas are considered as land-use changes. Small minimum areas are more accurate, but also the efforts required for the monitoring of changes and emissions in small areas are considerably higher.

For the selection of the forest definition the following aspects should be considered:

- The type of data that is available from national forest monitoring systems related to the proposed thresholds;
- Maintenance of consistency with the definitions chosen in the reporting as part of the national GHG inventories and other international and national processes;
- Maintenance of consistency with definitions used at national level, e.g. for national forests statistics;
- When data from international sources (e.g. FAO) are used, it is important to maintain consistency with the definitions used in these international datasets.

The choice of definition is a specific feature relevant for forests, but not for other land-uses such as cropland or grasslands/ grazing land for which the activities or land categories are defined as part of the IPCC guidelines and/or UNFCCC guidelines.

3.2.2 ACTIVITY-BASED VERSUS LAND-BASED ACCOUNTING

There is a distinction between activity-based and land-based accounting under the UNFCCC which arises originally from the IPCC Special Report on LULUCF for the purposes of the Kyoto Protocol (IPCC, 2000). According to the IPCC, a **'land-based' approach** to accounting would take as a starting point the total carbon stock changes in all carbon pools on all land areas. An **'activity-based' approach** estimates the impact of carbon stock changes of determined activities and only considers the land areas attributable to these activities. Thus, the distinction is how the land to be accounted is identified.

In the current reporting under the UNFCCC, the inventory reporting under the Convention implements a land-based accounting approach as it aims at a representation of all anthropogenic emissions and removals on all land areas in a country.

Under the Kyoto Protocol and for REDD+ activities, activity-based approaches have been implemented under which specific land-use activities have been predefined and can be selected by Parties. Both cases are explained in more detail in the sections below.

The more activities, pools and gases are included under an activity-based accounting, the closer emissions and removals get to land-based accounting.

Due to the fact that the activity-based approach is using different definitions for land-use categories than the land-based accounting, it is not straightforward to switch between a land-based and an activity-based approach. National monitoring systems have to be set up in a way that they provide data in accordance with the approach chosen and it will require additional monitoring efforts to change the approach.

For example, the land-based reporting approach under the Convention allows that Parties report on net changes in carbon stocks from forests lands remaining forest lands which can be implemented via the monitoring of forest areas and forest inventories that provide information on the net changes of the biomass which includes both increases and decreases.

An example would be the switch from reporting on carbon stock changes on grasslands remaining grasslands under the Convention and the activity 'grazing land management'. Grazing land management is only a subset of grasslands because grazing does not occur on all grasslands in a country. If a country in its policies specifically addresses grazing activities and the impacts on soil carbon it will make a lot of sense to address the effects of such policies by an activity 'grazing land management' which would not require the monitoring of all grasslands in the country that are not addressed by the key policies.

3.2.2.1 REPORTING OF THE LAND-USE SECTOR UNDER THE CONVENTION (LAND-BASED ACCOUNTING)

A simple and straightforward approach to define the coverage of the land-use sector in an NDC is the use of the land-use categories included in the most recent GHG inventories as a basis for such decision.

GHG inventories for the LULUCF sector under the UNFCCC cover six main land categories (forest land, cropland, grassland, wetlands, settlements and other land), which are further categorized by the subcategories of:

3. ACCOUNTING OF THE LAND-USE SECTOR AS PART OF AN NDC

- a) land that remains in the same land category or
- b) land that is converted into another land category.

For each land category, the reporting covers all anthropogenic emissions and removals for the following pools:

- in living biomass,
- in dead wood and litter,
- in mineral or organic soils as well as
- harvested wood products (HWP.)

In addition, CH₄ and N₂O emissions related to certain categories such as biomass burning are also included in the GHG inventories.

The 2006 IPCC Guidelines have defined an AFOLU sector that merged the previous sectors agriculture and LULUCF into one. However, in the reporting guidelines for GHG inventories under the Convention for Annex I Parties, this merging has not been adopted and the separation into agriculture and LULUCF sector has been kept.

This has been done with the purpose to:

- keep consistency with the presentation of sectors in previous years and with the accounting under the Kyoto Protocol;
- allow for a separate aggregation of emissions from agriculture and LULUCF as these sectors have different target groups, stakeholders and policies and it should be possible to track the effects of such policies separately;
- allow policy makers a continued knowledge of the sink function of the LULUCF sector (otherwise balanced out with agricultural emissions) (see e.g. Böttcher und Graichen 2015).

In the revised reporting guidelines that implemented the 2006 IPCC Guidelines in the reporting under the UNFCCC, new guidance to report emissions and removals from harvested wood products have been introduced. However, not all countries report all of these carbon stock changes for all land categories. In the LULUCF sector, selective reporting has been applied in the past under the Convention due to different monitoring capabilities and available data as well as different relevance of emissions and removals for land categories and pools. In addition, simple Tier 1 methods assume that certain pools such as dead wood are in equilibrium and that no changes occur and net emissions or removals are assumed to be zero. For the year 2012, 11 out of 44 Annex I Parties reported 'not estimated' or 'not occurring' for carbon stock changes in dead wood pools and mineral soil pools on forest land. This situation of incomplete reporting will likely continue in the future under the Paris Agreement.

For developing countries it is frequently unclear which LULUCF land categories and which pools within these land categories are included in national GHG inventories due to the lack of reporting of sectoral and background data tables and inventory reports that provide such level of detail. Many developing countries currently only report living biomass carbon stock changes, but no carbon stock changes in the dead wood or soil pools.

As it is often difficult to provide estimates for all source/sink categories and pools that are provided in the 2006 IPCC Guidelines for GHG inventories, countries should focus first on the significant source/ sink categories as part of the definition of NDCs. Significant categories are defined through the concept of key categories as part of the IPCC Guidelines and depend on the contribution to the total level of emissions/ removals and the effect on the trend in total

emissions. Additional guidance related to the significance of sub-categories and pools is provided as part of decision trees in the IPCC Good Practice Guidance and 2006 IPCC Guidelines.

There may be a difference between the most significant source/sink categories and those categories that offer considerable mitigation potentials in a country. For the choice of source/sink categories as part of an NDC, an additional consideration should be the mitigation potential as either emission reduction or increased C stocks related to a specific source category. Also adaptation co-benefits from land-use activities could trigger the inclusion in the NDC. This could lead to a decision that countries may add certain source/sink categories to their NDC and their inventories which they have not estimated in the past.

To avoid unambiguous determination of the mitigation target in the NDCs and enhance the transparency, it would be important that countries specify which exact land categories (forest land, cropland, grassland, wetlands, settlements, other land), which subcategories (land remaining in land category or land converted to other land categories) and which pools (living biomass, dead wood, mineral or organic soils) they will include when estimating the emissions and removals in the NDC.

3.2.2.2 REDD+ ACTIVITIES (ACTIVITY-BASED ACCOUNTING)

For developing countries, another option for the coverage of the land-use sector as part of the NDCs is the use of the REDD+ (Reducing emissions from deforestation and degradation) activities defined in UNFCCC decision 1/CP.16 adopted in Cancún. The REDD+ activities included in this decision are:

- Reducing emissions from deforestation;
- Reducing emissions from forest degradation;
- Conservation of forest carbon stocks;
- Sustainable management of forests;
- Enhancement of forest carbon stocks.

This presents an activity-based approach, because the estimates of GHG emissions and removals from these REDD+ activities measure the impact of determined activities on carbon stock changes and associated emissions and removals. The inclusion of REDD+ activities in the NDC seems particularly relevant for those developing countries that already started to engage in the REDD+ activities prior to 2020 and that invested in specific monitoring and reporting activities related to REDD+ activities. This work and the results could then also be used for the determination of the land-use target as part of the NDC and avoid separate and potential parallel activities.

Decision 4/CP.15 requested Parties to use the most recent IPCC guidance and guidelines as adopted by the COP as a basis for estimating anthropogenic forest-related GHG emissions by sources and removals by sinks, forest carbon stocks and forest area changes. However, while IPCC guidelines provide general guidance on all carbon stock changes occurring on all land areas, they do not provide specific guidance for the REDD+ activities. Therefore, other organizations have developed additional methodological guidance related to REDD+ activities, e.g. UN-REDD Programme (2015b), GOFC-GOLD (2013) or GFOI (2016)³. FAO developed voluntary guidelines on national forest monitoring in a consultative process (FAO 2017) and Ramirez-Zea and Morales-Hidalgo (2017) analysed the effects of the voluntary guidance related to REDD+. Under '<https://www.reddcompass.org/mgd-material>' a considerable amount of supportive

³ Global Forest Observations Initiative

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guidance documents and integrated ‘methods and guidance document’ (MGD) modules have been elaborated and made available for REDD+ experts (GFOI 2016). A specific element of REDD+ activities is also that these activities can be implemented at sub-national level encompassing only some regions and not the entire territory of a country.

COP 19 (Warsaw, Poland) adopted seven decisions of the Warsaw Framework for REDD+. The Warsaw Framework for REDD+ builds upon earlier decisions adopted by the COP and completes the rules and modalities for REDD+. These decisions provide guidance related to forest reference levels, technical assessments for REDD+ as well as related to the modalities for measuring, reporting and verifying of forest-related emissions by sources and removals by sinks, forest carbon stocks, and forest carbon-stock changes as well as forest-area changes resulting from the implementation of the REDD+ activities to access results base payments.

When countries already invested considerable resources and work in the planning and implementation of REDD+ activities, it seems a straightforward decision to continue with such activities after 2020 and include them in their NDC. The following general options exist for the continuation of REDD+ activities after 2020:

- 1. Inclusion of all REDD+ activities in the NDC:** Countries could continue or expand REDD+ activities after 2020 as part of their mitigation NDC. As REDD+ activities are sometimes limited to selected REDD+ activities (e.g. only deforestation) and sometimes in geographic extension, such approach may result in a partial coverage of the LULUCF sector depending on the choices made under the REDD+ programmes. This part of the NDC would be a ‘conditional’ NDC because REDD+ activities are linked to support provided by developed countries for result-based activities.
- 2. Inclusion of REDD+ activities combined with targets based on inventory LULUCF categories in the NDC:** For example, a country may have started to develop REDD+ activities only for the REDD+ activity ‘reducing emissions from deforestation’, but would like to include the land-use sector with a broader coverage in the NDC. If the country would like to extend the coverage to other forest-related activities, it does not seem useful to adopt a mixed approach and combine REDD+ activities with inventory-based forest categories, because overlaps and double counting are likely to occur. In such a situation, it would be easier to include additional REDD+ activities in the NDC that cover additional forest related activities. However, if a country would like to have a broader NDC coverage that includes other land use types such as croplands and grasslands, REDD+ activities could be combined with cropland and grassland inventory categories (provided that the countries do not chose the inventory categories that capture the emissions from forest conversions to croplands or grasslands which would result in double counting). A careful assessment of the scope of both REDD+ activities and inventory categories would still be needed to avoid double counting or gaps in the coverage of emissions and removals.
- 3. Geographical separation of REDD+ and other LULUCF contributions in the NDC:** If the REDD+ activities are limited to a specific region only (which occurs in some countries (see MADS und IDEAM (2014) where Colombia submitted a forest reference emission level for the Amazon region), countries may decide to include these regional REDD+ activities in their NDC and land-use categories based on the inventories for other regions. However, this would require monitoring and reporting arrangements that are based on the same regional scope and definitions.
- 4. REDD+ activities continue without recognition in the NDC:** Another option could be that a country that started with REDD+ activities, continues to implement the REDD+ activities, but chooses an accounting approach based on the inventory for their NDC and reflects the mitigation effects of the REDD+ activities as part of the Convention inventory reporting. Thus the accounting of the land-use sector as part of the NDC would cover a much larger land

area and a broader range of human impacts on carbon stock changes and land conversions than covered by the REDD+ activities. This option may need more resources for monitoring and reporting because the country would be expected to report based on REDD+ activities in those initiatives that provide finance for REDD+ and would be expected to report progress in inventory categories for the NDCs. However, the additional effort seems limited because countries are anyway required to report inventories every two years under the Convention. This approach could result in potential double counting of emission and removals as part of REDD+ result based activities and as part of the contribution to the NDC. As the Paris Agreement requires avoiding double counting, the country would need to develop and implement an accounting approach that avoids such double counting. E.g. the emissions and removals related to REDD+ activities could be separately tracked and reported as implemented and achieved with financial support received under REDD+ programmes. This would at least result in a transparent reporting of the mitigation results related to the REDD+ activities. Countries choosing such approach should also refrain from transferring such mitigation outcomes as part of cooperative approaches under Article 6 under the Paris Agreement to other countries outside of any agreements made as part of the REDD+ frameworks.

Mexico and Colombia have submitted forest reference levels under REDD+ and NDCs. Therefore, the linkages between REDD+ and NDCs are analysed in more detail for these two countries to provide some 'real world' examples in this context:

- Mexico:** Mexico has submitted a forest emission reference level related to REDD+ under the Convention which includes deforestation and emissions caused by fires. Mexico also submitted an NDC that includes the LULUCF sector as part of its economy-wide target. Mexico's NDC only includes gross emissions from LULUCF (these emissions include emissions from all types of land conversions and fires), but not removals and the NDC includes the target to reduce the gross emissions from LULUCF in 2030 from 36 MtCO₂e in 2013 to 18 MtCO₂e in 2030 (reduction of 14 MtCO₂e against a baseline of 32 MtCO₂e) (México 2015).⁴ This is consistent with the scope of Mexico's REDD+ activity as submitted to the UNFCCC which is also related for land conversion and forest fires. In addition Mexico included the target to reach a rate of 0% deforestation by the year 2030 as part of the adaptation component of its NDC (México 2015).
- Colombia:** Colombia has submitted a forest emission reference level related to REDD+ under the Convention which includes CO₂ emissions from deforestation in the Amazon biome. The NDC covers emissions and removals from the AFOLU sector in the GHG inventory (Gobierno de Colombia 2015) as part of its economy-wide target. The BAU scenario used as a reference for the mitigation target that includes emissions and removals from forest plantations, deforestation and permanent crops. Emissions and removals from natural forests that remain natural forests are excluded. The BAU projections related to deforestation were built upon the forest reference level projections submitted for REDD+ for the Amazon region but were extended to cover the entire country. Thus Colombia took care of a consistent approach for REDD+ activities and the NDC.

For countries that also host REDD+ activities, it is generally recommended to explain the relationship between their NDCs and the REDD+ activities (e.g. Colombia has provided specific information on how the REDD+ activities are related to their NDC) because this enhances the transparency and understanding of the NDC.

⁴ In the GHG inventory countries are required to report all emissions and removals from the AFOLU sector and the decision will result in a difference between the reported GHG emissions and removals in the GHG inventory under the Convention and the accounted LULUCF emissions and removals as part of the NDC.

3.2.2.3 LULUCF ACTIVITIES UNDER THE KYOTO PROTOCOL (ACTIVITY-BASED ACCOUNTING)

Under the Kyoto Protocol an activity-based accounting approach was chosen for developed countries where accounting for some activities (afforestation, reforestation and deforestation) and forest management (for the 2nd commitment period) is mandatory and other activities (Cropland Management, Grazing Land Management, Wetland Drainage and Rewetting) can be accounted on a voluntary basis. Under the Kyoto Protocol, voluntary activities have to be accounted continuously over the commitment period, if accounted once (a principle called “once in, always in”).

Due to the different definitions of KP LULUCF activities, the emissions and removals estimated related to these KP LULUCF activities can be different compared to the emissions and removals reported in similar categories in the Convention reporting. One example for this difference is ‘Grazing Land Management’. As KP LULUCF activity it includes “*lands used for production of herbaceous perennial vegetation (introduced or indigenous) for harvest by grazing, cutting, or both*” (IPCC, 2013). The reporting under the Convention, in contrast, relates to grasslands and includes all land areas covered by herbaceous perennial vegetation independent from the fact whether these grassland areas are used for grazing or food for animals.

Another examples is the Kyoto activity ‘Afforestation’ which is defined as the direct human-induced conversion of land that has not been forested for a period of **at least 50 years** to forested land through planting, seeding and/or the human-induced promotion of natural seed sources. The reporting under the Convention, defines that **20 years after afforestation or reforestation** an area of land transitions from “land converted to forest land” to “forest land remaining forest land” and would no longer be part of ‘land converted to forests’ while under KP this land continues to be reported as afforestation. This can have a big impact on the accounted net removals on the land area as ‘afforestation’ or as ‘forest management’, but no impact on the total amount of emissions and removals reported for those land areas if aggregated together.

Annex I Kyoto Parties will need to decide whether they will continue with the accounting of Kyoto LULUCF activities as part of their NDCs or whether they will base their accounting of the land-use sector on the GHG inventories. If they chose to continue with Kyoto LULUCF activities, it is essential that countries specify which exact Kyoto activities (afforestation, reforestation and deforestation, forest management, cropland management, grazing land management, wetland drainage and rewetting) are included in the proposed nationally determined contribution.

It may not be very likely that developing countries chose to start accounting on the basis of the Kyoto definitions of activities as part of their NDCs because this approach would require additional efforts and resources compared to an approach that uses the Convention GHG inventory as a basis or compared to using monitoring systems already established for REDD+ activities.

3.2.3 SYMMETRICAL CARBON ACCOUNTING – SELECTIVE ACCOUNTING

The term ‘Symmetrical carbon accounting’ has been used by IPCC (2000) in the past to describe an accounting system for an area of land for which both losses of and increases in carbon pools are reported and accounted. Carbon accounting should be symmetrical and asymmetric accounting should be avoided which can occur in different ways:

1. **Asymmetric activities:** If activities/ land areas that result in an increase in net removals are elected and activities/ land areas that result in an increase in net emissions are not elected, such an approach would result in an asymmetric accounting of LULUCF emissions and removals. From a point of view of environmental integrity the opposite direction is not problematic (also still asymmetric): if a country would voluntarily decide not to account for activities/ land areas that result in net removals it would de facto reduce more emissions than under a symmetrical approach where net removals and net sinks wouldn't be disregarded.
2. **Asymmetric carbon pools:** Another example of asymmetric accounting would be to exclude certain carbon pools or emission sources from the estimation and accounting (e.g. soils), but include the pools that are sinks (e.g. aboveground biomass).
3. **Asymmetric accounting over time:** Similar to the above issue, a lack of symmetry over time would also occur if a country would include an activity, area or pool in the sector accounting when it is a net sink and would stop to account for it when it turns into a net source.

Paragraph 31 of the decision of the Paris Agreement (decision 1/CP.21) addresses the issue of asymmetric accounting in terms of activities and time and requires that *“Parties strive to include all categories of anthropogenic emissions or removals in their nationally determined contributions and, once a source, sink or activity is included, continue to include it.”* This may be further reflected in more detailed accounting guidance which may also address symmetry in the reporting of carbon pools which will be elaborated according to the mandate in paragraph 31 and Article 4, paragraph 13 of the Paris Agreement. Paragraph 31 also includes the requirement that Parties shall provide an explanation of why any categories of anthropogenic emissions or removals are excluded which the aim to ensure symmetric accounting.

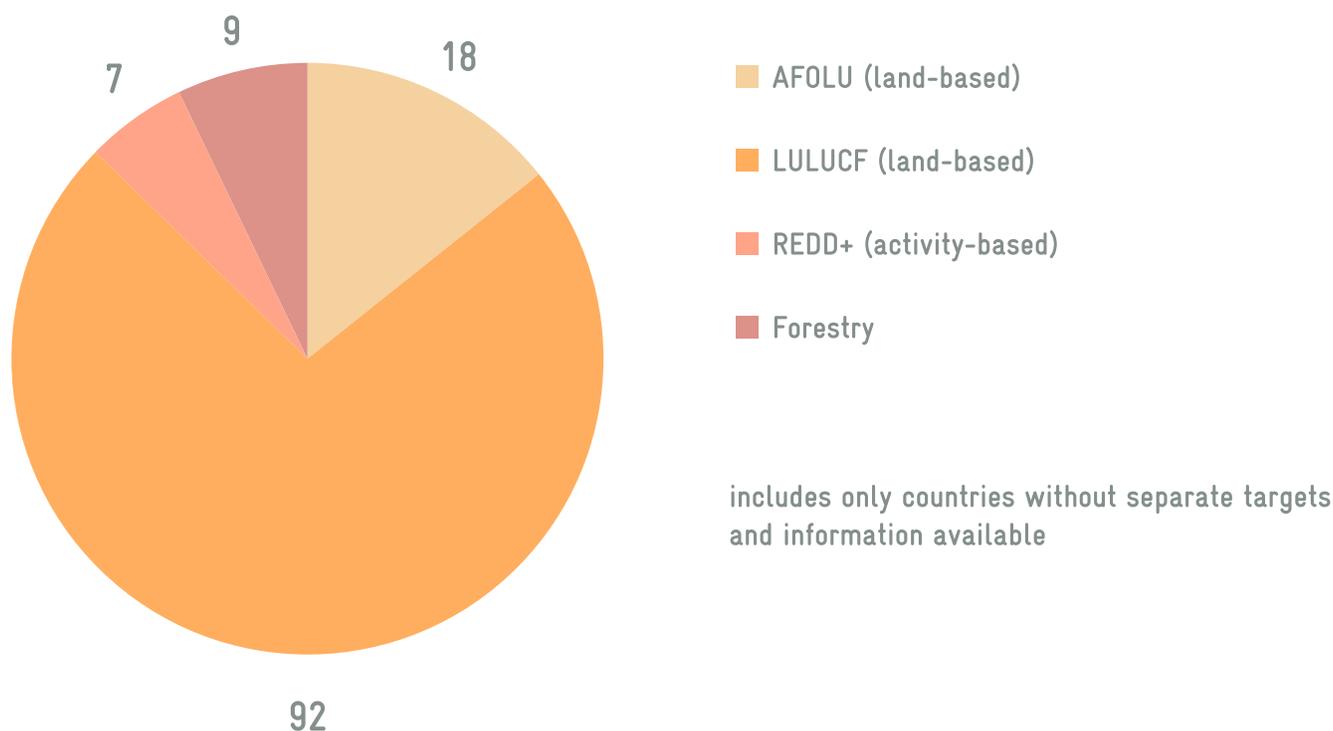
3.2.4 COVERAGE IN SUBMITTED NDCS

Many NDCs submitted do not explain which specific source and sink categories or activities have been included in the NDC.

92 countries refer to the land-use sector as LULUCF, 18 countries refer to AFOLU, nine refer to forestry only and seven countries made explicit reference to REDD+ activities. Those countries that refer to REDD+ in their NDCs, mostly do not specify very clearly which individual REDD+ activities they will include and whether the targets were defined on the basis of REDD+ activities (see → [Figure 3-5](#)).

When countries refer to the LULUCF sector as included in the scope of their commitment, this does not necessarily mean that they cover the same land use, land use change and forestry categories. Several countries indicate that the detailed coverage of land-use source categories will be the same as in their most recent inventories. Few countries provide a detailed list of source/ sink categories covered. Thus the detailed coverage will vary depending on the completeness of GHG inventories that were used as a basis for the determination of the NDC.

► **Figure 3-5: References to the land-use sector in NDCs**



Source: Based on the analysis of 163 NDC submissions under the UNFCCC, analysis by Öko-Institut (EU counted as EU plus 28 Member States)

Some NDC submissions with economy-wide targets mention country-specific categories that do not appear in the inventories (e.g. mangroves, coastal areas, natural resource management, water resources, rural settlements, forestry) for which it is unclear whether these countries intend to use own categories for the tracking of progress with the NDCs. For those countries with targets that refer to policies and actions in the land-use sector, the scope of the sector in terms of LULUCF or AFOLU is less relevant because their specific mitigation options define the scope of the land-use mitigation commitment.

Thus, related to the coverage of the land-use sector in the NDC submission, for many countries additional information will be necessary to clarify the coverage of scope of the sector included to enable the tracking of progress under the Paris Agreement.

3.2.5 RECOMMENDATIONS

In the selection of source/sink categories or activities Parties should be guided by the principle of symmetric accounting and ensure including all significant activities, pools or land-use categories. This could be achieved by applying the following provisions:

1. Account for all significant activities/ land uses and land use changes. For an activity-based accounting this can be defined using significant activities. For a land-based accounting approach, this could be defined by using the key category concept established under the Convention reporting that defined the most relevant source/ sink categories for each Party.
2. To avoid asymmetries due to carbon pool selection, it will be desirable to report and account for all pools at least for key categories and those pools that are significantly affected by the activities, management activities or land-use changes that occur. If this is not possible asymmetries should be minimized as far as possible.
3. To avoid asymmetric accounting over time, activities and land areas covered once in a commitment should continuously be accounted for ('once in, always in'). This accounting principle is already reflected in paragraph 31 (c) of the decision adopting the Paris Agreement.

In the selection of source/sink categories or activities Parties as part of their NDCs should be guided by the following questions:

- Are all activities, land-use categories or pools that contribute significantly to emissions and removals from the sector included?
- Which activities or categories have significant mitigation potential and are part of planned mitigation actions?
- Which activities or categories will be affected by planned adaptation actions or expected climate change impacts?
- Are there national objectives in the land-use sector in favour of the inclusion of activities or categories that are not significant contributors?
- Is the national monitoring system able to produce reliable data for the monitoring of emissions and removals from these activities or categories or can such system be developed before 2020?

A straightforward approach to define the coverage of the land-use sector in an NDC is the use of the land-use categories included in the most recent GHG inventories (land-based approach). This builds in the use of existing resources and supports the improvement of GHG inventories as part of the enhanced transparency framework under the Paris Agreement.

As it is often difficult to provide estimates for all source/ sink categories and pools that are provided in the IPCC guidelines, countries should focus first on the significant source/ sink categories as part of the definition of NDCs. Significant sources can be identified in the inventory or from planned mitigation actions and the planned adaptation actions affecting main categories. However, there may be a difference between the most significant source/sink categories and those categories that offer considerable mitigation potentials in a country. For the choice of source/sink categories as part of an NDC, an additional consideration should be the mitigation potential as either emission reduction or increased long-term C stock related to a specific source/ sink category. This could lead to a decision that countries may add certain source/sink categories to their NDC and their inventories which they have not estimated in the past.

For developing countries that already engaged substantially in REDD+ activities, another option for the coverage of the land-use sector as part of the NDCs is the use of the REDD+ activities (activity-based approach). When countries already invested considerable resources and work in the planning and implementation of REDD+ activities, it seems a straightforward decision to continue with such activities after 2020 and include them in the NDC because monitoring systems may already be under development. For countries that host REDD+ activities, it is generally recommended to explain the relationship between their NDCs and the REDD+ activities (e.g. whether accounting will be based

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on emissions / removals from REDD+ activities or whether REDD+ activities mainly are considered as measures to achieve the NDC, but mitigation impacts are accounted on the basis of GHG inventories), because this enhances the transparency and understanding of the NDC.

Under the Kyoto Protocol an activity-based accounting approach was chosen for developed countries where accounting for some activities is mandatory (afforestation, reforestation and deforestation and forest management for the 2nd commitment period) while other activities (Cropland Management, Grazing Land Management, Wetland Drainage and Rewetting) can be accounted for on a voluntary basis. For the post-2020 period, Kyoto Parties will need to decide whether they will continue with the accounting of Kyoto LULUCF activities as part of their NDCs or whether they will base their accounting of the land-use sector on the GHG inventories. In the first case, it is essential that countries specify which exact Kyoto LULUCF activities are included in the NDC. It is very unlikely that developing countries chose to start accounting on the basis of the Kyoto definitions of LULUCF activities because this approach would require significant additional efforts and resources compared to an approach that uses the Convention inventory as a basis.

It is important that the coverage of source and sink categories in the NDCs is clearly defined when the NDC is established and that the same coverage is maintained throughout the monitoring of progress and achievement for the entire period until 2030 (see the suggested principle: “once in, always in”). Inconsistent coverage over the time series, in particular leaving out of emission sources during the implementation that were considered in the reference level may compromise the assessment of progress and environmental integrity.

For an unambiguous determination of the mitigation target in the NDCs, it is also important that countries communicate which exact land categories (forest land, cropland, grassland, wetlands, settlements, other land), which subcategories (land remaining in land category or land converted to other land categories) and which pools (living biomass, dead wood, mineral or organic soils, HWP) are included in the NDC.

3.3 STEP 3: CHOICE OF METHODOLOGICAL GUIDANCE

3.3.1 METHODOLOGICAL GUIDANCE UNDER THE UNFCCC

Another important aspect of defining the land-use component of NDCs relates to the choice of methodological guidance on which the assumptions and estimation are based on. A number of documents related to the estimation of emissions and removals from the land-use sector were prepared in the past by the IPCC:

- **1996 IPCC Guidelines for national GHG inventories (IPCC 1996)**

1996 IPCC Guidelines provide methodologies for the estimation of emissions and removals from land-use change and forestry for four main categories which are changes in forest and other woody biomass stocks, forest and grassland conversion, abandonment of managed land and CO₂ emissions from soil.

- **2003 IPCC Good Practice Guidance for LULUCF (IPCC 2003)**

This guidance document includes a more complete coverage of source and sink categories on land, updated

and added default emissions and removal parameters and more complex and accurate methods. It also corrected errors and deficiencies that had been identified in the 1996 IPCC Guidelines. For the first time it introduced guidance on how to estimate land areas and changes in land areas and developed new categories that are based on six broad land categories (forest land, cropland, grassland, wetlands, settlements and other lands). It also includes additional methods for the estimation of non-CO₂ greenhouse gases from the LULUCF sector. Decision trees are consistently introduced to guide the choice of methodologies according to national circumstances.

- **2006 IPCC Guidelines for National GHG Inventories (IPCC 2006)**

2006 IPCC Guidelines integrate the guidance for emissions from agriculture and LULUCF in one volume. It incorporated additional methods such as for the estimation of harvested wood products. Default emission and stock change factors were updated and improved and more default values and parameters specific for developing countries were incorporated as well as activities that typically occur in developing countries. The estimation approach is more systematic and more consistent across all source categories.

- **2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol (KP Supplement) (IPCC 2013a)**

The 2013 Revised Supplement related to the Kyoto Protocol takes into account changes in the accounting provisions agreed for the second commitment period under the Kyoto Protocol and provides methodologies to enable the exclusion of emissions and removals from natural disturbances, a new method for Harvested Wood Products (production approach) and new methodologies for the Kyoto activities Wetland Drainage and Rewetting. For Forest Management it introduced accounting on the basis of forest management reference levels.

- **2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (Wetlands Supplement) (IPCC 2013b)**

This supplement filled some gaps in the 2006 IPCC Guidelines. It covers drainage and rewetting of inland organic soils, wetlands on mineral soils, coastal wetlands including mangrove forests, tidal marshes and seagrass meadows and constructed wetlands for wastewater treatment. It also updated emission factors and default parameters.

At the moment the IPCC Task Force on Inventories is developing a new Methodology Report to refine the 2006 IPCC Guidelines for National Greenhouse Gas Inventories in accordance with the decision taken at the 44th Session of IPCC in Bangkok, Thailand, in October 2016. The final draft of this new Methodology Report titled “2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories” (2019 Refinement) will be considered by the IPCC for adoption at its Plenary Session in May 2019.

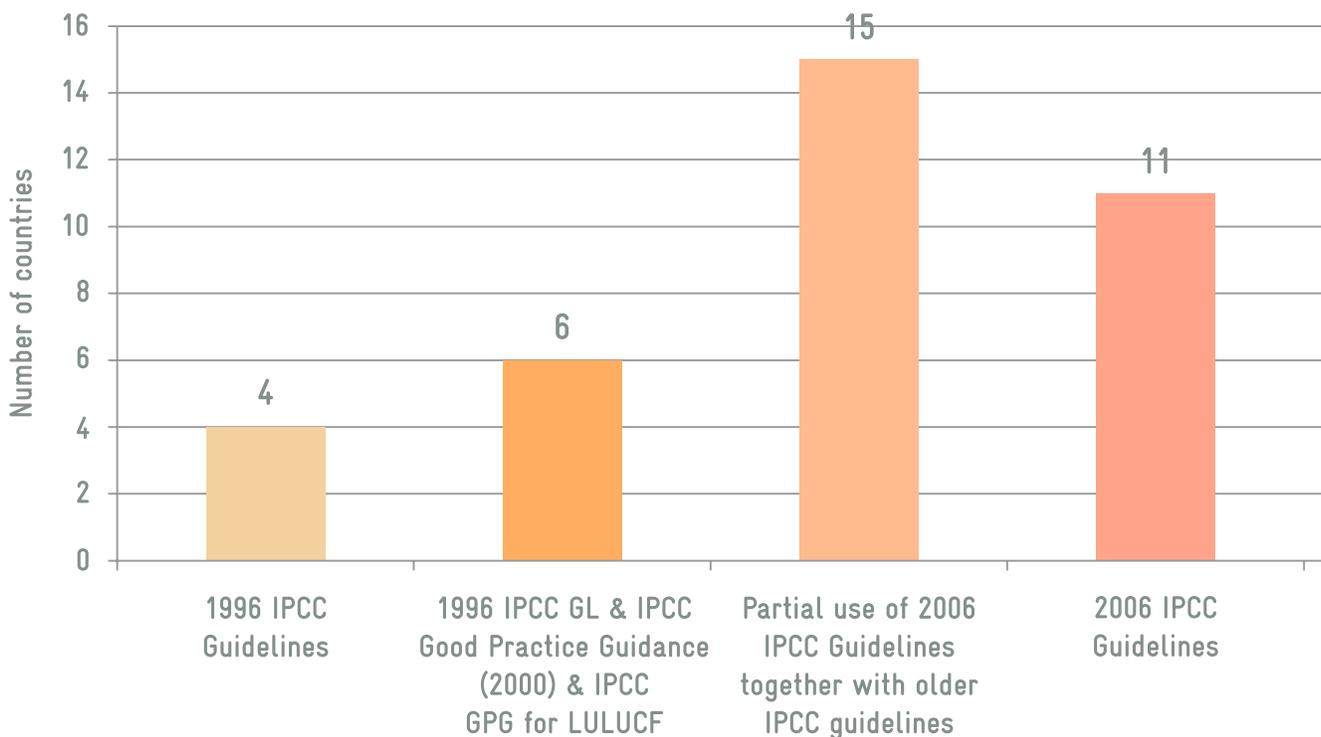
Developed countries started to use 2006 IPCC Guidelines and the 2013 Revised Supplementary Methods and Good Practice Guidance arising from the Kyoto Protocol for their reporting in 2015. UNFCCC reporting guidelines for national communications and biennial update reports recommend for developing countries to use 1996 IPCC Guidelines and 2003 IPCC Good Practice Guidance for LULUCF.

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The Paris Agreement requests that “Parties account for anthropogenic emissions and removals in accordance with methodologies and common metrics assessed by the IPCC and adopted by the CMA.”⁵ Also national inventory under the Paris Agreement reports shall be prepared “using good practice methodologies accepted by the IPCC and agreed upon by the CMA.”⁶ Such decision is expected to be adopted at COP 24 at the end of 2018. Thus, the exact IPCC methodological guidance will only be agreed in the future work under the Ad Hoc Working Group on the Paris mandate. In the absence of a CMA decision, countries can select among existing IPCC methodologies or even use their own methodologies. This could result in a complicated and intransparent situation during the assessment and implementation of NDCs. For the accounting of the first NDC any accounting guidance adopted by the CMA under Article 4, paragraph 13 will only apply on a voluntary basis, and will only be mandatory for the second and subsequent nationally determined contributions⁷. However, IPCC guidance adopted for GHG inventories will apply from the start of the reporting under the Paris Agreement.

Generally, the latest IPCC guidelines documents advanced the methodologies in the land-use sector and updated emission factors or other country-specific parameters, in particular for developing countries. This leads to more accurate estimates if default parameters are used. Therefore, many developing countries started to use 2006 IPCC Guidelines, even when this is not mandatory. Herold et al. (2017) analysed the use of 2006 IPCC Guidelines by developing countries in the reporting of Biennial Update Reports (BURs) (→ Figure 3-6). Out of 36 Parties that provided a biennial report, 11 Parties generally used 2006 IPCC Guidelines for the reporting of their GHG inventories and 15 Parties use 2006 IPCC Guidelines at least partly.

► **Figure 3-6:** Use of IPCC guidelines in BUR submissions of developing countries



Source : Compilation by Öko-Institut, based on first BUR submissions as submitted per May 2017.

⁵ Paragraph 31(a) of decision 1/CP.21

⁶ Paragraph 7(a) of Article 13 of the Paris Agreement

⁷ Paragraph 32 of decision 1/CP.21

If developing countries would like to address emissions and removals from mangrove forests, the most recent 2013 IPCC Supplement on Wetlands provides much better guidance related to this forest type. For the establishment and tracking of NDCs in the land-use sector, it is therefore useful to check which IPCC guidelines document addresses the country-specific situation in the best way. If for example wetlands, coastal areas and mangroves play an important role in a country, it will find the most detailed and most appropriate methods that allow a monitoring of mitigation actions in these areas only in the latest 2013 IPCC supplement.

The improvements between different sets of IPCC guidelines over time can lead to substantial changes in the estimated emissions and removals for a particular source category, e.g. when default emission factors are revised upwards or downwards. It is therefore very important that consistent methodologies are used for the determination of the baseline or reference level and during the implementation of a mitigation target. If methodologies would be changed after the reference level has been determined, this can result in either significant higher or lower efforts needed to achieve the mitigation target, if the reference level is not recalculated based on the same methodologies.

3.3.2 OTHER METHODOLOGICAL GUIDANCE

Apart from the IPCC guidelines, other global initiatives have developed methodological guidance for the land-use sector which covers some gaps in the IPCC guidelines (such as more detailed and practical guidance on the use of remote sensing imagery and analysis tools for remote sensing data). A number of such methodological guidance documents have been developed particularly for developing countries for the implementation of REDD+ activities.

One important additional methodological guidance document is the “*GOFC-GOLD Sourcebook of methods and procedures for monitoring and reporting anthropogenic GHG emissions and removals associated with deforestation, gains and losses of carbon stocks in forests remaining forests and forestation*” which is regularly updated (GOFC-GOLD 2013). The sourcebook presents the state of the art for data and approaches to be used for monitoring forest area changes at the national scale in tropical countries using remote sensing imagery. It presents guidance on the estimation of carbon emissions and removals from changes in forest areas, in particular on the linkage between the remote sensing imagery estimates of changes in areas, estimates of carbon stocks from field / in-situ data and the use of biophysical models of carbon emission and removals. Related to emissions from biomass burning, it provides information on existing systems for observing and mapping fires and burned areas.

The Global Forest Observation Initiative fosters the sustained availability of satellite data for national forest monitoring systems and supports countries in accessing satellite data. It is also published a guidance document: *Integrating remote-sensing and ground-based observations for estimation of emissions and removals of greenhouse gases in forests: Methods and Guidance from the Global Forest Observations Initiative* (GFOI 2016). This guidance document presents stepwise guidance how emissions from forest degradation can be estimated, describes the availability of satellite data, the pre-processing of satellite data to identify area changes, but it also contains practical guidance how data for the C stock changes and non-CO₂ emissions can be obtained.

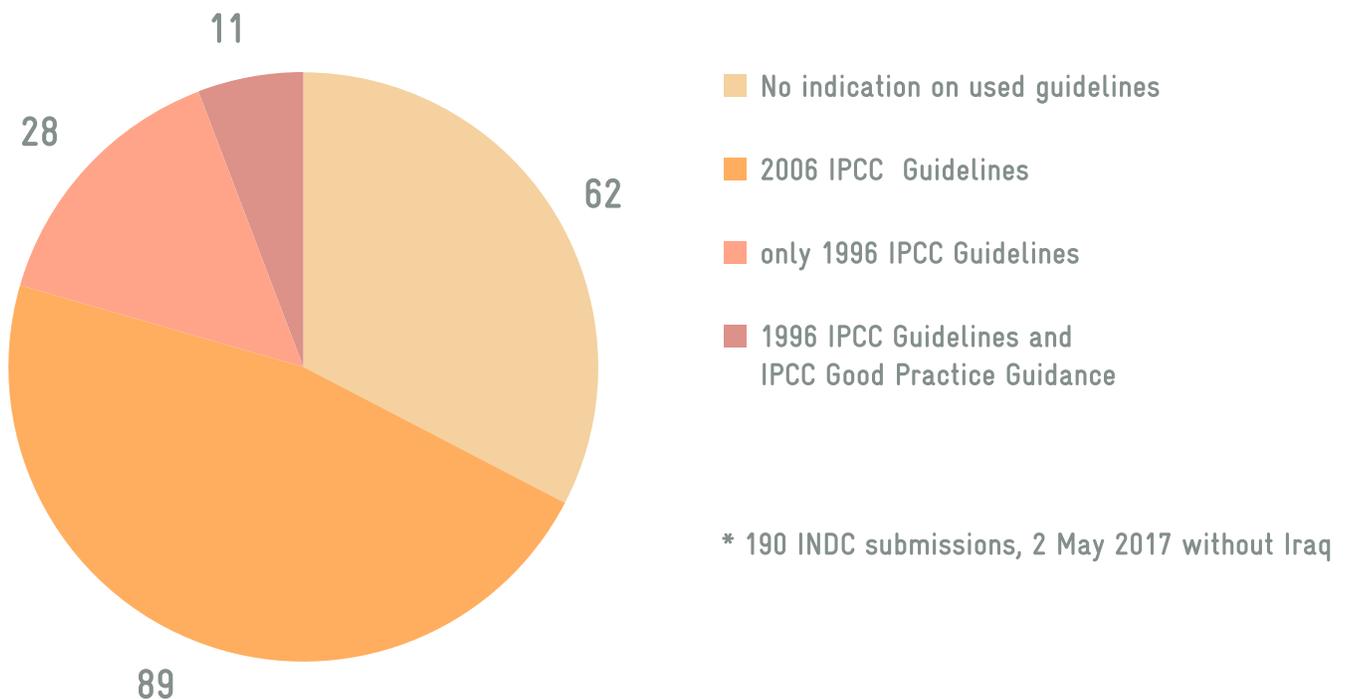
The “*Field Guide for Assessing and Monitoring Reduced Forest Degradation and Carbon Sequestration by Local Communities*” (Project Team KYOTO 2009) provides particular guidance for carbon assessment and forest monitoring by local communities.

FAO (2015) published a manual to address data requirements for the estimation of emissions in the agriculture sector and how FAOSTAT data can be used to provide data for the inventory estimation.

3.3.3 CHOICE OF IPCC METHODOLOGICAL GUIDANCE IN SUBMITTED NDCS

→ **Figure 3-7** presents the choices related to methodological guidance indicated in the NDC submissions. 32 % of Parties did not specify which IPCC inventory guidance document they will use for the reporting on the progress with their NDCs. 47 % of the countries indicated that they will use 2006 IPCC Guidelines for national GHG inventories. This group of 89 countries is almost equally composed of from developed country Parties (42 countries) and developing country Parties (47 countries). For developing countries it is currently not mandatory to use the 2006 IPCC Guidelines. Nevertheless, a significant number of developing countries intend to use the most recent IPCC 2006 Guidelines for the tracking of progress with their NDCs. 28 developing countries indicated that they want to stick to the outdated 1996 IPCC Guidelines for national GHG inventories which is in line with the current reporting guidance under the Convention for developing countries.

► **Figure 3-7:** Use of IPCC methodological guidance as indicated in NDCs



Source: Based on the analysis of 163 NDC submissions under the UNFCCC, analysis by Öko-Institut (EU counted as EU plus 28 Member States)

3.3.4 RECOMMENDATIONS

In the absence of specific IPCC methodological guidance agreed under the Paris Agreement, countries can use existing IPCC methodologies or even use their own methodologies. Generally, the latest IPCC guidelines documents advance the methodologies in the land-use sector and updated default emission factors or other country-specific parameters, in particular also for developing countries. This leads to more accurate estimates if default parameters are used.

It is recommended to check which IPCC guidelines document addresses the country-specific situation in the best way. If for example wetlands, coastal areas and mangroves play an important role in a country, the most detailed and most appropriate methods that allow a monitoring of mitigation actions in these areas are only contained in the latest 2013 IPCC supplement on wetlands.

The improvements between different sets of IPCC guidelines over time can lead to substantial changes in the estimated emissions and removals for a particular source category, e.g. when default emission factors are revised upwards or downwards. It is therefore very important that consistent methodologies are used for the determination of the baseline or reference level and during the implementation of a mitigation commitment.

3.4 STEP 4: DEFINITION OF REFERENCE LEVELS AND BASELINES FOR THE ACCOUNTING OF LAND USE AND FORESTS

Developed countries have mostly been accounting emissions in the existing economy-wide mitigation commitments against a base year (mostly 1990). This option of accounting compared to a base year was not very attractive for many countries for forest management or emissions from forest land because forests would not have resulted in an accountable net sink when net emissions/ removals would be compared to a specific historic base year, due to legacy effects of previous activities/ disturbances, even when no management practices occurred in the accounting period. Therefore, different references have been developed for the LULUCF sector under the Kyoto Protocol, and also for REDD+. The experiences made with the establishment of these reference levels are valuable and thus are presented in the following sections.

3.4.1 DEVELOPMENT OF FOREST REFERENCE LEVELS UNDER THE KYOTO PROTOCOL

Under the Kyoto Protocol different accounting methods in the LULUCF sector exist. In the following we describe their characteristics and development over time.

Net-net accounting is applied to several activities under KP LULUCF activities, such as cropland and grazing land management and to all other sectors except LULUCF. They are accounted using the reported net emissions/ removals (sum of emissions plus removals) during the accounting period compared to net emissions/ removals in a base year (e.g. 1990, see → [Figure 3-8](#)). A country with decreasing net emissions would generate credits under this approach; a country with a declining sink would have to accept debits (see example in → [Figure 3-8](#)).

Gross-net accounting considers only emissions and removals during a commitment period. No comparison with any historic or future reference is made and net emissions/ removals are compared to zero (see → [Figure 3-8](#)).⁸ Such approach is applied to deforestation and afforestation/reforestation under the Kyoto Protocol and was the accounting method for forest management in the first commitment period. A country with a declining sink would receive credits if

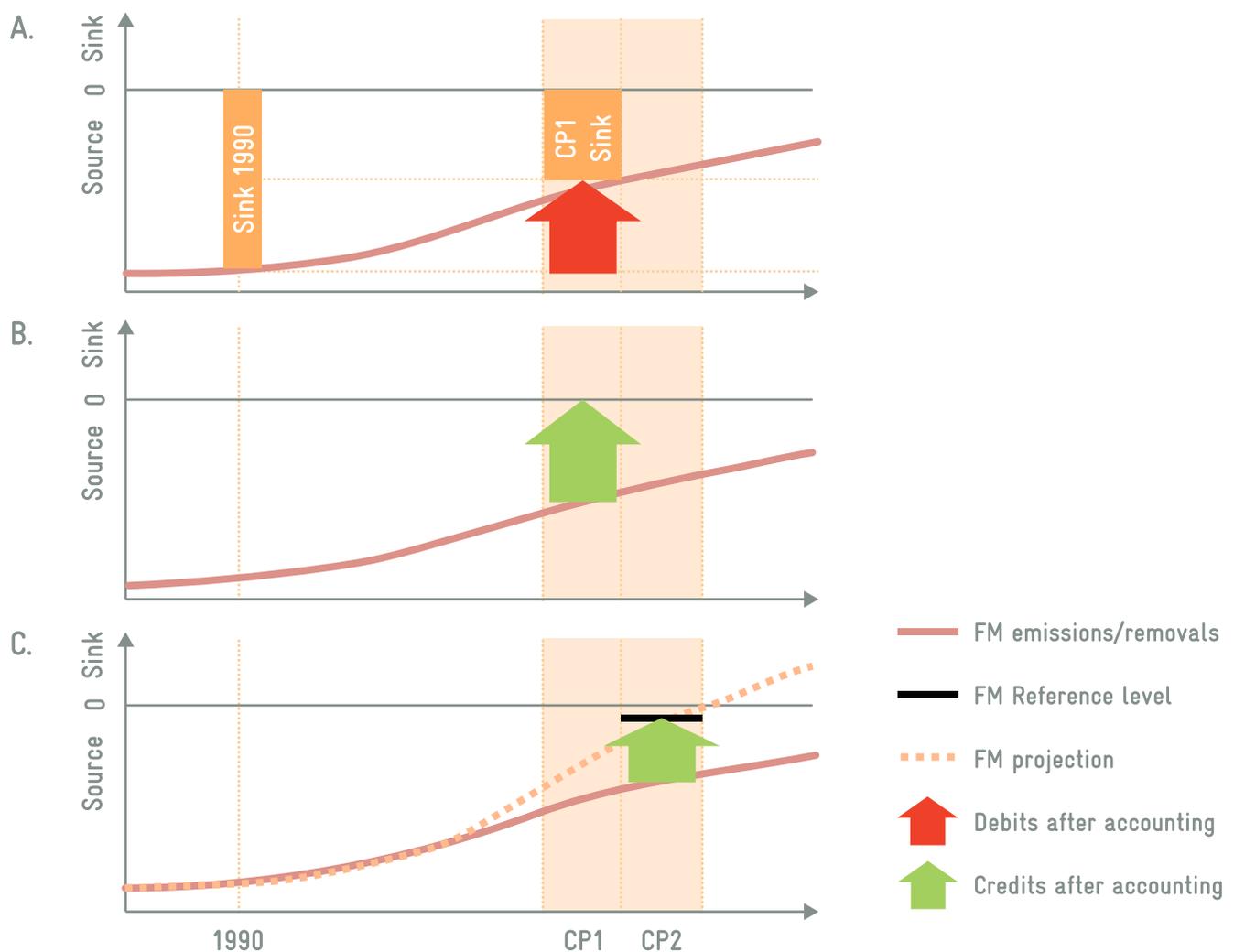
⁸ This can also be considered as a net-net approach with '0' as reference

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the sink still exists in the commitment period (see example in → [Figure 3-8](#)). Due to the fact that gross-net accounting of forest management leads for many countries to large removals, a cap was introduced under the Kyoto Protocol to limit excessive credits resulting from gross-net accounting.

A **reference level accounting approach** was introduced in the second commitment period for forest management under the Kyoto Protocol. It is applied by introducing a forest management reference level (FMRL), against which emissions and removals during the commitment period are compared. The FMRL is derived for most countries from forward looking scenarios (see FM projection in → [Figure 3-8](#)).

► **Figure 3-8:** Illustration of different accounting approaches under the Kyoto Protocol



Source: Böttcher und Graichen 2015

Notes: A. net-net accounting, B. gross-net accounting and C. reference level accounting

The FMRL should reflect expected emissions and removals from business-as-usual forest management. Factors that countries were supposed to consider in estimating reference levels include among others:

- historical removals or emissions from forest management (harvest rates and associated forest re-growth are the main driver of the forest carbon balance in the short term in developed countries);
- age-class structure (determines the medium to long-term carbon balance of forests);
- projected forest management activities and policies under business as usual conditions.

The challenge is to set a reference level that ensures environmental integrity in the construction of a forest reference level. FMRLs are based on projections of future forest management activities. Assumptions on future trends in projections can hardly be scientifically validated, in particular when assumptions related to policies are introduced. Therefore, transparency and consistency are paramount. Due to the high uncertainties related to future developments, forest reference levels are often projected based on the continuation of the historic or current trends of a certain period.

The proposed FMRLs by Annex I Parties under the Kyoto Protocol were subject to a technical assessment coordinated by the UNFCCC to ensure that the requirements on accuracy and transparency.⁹ Compared to gross-net accounting, the FMRL reduces the amount of credits or debits received to the difference of emissions and removals during a commitment period compared to a reference (net-net). Therefore, it sets more incentives to change current and future forest management to store more carbon or avoid emissions, regardless of the trend of forest being a declining or increasing net sink or source. The total amount of credits from forest management is expected to be considerably lower than with gross-net accounting.

For the second commitment period of the Kyoto Protocol, the 2013 IPCC Supplement (IPCC 2013a) categorized methods for forest management reference levels as follows:

- **Method 1:** Change against the same base year as for other sectors (net-net accounting as for other article 3.4 activities)
- **Method 2:** Reference levels based on projections under a ‘Business-as-usual’ scenario. This approach was further subdivided into
 - Model-based projections using country-specific methodology.
 - Model-based projections using a common methodological approach
 - Projections based on the elaboration of historical data from greenhouse gas inventories
 - Average of historical data
 - Extrapolation from a historical time series trend
- **Method 3:** Reference levels equal to zero (gross-net accounting).

This overview shows that the approach implemented for the 2nd commitment period of the Kyoto Protocol is not based on a consistent methodology across all countries, but on very different methodological approaches implemented.

⁹ Decision 2/CMP.6, appendix II, part II.

If countries will continue utilizing such diverse methods for the establishment of forest reference levels within the NDC as under the KP, the accountable net removals will not be comparable across countries and the same type of mitigation or sequestration activity with the same net effect to the atmosphere would result in significant different accountable net removals.

3.4.2 REFERENCE LEVELS FOR REDD+

In the context of REDD+, forest reference levels also serve as baselines against which achieved emission reductions are compared. In accordance with Decision 1/CP.16, paragraph 71 (UNFCCC, 2009), countries that aim to implement REDD+ activities are to develop:

- i) a national strategy or action plan;
- ii) a national forest reference emission level and/or forest reference level (FREL/FRL);
- iii) a robust and transparent National Forest Monitoring System (NFMS); and
- iv) a system for providing information on safeguards.

According to decision 12/CP.17, “*forest reference emission levels and/or forest reference levels expressed in tonnes of carbon dioxide equivalent per year are benchmarks for assessing each country’s performance*” in implementing the REDD+ activities. Reference levels are usually business-as-usual (BAU) projections against which actual emissions and removals are compared. BAU baselines are developed by taking into account historic data, and adjusting for national circumstances. Net Emission reductions/ removals are estimated as the difference between reference levels and actual emissions/ removals within an established period. The decision under the UNFCCC does not explain the difference between a forest reference emission levels (FREL) and/or forest reference levels (FRL). A common understanding according to UN-REDD Programme (2015b) is that “*a FREL only includes activities which reduce emissions. Thus the scope of a FREL would be for example reducing emissions from deforestation and/or forest degradation. A FRL includes both activities which reduce emissions and activities which increase removals. Thus the scope of a FRL could include the same activities as a FREL plus for example enhancement of forest carbon stocks.*”

UNFCCC decision 12/CP.17 and decision 4/CP.15 outline the modalities and guidance for forest reference emission levels and forest reference levels for REDD+ and the annex to this decision provides guidelines related to the information on reference levels. These modalities and guidelines comprise the following provisions:

- FREL/FRLs should be expressed in tonnes of carbon dioxide equivalent per year. Non-GHG metrics such as forest coverage or forest area loss are not accepted (decision 12/CP.17, paragraph 7).
- FREL/FRLs should maintain consistency with national GHG inventories (decision 12/CP.17, paragraph 8) and be based on IPCC guidelines for the estimation of GHG inventories.
- FREL/FRLs should take into account historical data (decision 4/CP.15, paragraph 7).
- FREL/FRLs should be established transparently, providing information and rationale of FREL/FRL development (decision 12/CP.17, paragraph 9). The information to be submitted is specified in the Annex to decision 12/CP.17.
- FREL/FRLs should recognize step-wise approaches, this means that FREL/FRLs should improve over time by incorporating better data, improved methodologies and, when appropriate, additional pools. It also suggests countries should update their FREL/FRLs periodically to take into account new data, changes in trends or any improvements in methodologies.

Decision 13/CP.19 decided that each submission on proposed forest reference emission levels and/or forest reference levels shall be subject to a technical assessment. The same decision and its annex also contain guidelines and procedures for the technical assessment of submissions from Parties on forest reference emission levels and/or forest reference levels. Each submission is technically assessed by an assessment team in accordance with the procedures and time frames established in these guidelines. The technical assessment process is conducted once a year and is coordinated by the secretariat. Thus, similar to the approach under the Kyoto Protocol, also for forest reference (emission) levels for REDD+ activities, there is a technical assessment under the UNFCCC.

Once its FREL/FRL has been technically assessed, a developing country seeking results-based payments from REDD+ activities is requested to submit a technical annex with information on the achieved results and the reference level to its Biennial Update Report (BUR) (Annex to decision 14/CP.19)

In relation to REDD+ activities, additional guidance has been developed for the establishment of forest reference emissions levels to support countries in the methodological and practical development of such reference levels as well as in the decision-making related to the choice of reference level. Examples for such guidance which has been submitted to the UNFCCC-REDD+ platform are:

- **GFOI (2016):** Integration of remote-sensing and ground-based observations for estimation of emissions and removals of greenhouse gases in forests: Methods and Guidance from the Global Forest Observations Initiative, Edition 2.0, Food and Agriculture Organization, Rome.
- **UN-REDD Programme (2015a):** Emission Levels and/or Forest Reference Levels for REDD+, FAO.
- **UN-REDD Programme 2015b:** Technical considerations for Forest Reference Emission Level and/or Forest Reference Level construction for REDD+ under the UNFCCC (collaboration between FAO, UNDP and UNEP)
- **Meridian Institute 2011b:** Modalities for REDD+ Reference Levels: Technical and Procedural Issues. Prepared for the Government of Norway, by Arild Angelsen, Doug Boucher, Sandra Brown, Valérie Merckx, Charlotte Streck, and Daniel Zarin.
- **Meridian Institute 2011a:** “Guidelines for REDD+ Reference Levels: Principles and Recommendations” Prepared for the Government of Norway, by Arild Angelsen, Doug Boucher, Sandra Brown, Valérie Merckx, Charlotte Streck, and Daniel Zarin
- **Griscom, B., et al. 2009:** Implications of REDD baseline methods for different country circumstances during an initial performance period.
- **Union of Concerned Scientists 2011:** Points of Reference Finding Common Ground among Reference Level Approaches to Move REDD+ Forward.

So far, 34 countries submitted proposals for forest reference levels (FRL) and/or national forest emission reference levels (NFREL) for technical assessment under the UNFCCC. → **Table 1** presents the scope of the forest reference level proposals submitted by some countries for which the forest reference levels were already assessed under the UNFCCC. Most proposals only address CO₂ emissions from deforestation, some are only for a subnational territory and most only address carbon stock changes in living biomass.

► **Table 1:** Overview of scope of forest reference levels / forest reference emissions levels presented to the UNFCCC by June 2015

COUNTRY	SCOPE OF REDD+ ACTIVITIES	REGIONAL SCOPE	SCOPE IN TERMS OF POOLS	APPLICABLE PERIOD
Brazil	CO ₂ emissions for 'reducing emissions from deforestation'	Subnational: Amazon biome (49.3% of national territory)	Above- and below-ground biomass (no dead wood, litter or soils)	Will be updated every 5 years
Colombia	CO ₂ emissions for 'reducing emissions from deforestation'	Subnational: Amazon biome (40% of Colombian land surface and 67% of total forest area)	Above- and below-ground biomass (no dead wood, litter or soils)	Result-based payments for the period 2013-2017
Ecuador	CO ₂ emissions for 'reducing emissions from deforestation'	National territory excluding Galapagos Islands, Punã Islands and other small islands	Above- and below-ground biomass, dead wood, litter	Not clearly indicated for which period the FRL will remain valid and when it will be updated
Guyana	CO ₂ emissions 'reducing emissions from deforestation' and 'forest degradation'	National territory	Deforestation: Above- and below-ground biomass, dead wood, litter, soil carbon, Degradation: Above- and below-ground biomass, dead wood, harvested wood products	Not clearly indicated for which period the FRL will remain valid and when it will be updated
Malaysia	CO ₂ emissions and removals from sustainable management of forests	National, covering Permanent Reserved Forest under the National Forestry Act only	Above- and below-ground biomass, litter (no dead wood and soils)	Result-based payments for the period 2011-2015
Mexico	CO ₂ emissions associated with gross deforestation and GHG emissions caused by fires on forest land (emissions from degradation are not included in this NFREL, but are estimated and presented)	National territory	Deforestation: Above- and below-ground biomass Wildfires: Above-ground biomass, dead wood, litter, fermentation	Result-based payments for the period 2011-2015

Sources: UNFCCC 2014a; Colombia 2015; UNFCCC 2014; The Government of Guyana 2014; Ministry of Natural Resources and Environment, Malaysia 2014

The UN-REDD Programme (2015b) assessed the choice of data selection and analysis for the construction of REDD+ reference levels. The type of data required differs depending on the type of FREL/FRL chosen. In general terms, these types involve the use of the historical average emissions, historical emission trend extrapolation, non-linear extrapolation, modelling approaches, or modelling including policies.

→ **Table 2** provides an overview of different ways how reference levels can be constructed from a methodological point of view (all approaches would be possible for REDD+ activities). This overview shows that there is not clearly the most straightforward approach available and that each approach has specific disadvantages which countries need to evaluate in their decision-making process.

Under the UNFCCC Parties did neither specify mandatory rules for the use of any of options for forest reference levels for REDD+ nor for NDCs. Therefore, countries need to evaluate the available options on the basis of their national circumstances, e.g.:

- Whether a historic period is likely to present a good prediction of the future or whether it is likely that the future trend will look different (e.g. due to the development of key driving forces);
- What type of data is available for the different options and what uncertainties are related to these data?
- Have policies been recently adopted that are likely to change past trends?
- If models are considered:
 - Is there enough data in the country to feed the model to produce reliable results?
 - Can assumptions be supported by research and available information?
 - Is there enough expertise in the country to develop and regularly update any models used?

► **Table 2: Methodological options for construction of a FREL/FRL and potential advantages and risks (adapted from UN-REDD Programme 2015b)**

CONSTRUCTION APPROACH	ADVANTAGES	RISKS
Historical average	Simple, transparent Represents a clear benchmark for progress in mitigation	May over- or underestimate future emissions or removals, depends strongly on the exact historic period chosen and can give quite different results for different historic periods. Requires the availability of longer time series of data
Linear extrapolation	Simple, transparent	May over- or underestimate future emissions or removals, e.g. deforestation rates are unlikely to remain constant over long time periods when the forest area is continuously decreasing
Non-linear extrapolation	Better for non-linear trends	Difficulty to predict how non-linearity will apply in the future. A non-linear extrapolation assuming a wrong function may over- or underestimate more strongly than a linear extrapolation.
Modelling approach	Can reflect the relationship to drivers	Less transparent, requires assumptions on the development of drivers, requires higher capacities for model development and implementation
Modelling approach that includes relevant policies	Can better reflect likely future changes driven by policies	There are high uncertainties related to the ex-ante prediction of emission changes due to policies, in particular the aggregated effects of several policies.

Source: adapted from UN-REDD Programme 2015b

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If models are used for predictive purposes, countries should also test the credibility of model outputs by assessing whether the models can reproduce current emissions and removals based on historic data and assumptions fed in the model.

The current forest reference emissions levels for REDD+ which were submitted under the UNFCCC only extent until 2020. This means that also those developing countries that already established forest reference emission levels for REDD+ activities needed to invest additional work to extent the projection until 2030 in order to use the FREL/FRL for their NDC.

When REDD+ activities have so far be implemented on a sub-national scale, it is necessary to scale up to the national level. This can be done by either developing subnational FREL/FRL for other regions and an aggregation of sub-national reference levels, or by the integration of the existing subnational FREL/FRL in a national reference level in which the sub-national FREL/FRL would not be recognizable at the end but was considered in the determination of data, assumptions and parameters. UN-REDD Programme (2015b) provides further guidance related to the scaling up of sub-national FREL/FRL reference levels.

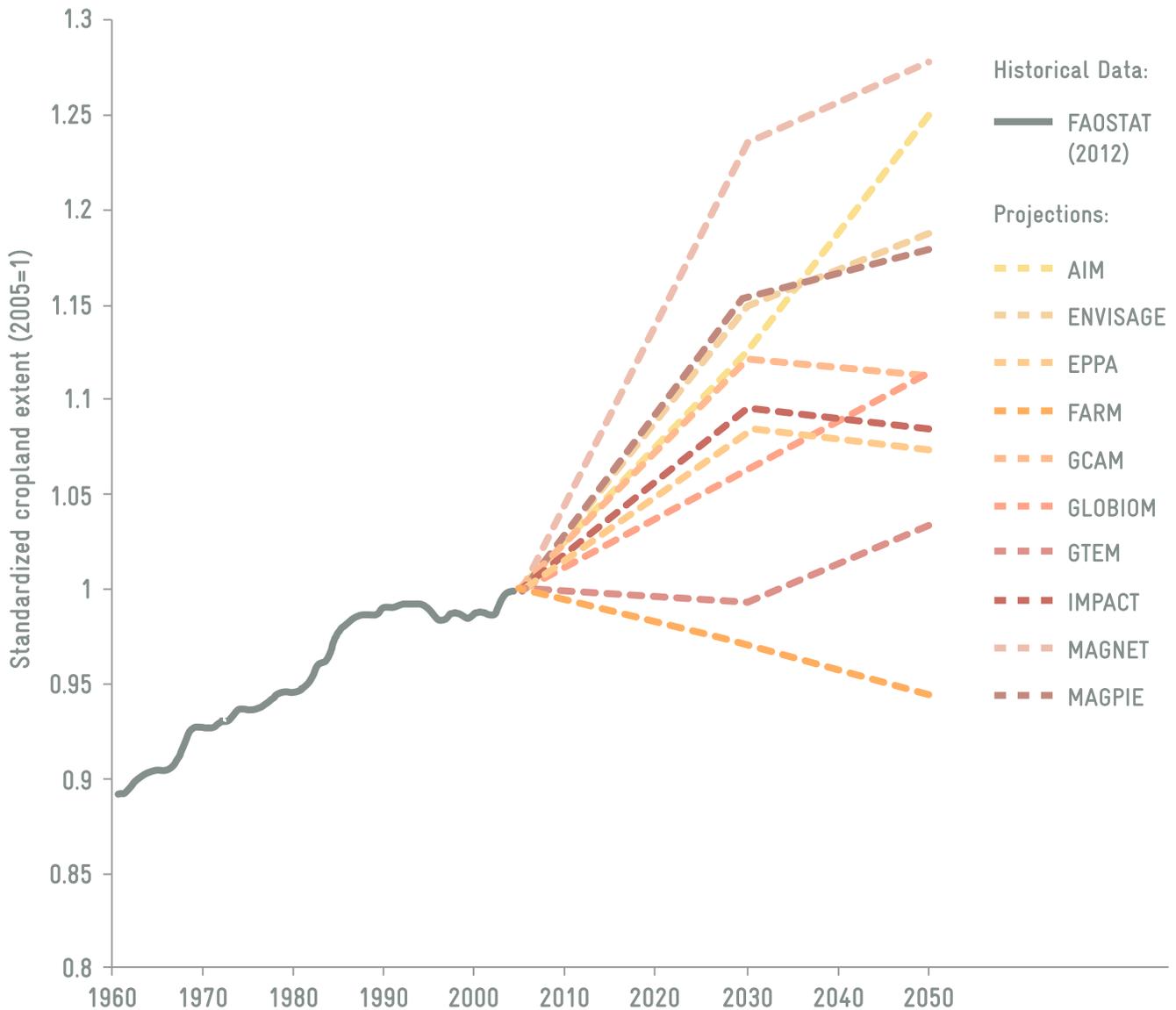
As no rules are established related to accounting modalities under the Paris Agreement yet, it is unclear, both for developed and developing countries, whether processes similar to the current review/ assessment processes for forest reference levels would also be implemented for any forest reference levels as part of NDCs. Such process would provide significant transparency and trust in the proposed NDCs if these procedures also were used under the Paris Agreement. Some Parties have made related proposals for the negotiation text.

3.4.3 LAND-USE REFERENCE LEVELS AS PART OF OVERALL BAU PROJECTIONS

Those countries that have chosen an NDC that defined emission reductions compared to a BAU projection for 2025 or 2030 and that included the LULUCF or AFOLU sector in the NDC, have already included the land-sector reference level in a more general BAU scenario. This seems implicit in the choice of this type of NDC and those countries that provide a sectoral disaggregation of the BAU projection, usually explain the contribution of the LULUCF/ AFOLU/ forestry sector as part of the BAU scenario. However, most NDC submissions that only provide aggregate BAU projections for an economy-wide target including the land-sector do not explain the reference chosen for the land-sector explicitly. Therefore, it remains unclear which type of reference level was applied and whether this is consistent with the GHG inventory. When land-use reference levels are included in economy-wide BAU projections, the general methodological options presented in → Table 2 are still applicable. However, it is likely that the evaluation of the specific approach will be taken in the context of the general approach chosen for the BAU projection.

While the options presented in → Table 2 have been considered as benchmarks for the emissions and removals in the forestry sector, emissions and removals from other land-uses such as cropland management or grassland management have in the past mostly not been compared to complex projected benchmarks, but to historic years or periods. Management practices and land use changes for croplands and grasslands affect mainly C in soils which is estimated by complex models in GHG inventories and linked to high uncertainties. The projection of all parameters used in such models may result in very complex projections with high uncertainties for the reference level while the comparison to a historic situation is simple and straightforward.

► **Figure 3-9:** Cropland projections by 10 different models according to Schmitz et al.



Source: Schmitz, C. et al. 2014

→ **Figure 3-9** shows the strong variance in results from different models for cropland extent by 10 different socio-economic land-use change models which all used the same historical data for cropland and the same exogenous assumptions on GDP and population growth (taken from Schmitz, C. et al. (2014)). The figure only shows changes in areas, with an additional layer of emissions and removals, the variation would be even higher. Thus, a projected reference level for cropland and grasslands may involve complex methods and may be linked to high uncertainties.

3.4.4 MINIMUM CONTRIBUTION OF NET SINKS AND QUANTIFIED ABSOLUTE NON-GHG TARGETS

Many developing countries have poor information about the historic trends of the emissions and removals in the land-use sector because they have not prepared GHG inventories on a regular basis over many years. In the absence of the understanding of the past trends, it may be very difficult to establish reliable and credible forest reference levels or land-use reference levels for a long period until 2030. Some countries have avoided the high uncertainty implied in reference emission levels, by indicating a quantified minimum net sink that they will maintain or achieve between now and 2030 in the sector (e.g. Chile, Bosnia and Herzegovina, India, Kiribati or Sao Tomé and Príncipe). This approach avoids the establishment of a reference level and considerably reduces the uncertainties related to the achievement of the target as no projection is necessary.

Many quantified non-GHG targets define absolute targets, e.g. in terms of total forest cover that should be achieved or the total increase in area by afforestation/ reforestation without specifying an explicit reference level. This approach also reduces the large uncertainties that are implicit in the projection of emissions/ removals from the land-use sector and for afforestation and reforestation it is easier to integrate the targets with national strategies and plans in the forest sector.

3.4.5 REFERENCE LEVELS IN SUBMITTED NDCS

The unclear situation related to future accounting modalities for the land-use sector is reflected in the NDC submission. Several countries, mostly Annex I Parties, indicate that the detailed accounting approach will be decided later after the development of agreed, common accounting rules. Five countries (Australia, Canada, USA, Moldova and Dominican Republic) intend to apply a net-net accounting approach where the net emissions and removals from the land-use sector in the target year/ period are compared to net emissions and removals in the base year.

Very few countries specify the reference or baseline that will be used for the accounting of the LULUCF sector, some indicate the intention to establish forest reference emission levels or forest reference levels against which the effects of the mitigation activities are counted.

For those countries that have chosen an NDC that defined emission reductions compared to a BAU projection for 2025 or 2030 and that included the LULUCF or AFOLU sector in their NDC, it is very likely that the chosen accounting approach for the land-sector is the comparison with the BAU scenario. This seems implicit in the choice of this type of NDC and those countries that provide a sectoral disaggregation of the BAU projection, usually explain the contribution of the LULUCF/ AFOLU/forestry sector as part of the BAU scenario. However, most submissions that only provide aggregate BAU projections for all sectors of the economy usually do not explain this explicitly and it therefore remains uncertain whether this assumption is correct for all countries with NDCs compared to BAU projections.

Eight countries indicate that the approach used for REDD+ activities with the definition of forest reference emission levels will be used under the Paris Agreement as well. Few countries refer to specific accounting elements under the Kyoto Protocol such as forest reference levels or gross-net accounting and one country intends to use CDM methodologies.

Only 27 countries have provided information related to the expected quantitative contribution of the land-use sector to the country's target. This low share shows relative high uncertainty either in the available data and projected emissions and removals for the land-use sector or it can also indicate that Parties wait with such quantification because they expect the elaboration of future accounting rules in this area.

For a large majority of countries it remains unclear what exact reference they have chosen for the land-use sector or they explicitly report that they haven't established such reference yet.

3.4.6 RECOMMENDATIONS

→ **Table 2** shows the range of options that Parties have available for defining land-use or forest reference levels as part of their NDCs. The current information provided in the NDC submissions of Parties mostly neither include any detailed explanation of the type or methods of forest reference level used, nor an indication of the quantitative reference level for forest emissions and removals or the land-use sector. Thus, for a future implementation of the Paris Agreement, additional information will be necessary for the international community to understand the forest reference levels and baselines for other land-use categories chosen.

A transparent reporting on land-use, land use change and forest reference levels can be deducted from the requirements that are already in place for REDD+ FREL/FRLs or for forest management, and afforestation/ reforestation / deforestation activities reference levels under the Kyoto Protocol should include the following key information:

- **Forest definition:** The forest definition used for the construction of the reference level;
- **Data used:** What type of historical data from which period has been used and how has the historical data been taken into account
- **Coverage:** Activities or source/sink categories, gases and carbon pools included.
- **Approach chosen for reference level construction:** Type of approach and rationale for the choice.
- **Monitoring approach for implementation:** Approach for monitoring and estimation during the implementation period which is defined by the national land-use sector monitoring systems and the data available in the system (e.g. expected use of satellite data, forest inventories, models for soil carbon) and how the monitoring approach is consistent with the reference level.

If countries decide to use projected reference levels or baselines in the LULUCF sector, it is recommended to use the existing guidance for forest reference levels either related to REDD+ activities or related to the Kyoto Protocol. Even in a situation in which guidelines have not been adopted for mandatory use, it is helpful for all experts involved in the task of setting reference levels to have a systematic methodology that has been developed by a wide network of scientists across all countries. This is likely to be more comprehensive as if national experts have to develop their own approaches. In this regard the availability of existing guidance for reference levels (as presented above) is an advantage in the land-use sector compared to other sectors.

If countries opt for a mitigation target that is compared with a BAU projection, it is very likely that the land-use sector is integrated into the BAU scenario in a similar way as other sectors. The assumptions and methods used will not be very different compared to the establishment of a separate forest reference emission level as for REDD+ or under the Kyoto Protocol and it would still be useful to consider the existing guidance elaborated for REDD+ or by the IPCC

3. ACCOUNTING OF THE LAND-USE SECTOR AS PART OF AN NDC

guidelines in such approach. It is important that countries provide transparent information how the BAU scenario for the LULUCF sector was constructed.

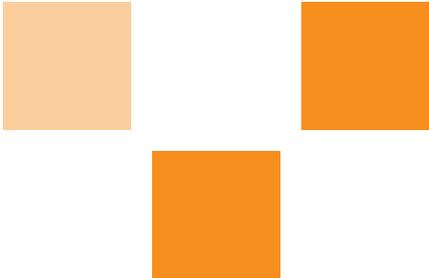
A net-net accounting approach in which the land-sector emissions are compared to a base year is a simple and straightforward approach for those countries that elect NDCs in which they account against a base year. However, for countries with a declining net sinks, this approach creates debits and additional mitigation efforts are needed from other sectors to compensate for the declining sink. Therefore, the net-net accounting against a base year approach has in the past not been very attractive for countries with large net sinks that see few potential to further enhance those. However, a number of countries have chosen a net-net accounting approach as part of their NDC (Australia, Canada, USA, Dominican Republic, and Moldova).

For the purposes of REDD+ activities, reference levels are often determined based on average GHG emissions from forests for a historical period, not a single base year (e.g. emissions from deforestation). Thus countries may wish to express its NDC contributions in the forest sector through REDD+ actions under the UNFCCC.

If countries want to avoid the high uncertainties that are linked to forest reference emission levels, there is the option to express the NDC in terms of absolute quantified levels or non-GHG metrics that should be achieved until 2030. Few countries have clearly indicated the reference level they intend to use and several have indicated that they have not yet completed the work to establish a forest reference emission level. Thus, related to the assumptions chosen for the reference level or baseline, additional information is necessary to clarify the way how emission and removals from the land-use sector are going to be accounted during the implementation of the NDC.

For all types of reference levels it is important to maintain consistency related to the methodologies, definitions, the coverage of sources and pools between the emission and removal estimates in the reference level and the monitoring of progress in the implementation period. A lack of consistency may compromise the assessment of performance and environmental integrity.

While the options presented in → **Table 2** have been considered as benchmarks for the emissions and removals in the forestry sector, emissions and removals from other land-uses such as cropland management or grassland management have in the past mostly not been compared to complex projected benchmarks, but to historic years or periods. Management practices and land use changes for croplands and grasslands affect mainly C in soils which is estimated by complex models in GHG inventories and linked to high uncertainties. The projection of all parameters used in such models may result in very complex projections with high uncertainties for the reference level while the comparison to a historic situation is simple and straightforward.



4. ACCOUNTING ELEMENTS AND DECISIONS RELATED TO THE IMPLEMENTATION OF NDCS

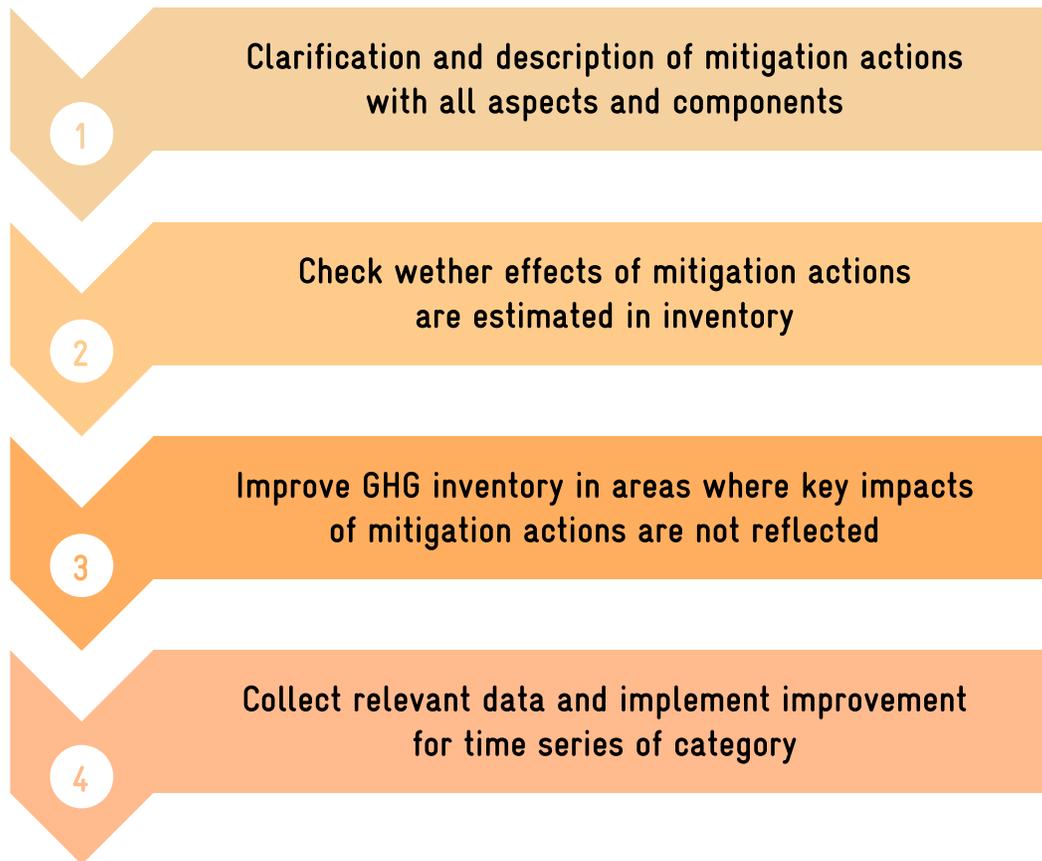
4.1 TRACKING OF PROGRESS WITH THE IMPLEMENTATION AND ACHIEVEMENT OF NDCS IN THE LAND USE SECTOR

4.1.1 REFLECTION OF MITIGATION ACTIONS IN THE LAND-USE SECTOR IN THE NATIONAL GHG INVENTORY

For all NDCs that have an economy-wide target, the national GHG inventory is the key tool to track the progress with quantitative emission targets. However, this only works if the effects of all implemented mitigation actions are reflected in the national GHG inventory. Therefore Parties should assess whether the inventory methods chosen as well as the source/sink categories and C pools estimated in the GHG inventory capture the effects of mitigation actions in the land-use sector. This can be a particular issue for developing countries, because their inventory methods are often based on tier 1 methods and have gaps related to categories or gases.

This is particularly relevant for the land-use sector, as this sector is often important in terms of contribution to total emissions and therefore subject to mitigation actions. At the same time there are certain gaps in the GHG inventory, e.g. related to the estimation of C stock changes in soils based on different management practices which prevents the tracking of actions related to grassland or cropland categories.

► **Figure 4-1: Steps to reflect mitigation actions in the national GHG inventory**



Source: Öko-Institut

→ **Figure 4-1** shows the individual steps necessary to integrate the effects of mitigation actions in the inventory estimation. As a first step it is necessary to clarify the detailed effects that a mitigation action is likely to have on the national emissions and removals and that a clear description of the mitigation action addresses

- the objectives,
- the elements or components of the mitigation actions,
- how the mitigation action contributes to reduction of emissions or removals in sinks, i.e. types of practices or management systems to be used

The second step related to the GHG inventory should analyse

- Which inventory categories will reflect the impacts of the mitigation action?
- Is the inventory category already reported in the national GHG inventory?
- Which lands, crops, animal populations or other relevant activity data, gases and pools will change due to the mitigation action? Are they estimated?
- Which method is currently implemented in the national GHG inventory?

- Is it necessary to move to a higher tier method to reflect the impacts of the mitigation action?
- If a higher tier method is needed, a related improvement of the GHG inventory should be planned and implemented.
- If it is necessary to move to a higher tier method, it needs to be considered what data sources are available to implement such method and how relevant data can be collected.
- Is there data related to the practices and management systems that allows to relate the categories of the inventory with them?

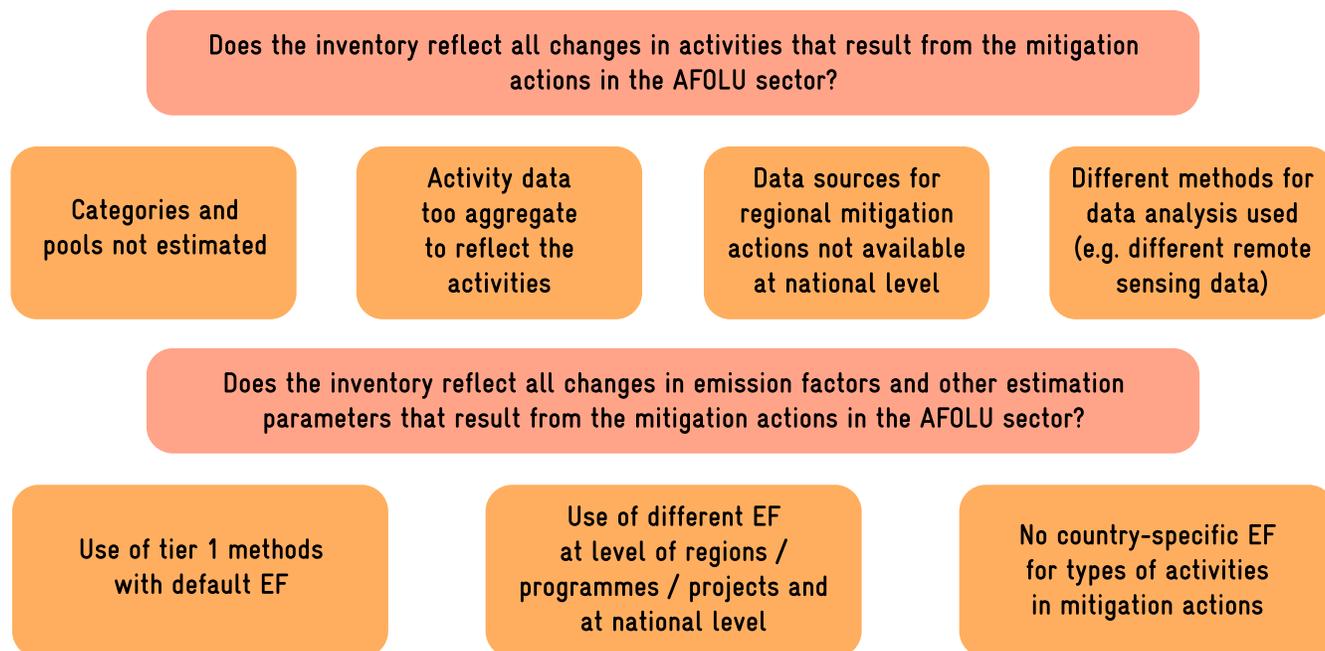
There are certain typical situations in relation to the availability of activity data and emission factors that may lead to a situation that the GHG inventory does not reflect the impacts of mitigation actions. Such typical situations are presented in → **Figure 4-2**. Apart from the situation that the mitigation actions may address a category or pool that is not yet estimated in the GHG inventory, it is also possible that the tracking of a mitigation action requires more disaggregated activity data, e.g. related to management systems of livestock, the disaggregation of different types of pasture management systems or detailed data on forest degradation that is not easily available from national statistics. If related data is collected as part of the mitigation action that may not be implemented in the entire country, but only in certain regions, comparable data for other regions may be missing to estimate the emissions and removals with a higher tier approach for the entire country in the GHG inventory.¹⁰

Another problem that may occur is that regional mitigation actions use different methods to collect activity data, e.g. higher resolution remote sensing data, different software tools to analyse remote sensing data or more disaggregate models to calculate livestock emissions that are not compatible with the approaches implemented for the national GHG inventory.

Related to emission factors and other calculation parameters, it is also possible that the inventory is not reflecting the changes triggered by the mitigation actions. Many developing countries use default emission factors and tier 1 methods for the inventory estimation. If the mitigation action changes the emission factor, e.g. the feeding situation of cattle, the fertilizer efficiency or the C uptake in biomass (e.g. in soils), the use of default parameters would not reflect this change and country-specific EF may not be available. When mitigation actions limited to certain regions collect more detailed information for country-specific emission factors, it may be challenging to scale the EF to the national level.

¹⁰ However, inventory guidelines do not require to estimate emissions and removals across the entire country with the same types of activity data and methodologies. Thus different regions could be estimates using different approaches so far as double counting and incompleteness are avoided and general consistency is maintained.

► **Figure 4-2:** Situations in which the inventory may not adequately reflect the effects of mitigation actions



Source: Öko-Institut

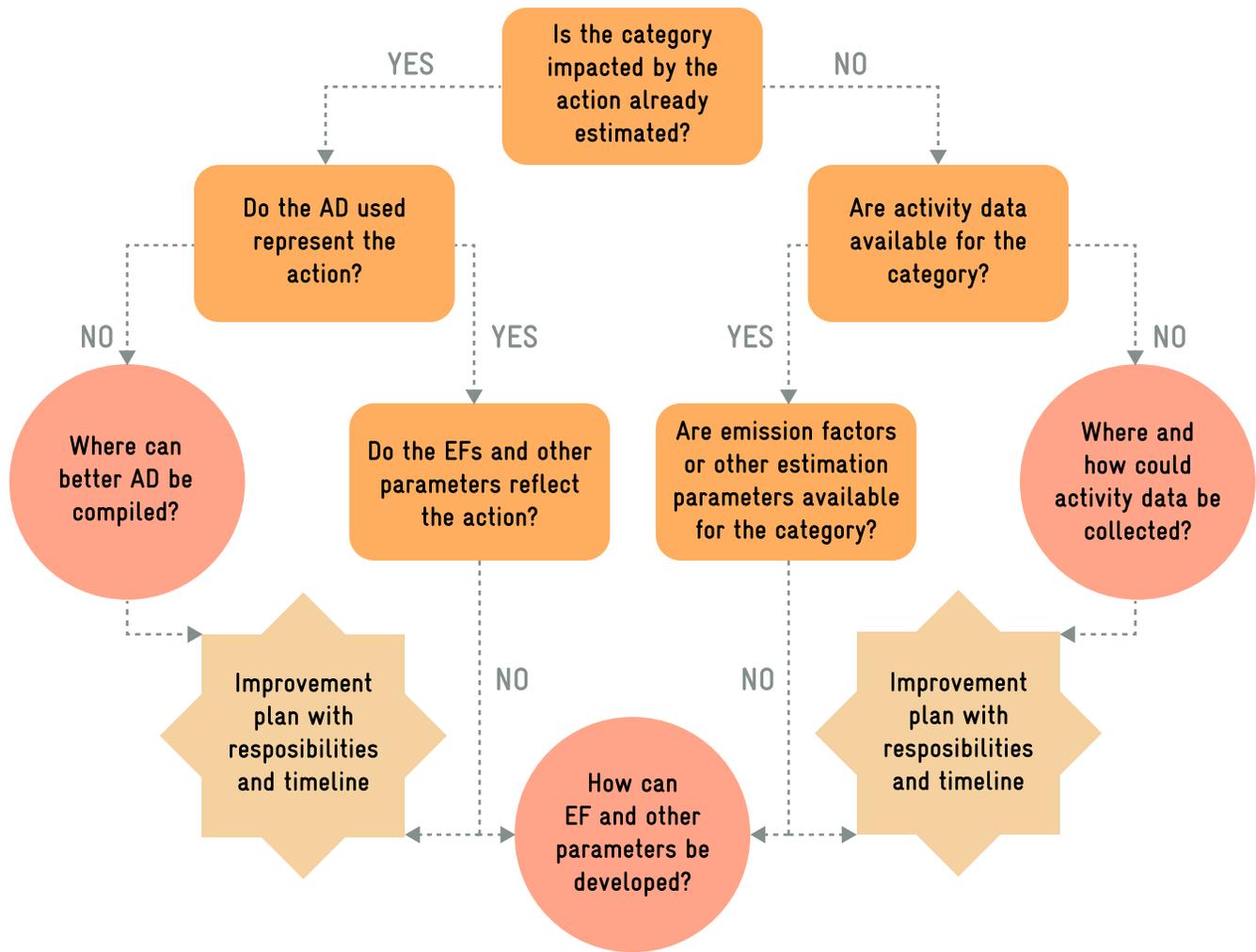
If such situations occur, it is important to initiate improvement activities to ensure that the mitigation actions are appropriately reflected in the national GHG inventory. → **Figure 4-3** presents a decision tree related to the steps that could help if a certain category, subcategory or pool which is impacted by the mitigation action is not yet estimated as part of the GHG inventory.

The selection and design of mitigation actions in the land-use sector can also contribute to a more straightforward or more difficult task to integrate the effects in the national GHG inventories. Sometimes mitigation actions are described in a very broad way and include many different individual objectives and activities and few details related to the exact changes that may result from the mitigation action. A clear description of the mitigation actions as explained above and the design of MRV needs and activities as part of the design of the mitigation actions assist the tracking of progress during the implementation of the action.

It also has to be taken into account that mitigation actions in the land-use sector may have impacts in other sectors in the national GHG inventory, e.g. mitigation actions that cover certain crop types like coffee or manure management activities usually also address the energy use in the processing of crops or the use of manure in bio digesters and have impacts in the energy sector. It is important to recognize that biomass or biofuel use for energy purposes is not accounted as emissions in the GHG inventory, but reported as a memo item as it is assumed that the biomass captured the CO₂ released during the combustion process in the phase of plant growth from the atmosphere.

This means that certain sub-activities of mitigation actions planned in the land-use sector may be accounted in the energy sector of the GHG inventory. Mitigation actions that address efficiency improvements in the processing of agricultural or forest products that already use biomass fuels will not show any impacts on national total CO₂ emissions due to the accounting of those CO₂ emissions under memo items in the GHG inventory.

► **Figure 4-3:** Decision tree for the integration of additional categories, subcategories or pools in the national GHG inventory



Source: Öko-Institut

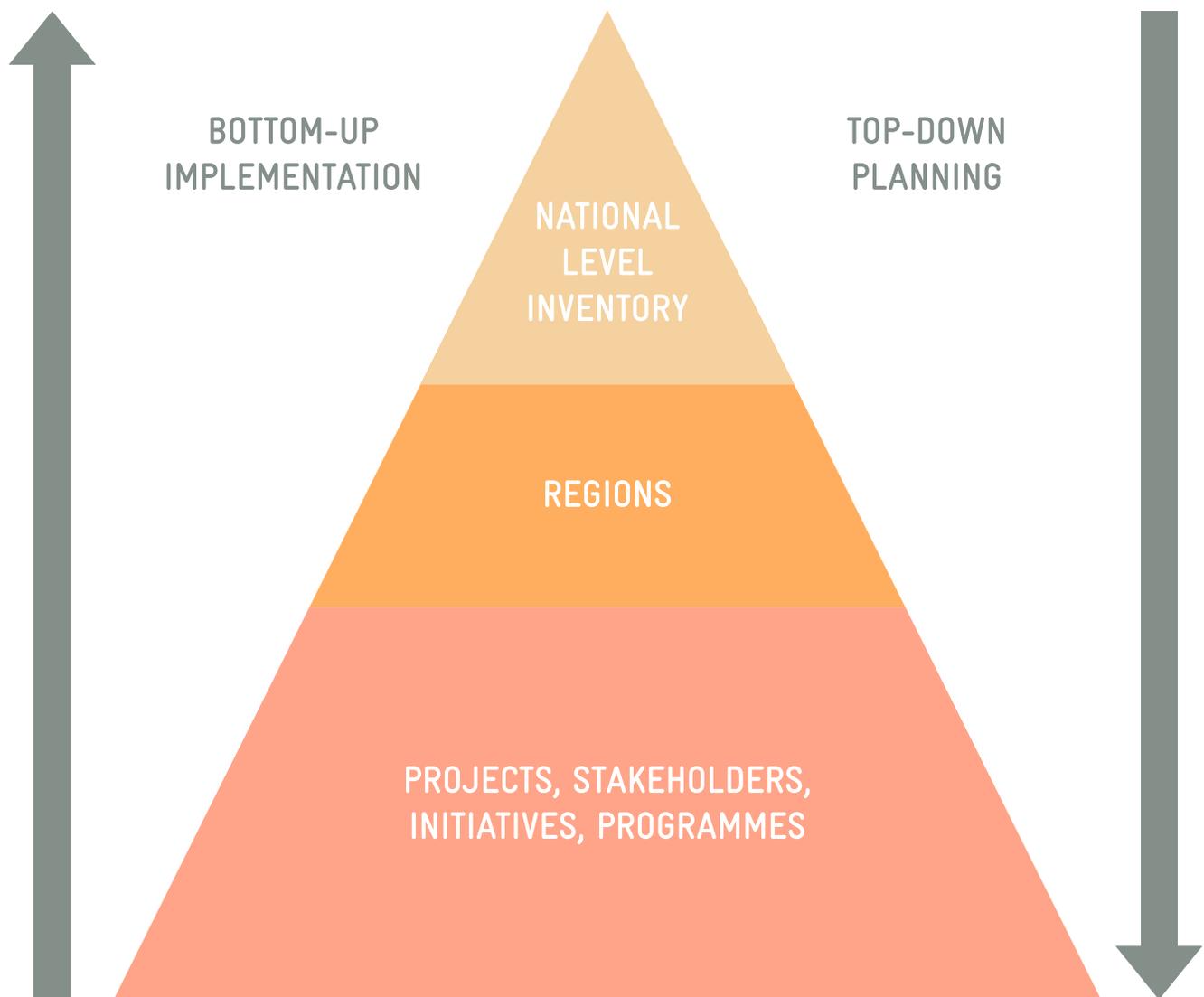
4.1.2 REFLECTION OF MITIGATION ACTIONS IN THE LAND-USE SECTOR IN THE NATIONAL GHG INVENTORY

In the land-use sector, mitigation actions are often implemented as actions in specific regions, programmes or initiatives because the regions in countries may be different related to forest types, crop types or livestock systems and related emission sources or opportunities for enhancement of C stocks which may require a regional approach. Whereas the NDCs are frequently planned using a top-down planning approach by the governments, the implementation of the NDCs – in particular in the land-use sector - has to occur by many different stakeholders in all regions of a country and the emission reductions result from a bottom-up implementation through many stakeholders at local and regional level. This implies that different regional activities need to be integrated into a domestic accounting system.

4. ACCOUNTING ELEMENTS AND DECISIONS RELATED TO THE IMPLEMENTATION OF NDCS

This means that for the domestic implementation of mitigation actions in the land-use sector, it is important to define the data and information flows between the stakeholders that implement the actions at local and regional level and the national entities that are responsible for the tracking of progress of the national target. It is also important to document the practices and actions at the implementation scale.

► Figure 4-4: Top-down planning of NDCs and bottom-up implementation



Source: Öko-Institut

It is important to achieve consistency of accounting approaches and methodologies and data used at local, regional and national level. If reference levels are established at national level, regional level and project level using different assumptions, it may be challenging to reconcile the accounted emission reductions compared to those reference levels. This would result in a situation that an emission reduction in tons achieved against a local projected baseline would not be comparable and consistent with an emission reduction achieved against the national projected baseline. In

an accounting system that covers all different levels (national, regional and local), it is therefore important that the accounting of the achieved emission reductions or enhancement of C stocks is consistent from a methodological point of view across the different administration levels to ensure that the individual approaches are comparable and can be added up and aggregated across the different administrative levels to a national estimate.

It is also very important that consistent definitions are used across all different levels of a country, e.g. related to the forest definition, the definition of deforestation or forest degradation.

Another aspect for which coherence should be achieved are the methodologies used and the calculation of carbon stock changes and biomass data in the forest sector or emissions in the agriculture sector.

With regard to changes in the areas of natural forests, satellite images are used at an annual basis for the compilation of the GHG inventory in Colombia. For reasons of consistency, the same approaches for the identification of area changes should be used at regional level. Some countries implemented different approaches (different types of satellite images, different software to identify changes, different approaches (wall-to wall or hot spots) which led to very different and contradictory results. Therefore, it is important to ensure consistency in the area identification. It is also a more efficient use of resources when the same data and approaches are used for a country.

It depends on the resolution of the forest area data at national level and the size of local projects whether the same methodological approaches for area identification can also be used for local projects. However, it is likely that more accurate data can be gathered at local level. If different methodological approaches are used at local level, it would be useful to check the consistency of the results with the methodological approaches used at national level, e.g. and to compare the area changes estimated at local level with the changes that can be identified for such local area with the national methodology.

Differences related to the accounted effects can also arise due to different parameters used for the carbon stock changes and the biomass data. A national monitoring strategy could ensure consistency and coherence related to the biomass and the emission estimation in the following way:

- If no regional or local biomass data are available, the same default parameters as those used for the GHG inventory should be used at regional or local level. This would require the compilation of the parameters and emission factors used at national level for the GHG inventory and the dissemination of these parameters to the regional and local stakeholders.
- If regional or local biomass data and carbon stock changes are available or can be monitored, the regional or local activities should document in a template how this data was collected and which parameters were actually measured and used for the estimation. This would enable the inventory agency to apply the same factors and parameters as part of country-specific parameters in the inventory estimation for the related region and to improve the inventory taking into account the regional or local information.

Some countries started to develop registries for domestic mitigation actions and related legislation (e.g. Colombia, Mexico, Costa Rica). Such registries can implement requirements related to consistent methodologies and accounting parameters for all regional or local activities in a consistent way and can be used for the information flow between the national government and the regional and local stakeholders.

Another way to contribute to consistency between the national level and regional or subnational levels would be to disaggregate the national GHG inventory to the regional level as well. Colombia for example implemented an inventory estimation at the level of 33 departments (IDEAM et al. 2016). This contributes to a consistent MRV and accounting approach between the national level and the regions.

4.1.3 TOOLS AND METHODS FOR TRACKING OF MITIGATION ACTIONS

Registries for mitigation action

The implementation of domestic registries for mitigation actions can assist the national governments in achieving methodological consistency and assist the information flows between inventory agencies and regional and local stakeholders that implement the mitigation actions. Colombia established a specific registry for REDD+ initiatives for result-based payments which is provided as an example to explain the potential contribution to a coherent and consistent accounting system. The objectives of the REDD registry in Colombia are to

1. Register and make public the information of the programs and projects directed to the reduction of the emissions derived from the REDD + activities.
2. To serve as an information mechanism that contributes, together with other instruments, to avoid overlapping and collision among the initiatives that are the subject of the registry.
3. Consolidate the information necessary for the accounting of reduction of emissions derived from REDD + activities in order to avoid double counting.
4. Be the mechanism for consulting the information reported by the programs and projects and serve as a tool for territorial planning.
5. To allow the monitoring and reporting of measures adopted by the programs and projects that are being registered, aimed at ensuring social and environmental safeguards.
6. Monitor the reports generated by the programs and projects subject to registration.

With the accounting rules implemented as part of the legislation for the REDD registry, Colombia ensures that it implements key international accounting principles such as the avoidance of double counting, ensuring environmental integrity and methodological consistency between the baseline and the implementation of the NDCs will be implemented at national level. The REDD registry requirements foresee that

- Projects and programmes can only register in the REDD registry if there is no overlap in terms of area, time period or type of activity to avoid double counting of the same areas.
- The programs / projects must adopt the same forest definition in relation to the parameters of canopy cover, tree height and minimum area that the country adopted as part of the forest reference emission level for REDD+ activities.
- The methodology for the establishment of the forest reference emission levels (FREL) at project or programme level should be based on the same approach as for the national FREL submitted to the UNFCCC.
- The programs / projects must adopt the protocols of the inventory agency which standardize methodologies and ensure consistency with the national GHG inventory. Projects and programmes must provide information regarding carbon stocks and activities to the REDD registry. This information should be as detailed as possible. Detailed information requirements are outlined in the legal resolution.

- In addition the REDD+ registry is used to ensure the implementation of the REDD+ safeguards¹¹ and information flow on the safeguards to the national government. This includes for example information related to land ownerships or land rights of indigenous people.

This illustrative example shows that such registry can become a key tool for the accounting of mitigation actions.

Ex-post evaluation of mitigation actions

An important step to understand the effects and impacts of mitigation actions is an ex-post evaluation of the mitigation actions. This is the most sophisticated approach to track progress and calculates the GHG impacts achieved and potentially also costs or co-benefits after the action has been implemented for a certain time period. There is however, no single source of methodological guidance for ex-post evaluation because the approaches depend on the specific mitigation actions. The methodologies of ex-post evaluation cannot be described in detail as part of this document, but methodological guidance is addressed in Schumacher et al. (2012), WRI (2014) or Foster et al. (2009). The Initiative for Climate Action Transparency (ICAT) is also working on guidance for assessing the GHG impacts of agriculture and forest policies and first drafts of guidance documents have been published for public consultation.¹²

Indicators

A frequently used approach to track the impacts of mitigation policies is the use of indicators. Many countries already specified in their NDC submissions which indicators they will use for the tracking of progress with the implementation of the mitigation actions. If indicators have not been established during the preparation and adoption of the mitigation actions, it is recommended that indicators are established as part of the monitoring and reporting practice for the mitigation actions implemented. Indicators should be monitored during the implementation phase of the mitigation action to provide a fast overview of the trend.

4.1.4 RECOMMENDATIONS

The domestic implementation of the NDCs with an economy-wide scale and mitigation actions implemented for their achievement require an evaluation whether the methods used in the GHG inventory are fit for the purpose of tracking the effects of all mitigation actions. In the land-use sector there are frequently gaps and improvements of the GHG inventory are necessary to enable countries to fully reflect the effects of the mitigation actions. As the implementation of inventory improvements can take time, it is recommended to start such evaluation at an early stage and to include such considerations in the elaboration and design of mitigation actions.

In the land-use sector, mitigation actions are often implemented as actions in specific regions, programmes or initiatives because the regions in countries may be different related to forest types, crop types or livestock systems. The implementation of the mitigation actions depend on many different stakeholders at regional and local level. This may imply that different regional activities may need to be integrated into a domestic accounting system. It is important to

¹¹ REDD+ Safeguards as adopted in paragraph 2 of UNFCCC decision 1/CP.16

¹² <http://www.climateactiontransparency.org/wp-content/uploads/2017/07/ICAT-Agriculture-Guidance-First-Draft-26-JUL-2017.pdf>, <http://www.climateactiontransparency.org/wp-content/uploads/2017/07/ICAT-Forest-Guidance-First-Draft-26-JUL-2017.pdf>

define the data and information flows between the stakeholders that implement the actions at local and regional level and the national entities that are responsible for the tracking of progress of the national target. It is also important to ensure consistency of definitions, accounting approaches and methodologies and data used at local, regional and national level to ensure that the individual approaches are comparable and can be added up and aggregated across the different administrative levels to a national estimate.

Apart from the GHG inventories, there are several other tools and methodologies that assist countries in the tracking of progress with the mitigation actions and the emission reductions. The most common tool used are specific indicators to track progress. Several countries also implement registries for domestic mitigation actions to ensure a consistent information flow and accounting approaches in the implementation of mitigation actions. The most sophisticated approach to track progress are ex-post evaluation methods for individual mitigation actions that calculate the GHG impacts achieved after the action has been implemented for a certain period.

4.2 ACCOUNTING OF ANTHROPOGENIC EMISSIONS AND REMOVALS

4.2.1 GENERAL APPROACHES

The choice of how to define and account anthropogenic emissions and removals is a further important question for the transparency and level of emission reductions implied in countries' proposed NDCs.

Beyond human-induced emissions and removals, many natural factors can lead to significant carbon stock changes affecting determined emission reduction targets. These natural factors include natural cycles of disturbance and recovery of biomass, e.g. from fires, pests and diseases.

However, it is complex and difficult to only account for the anthropogenic or human-induced emissions and removals, excluding natural causes for changes. Different concepts have been implemented in the past:

The IPCC Guidelines provide for forests to be designated as managed or unmanaged. In this approach stock changes on unmanaged forests are excluded from the accounting framework. This approach to only account for managed land areas was used as an approximation to define anthropogenic emissions and removals from LULUCF.

In the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol (KP Supplement) (IPCC 2013a) new methodologies have been developed to account for natural disturbances from e.g. storms, pests or diseases. The accounting approach developed under the Kyoto Protocol compares the emissions of specific disturbance events to a historic 'background' or average of single events that caused similar emissions. Only if a specific event causes emissions above such background level, it is qualified as natural disturbance. In such cases, the emissions caused by the natural disturbance event are taken out of the accounting, together with the subsequent removals. This approach requires geographic explicit reporting of the land areas over time on which the natural disturbances occur (Approach 3 of land area representation in IPCC Guidelines or approach 2 plus ancillary data) (which is only implemented under the Kyoto Protocol). Furthermore, it requires the establishment of background levels for such disturbances which require long time series of emissions and removals that include such disturbances. Some countries implemented this approach described in the IPCC supplement for reporting under the Kyoto Protocol

also under the Convention. However, at the moment there is no specific IPCC guidance describing how the approach to account and report for natural disturbances should be applied in the Convention reporting.

Developing countries may have difficulties to implement these approaches because of lack of emissions and removals for long time-series and lack of geographically explicit data. But nevertheless such natural events can occur during the implementation of an NDC and have significant impacts on expected emissions and removals from land areas.

4.2.2 ACCOUNTING FOR NATURAL DISTURBANCES IN SUBMITTED NDCS

Few countries have so far announced as part of their NDCs that they may exclude emissions/ removals from natural disturbances. The countries that indicated the intention to use such approaches are mostly Kyoto Protocol Parties. For other countries, this decision is still pending, but gains in importance towards implementation of the NDC.

4.2.3 RECOMMENDATIONS

Countries should consider whether the land-use categories or activities included in their NDCs are subject to natural disturbances and whether such disturbances can have strong impacts on the emissions and removals (regularly or in extreme years). Due to the local or regional nature of natural disturbances the potential influence can especially striking in small countries relative to total emissions whereas in large countries the absolute amount of emissions from natural disturbances can be very high. If a significant risk is identified, the country may want to consider whether it is possible to apply the methodological approach provided in the 2013 IPCC supplement under the Kyoto Protocol, the only accounting method currently available to exclude such emissions and removals.

If the land-sector is included in projected baselines, countries could assume a certain, regular level for emissions/ removals from natural disturbances in the baseline.

4.3 MARKET-RELATED ACTIVITIES IN THE LAND-USE SECTOR IN DEVELOPING COUNTRIES AND ISSUES RELATED TO ACCOUNTING

4.3.1 AFFORESTATION AND REFORESTATION UNDER THE CDM

Emissions and removals from LULUCF are also part of CDM project activities, namely afforestation and reforestation project activities. These afforestation and reforestation project activities can be small-scale or large-scale; large-scale CDM activities may result in amounts of sequestration that can be relevant to the national target in terms of its extent. With crediting periods of up to 60 years (20 years with two renewals of 20 years each) the achieved net removals from current afforestation and reforestation CDM projects will continue to be issued in the period post-2020.

As part of the Paris Agreement a new mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development was established under Article 6 which will result in internationally transferred mitigation outcomes.

If developing countries with existing afforestation/ reforestation CDM projects include the LULUCF sector or afforestation/ reforestation in their NDC, they will have to search for solutions to discount exported credits from the relevant CDM activities. Otherwise this would result in double counting as the country would sell the emissions reductions from afforestation and reforestation and count the emission reduction at the same time as national contribution NDC.

Currently there are 55 registered afforestation/ reforestation CDM projects in 23 developing countries. For these countries, it should be checked whether there are overlaps between the scope of their NDCs and the CDM afforestation and reforestation activities (for the relevant period).

If the NDC covers afforestation/ reforestation and if afforestation/ reforestation CDM projects are implemented in parallel on the same area as covered by the NDC, the CERs generated and sold outside the country should be subtracted from the net removals generated by afforestation/ reforestation and accounted as part of the NDC. If certificates from land-use projects are traded internationally, from an accounting perspective there should also be registries for such units that are linked and supervised in order to track the units that have been issued and used towards fulfilling the targets under the Paris Agreement.

Double counting would be avoided when emissions and removals from afforestation/ reforestation would not be part of the NDC.

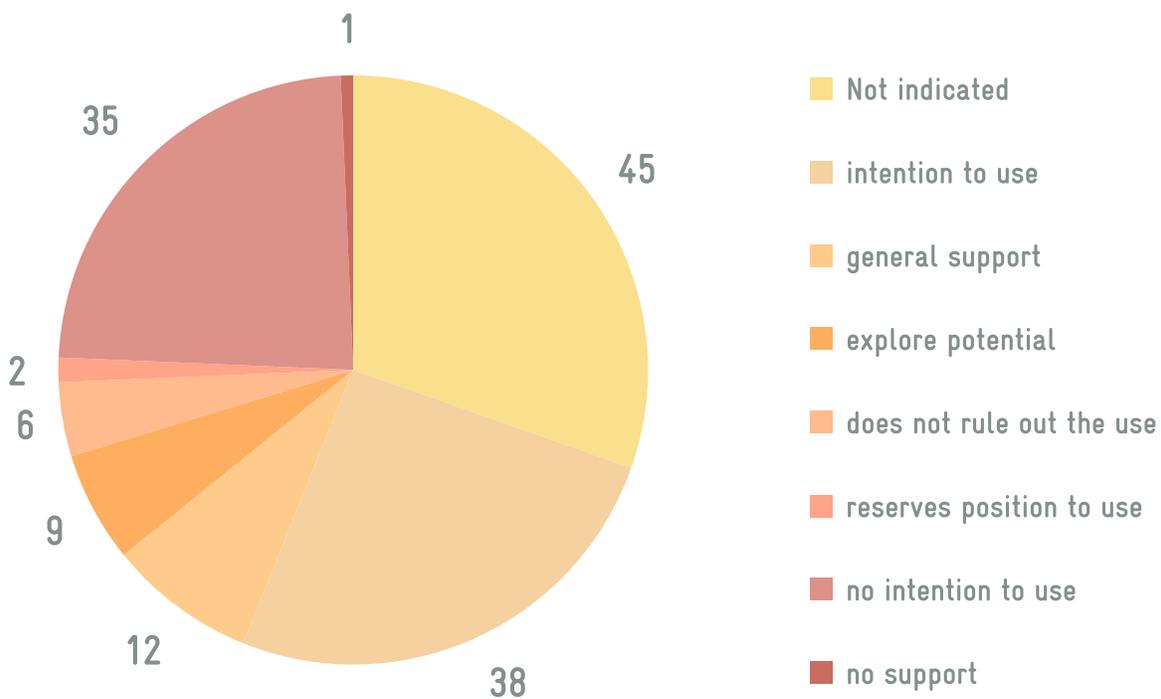
Such subtraction to avoid double counting is a measure that will only be taken during the implementation of an NDC. For the establishment of an NDC, it would be useful to identify whether the country expects to either sell or use CDM units. If countries intend to sell or use CERs, future double counting could potentially occur and the country could add to the NDC document the assumptions and potential rules how the country expects to deal with this situation.

4.3.2 USE OF MARKET MECHANISM AS PART OF SUBMITTED NDCS

In their NDC submission, 45 countries indicated that they intend to use international market-based mechanisms under the Paris Agreement, if they will be established. Of these countries, 12 mention explicitly the use of CDM. In total 112 countries show a positive attitude towards the establishment and use of new market mechanisms. Most countries with such intention stress the importance of a robust accounting and MRV framework for such mechanism.

► **Figure 4-5:** Indications related to the use of international market based mechanism under the Paris Agreement

Position related to international market mechanism



Source: NDC submissions under UNFCCC

4.3.3 VOLUNTARY CARBON MARKETS

Apart from the CDM, many different standards and third-party certification have been developed for voluntary offset projects in the land-use sector. Important standards are the Verified Carbon Standard (VCS) with an AFOLU program¹³ and Jurisdictional and Nested REDD+ (JNR)¹⁴ and the Gold Standard (projects for afforestation/ reforestation, agriculture and improved forest management)¹⁵, the Natural Forest Standard¹⁶, the Plan Vivo Standard¹⁷ or the Carbonfund Standard¹⁸ which have developed their own rules or methodologies for land-use or forestry projects (there are more voluntary initiatives as those listed before). The World Bank's BioCarbon Fund developed – Initiative for Sustainable Forests Landscapes also published methodologies a comprehensive landscape carbon accounting approach as the basis for purchasing emission reductions.¹⁹ These voluntary projects generate certificates. Certificates are traded on the voluntary carbon market, which extends to private individuals, for-profit and not-for-profit businesses that want to offset their CO₂ emissions on a voluntary basis.

Relevant accounting issues between NDCs and such private project-based certificates can occur when the NDC covers the same area and time period as such project based activities. Thus, the related emission reduction or enhanced sequestration would be accounted for at the national level of the country where the activity takes place. At the same time the certified emission reduction may be sold to emitters in another country and used by a company in this country to comply with its domestic emission reduction commitment and the government in this country subsequently counts the emission reduction towards its own NDC. This situation would result in double-counting of the same emission reduction in two countries.

Therefore, it is necessary to establish accounting rules that define which emission reductions or enhanced sequestration that occurred in other countries can be used to achieve NDCs. For such internationally traded certificates that are recognized as trading mechanism under the Paris Agreement a reporting, accounting and tracking framework would need to be established to ensure that an emission reduction or removal unit sold by a Party is subtracted from the emission reductions of this Party and added to the buying Party. In such framework it could also be defined to what extent certificates from the voluntary carbon market can be used. If voluntary certificates would be part of the recognized international project activities under the Paris Agreement, they would also be part of the accounting and tracking framework. If voluntary certificates would not form part of internationally recognized units under the Paris Agreement, they could not be used to achieve NDCs in other countries and double counting would not be an issue. For any mechanisms generating certificates that may be recognized under Paris Agreement, the countries that issue such units would need to register the issuance and the transfer outside the country and subtract a traded removal unit from the national removals and add corresponding emissions to the national emissions, if an emission reduction would be sold.

¹³ See <http://www.v-c-s.org/sites/v-c-s.org/files/AFOLU%20Requirements,%20v3.4.pdf>

¹⁴ See <http://www.v-c-s.org/JNR>

¹⁵ See <http://www.goldstandard.org/our-work/what-we-do>

¹⁶ See <http://www.naturalforeststandard.com/>

¹⁷ See <http://www.planvivo.org/our-approach/>

¹⁸ See <http://www.carbonfund.org/standards>

¹⁹ See <https://www.biocarbonfund-isfl.org/methodology>

In the absence of international accounting and tracking rules for project-based emission reductions, each country could individually decide whether it uses certificates from the voluntary carbon market and which standards and certificates it uses as a way to achieve its NDC. In the absence of a system that tracks the issuance and use of such certificates, it is likely that double-counting of related emission reductions or enhanced removals would occur. For a single country it would be impossible to track which units generated in the voluntary carbon market may be used in which way by other countries without an international tracking system.

4.3.4 RECOMMENDATIONS

If the CDM continues to be a market mechanism acknowledged under the Paris Agreement, an NDC that covers afforestation/ reforestation will need to subtract CERs from afforestation/ reforestation projects generated and sold to another Party from the net removals generated by afforestation/ reforestation activities that are accounted as part of the NDC; this is necessary to avoid double counting. From an accounting perspective there should also be registries for such units that are linked and supervised in order to track the units that have been issued and used towards fulfilling the targets under the Paris Agreement. Related rules under Article 6 of the Paris Agreement are currently under discussion that include how double counting should be addressed, but negotiation documents are currently not yet sufficiently developed to characterize the future requirements.

4.4 OTHER ELEMENTS RELEVANT FOR ACCOUNTING EMISSIONS AND REMOVALS FROM THE LAND-USE SECTOR

4.4.1 ACCOUNTING APPROACHES RELATED TO NON-PERMANENCE OF REMOVALS AND LEAKAGE

Enhancement of carbon sinks in soils or forests is potentially reversible through human activities as well as through natural disturbances. This is a characteristic difference of this sector compared to other sectors. Accounting rules need to ensure that any accounted removals for enhanced carbon stocks is balanced by accounting for any subsequent (anthropogenic or natural) reductions in those carbon stocks (IPCC 2000).

Different concepts have been developed in the past to address non-permanence of removals. For mitigation targets of Annex I Parties this was not specifically addressed, due to the fact that continuing commitments were envisaged, so that in any case, present and future, the Party would account for its carbon stocks and have to balance out fluctuations with other sectors of the economy. However, this turns into a non-reliable approach when Parties are not obliged to continuing commitments. In relation to CDM, the concept of temporary credits with tCERs and ICERs were introduced to address non-permanence of removals. Credits were issued for a certain time period only and had to be renewed or replaced thereafter.

Under REDD+, non-permanence of forests and soil sinks has been addressed in the UNFCCC negotiations in a minimal or rather weak way. Parties have consented to requiring REDD+ countries to take “actions to address the risks

4. ACCOUNTING ELEMENTS AND DECISIONS RELATED TO THE IMPLEMENTATION OF NDCS

of reversals”. Thus, the actions are left in the responsibility of individual Parties.

Other options to address non-permanence have been developed for offset and baseline-credit systems and have recently been summarized by Parker et al. (2014):

1. **Buffers** have been proposed as a means to deal with non-permanence by setting aside a portion of emissions reductions instead of selling them. This option is not applicable in systems with full carbon accounting in a country in which the accounted emissions and removals refer to the complete land use and forest area.
2. **Discounting**: only a portion of generated emissions reductions are actually used and accounted to allow for risk of reversal while the remainder is retired or remains unaccounted. This option would also be applicable in systems with full carbon accounting. However, this option is difficult to establish retrospectively after contributions have been submitted and included in an agreement as this accounting option would change the accountable amounts and therefore the level of ambition of the NDC.
3. **Country guarantees** have been proposed as an additional measure. This option is not applicable in systems with full carbon accounting in a country in which the accounted emissions and removals refer to the complete land use and forest area.
4. **Insurance premiums** can be paid to an insuring entity that guarantees against reversal risk by replacing accounted removals affected by reversal. This approach transfers risk to a third party, which may be desirable in cases where the host country is not able to provide risk mitigation. This option would imply a gap in time that is needed to replace the affected reversal of carbon storage.

Under the Paris Agreement Parties shall maintain successive NDCs, thus non-permanence is addressed through continuing obligations that account emissions and removals at the point in time when they occur. In addition Parties are required that they “*shall strive to include all categories of anthropogenic emissions or removals in their nationally determined contributions and, once a source, sink or activity is included, continue to include it.*” In paragraph 31(c) of UNFCCC decision 1/CP.21.

For the domestic implementation instruments to tackle non-permanence can still be an important issue for consideration to ensure the achievement of a specific NDC at the end of the target period.

4.4.2 LEAKAGE

Leakage to other regions or countries has frequently been quoted as an accounting problem related to the land use and forest sector, in particular related to the accounting of forests conservation. It is argued that the conservation of forests in one area may simply shift deforestation into other, less well-protected forest areas. The higher the coverage of a global agreement in terms of countries and sectors, the lower the problem of leakage becomes. As the coverage of the NDCs achieved under the Paris Agreement is already 174 countries. Even if not all countries chose to submit an NDC that includes the land-use sector, the high participation implies that leakage is unlikely to be a major accounting problem under the Paris Agreement between countries. It can be an issue at domestic level when the pressure for deforestation would be shifted from one region to other through the implementation of forest conservation activities in one region.

4.4.3 ACCOUNTING FOR HARVESTED WOOD PRODUCTS (HWPS)

The accounting of Harvested Wood Products assumes that harvested wood is immediately turned into CO₂ emissions, but that the C contained in the harvested wood is stored in wood products (e.g. wood used for construction purposes, but also paper) and is only released when these wood products achieve the end of their life and decay. The main assumption in the reporting and accounting of HWP is that the carbon is no longer immediately emitted when a forest is harvested, but is stored in harvested wood products. The rate at which carbon is emitted from harvested wood products is a function of the rate of retirement of products from end uses and the various processes used to dispose of products (Pearson et al. 2012):

1. Carbon is emitted directly to the atmosphere through the decomposition of wood products;
2. Carbon may be emitted to the atmosphere through burning of wood products at the end of their use;
3. If wood products are burned for energy production, the carbon is emitted but the energy produced displaces fossil fuels that therefore remain in storage, resulting in emission reductions;
4. Retired wood products may also be recycled, extending the duration of carbon storage in end uses;
5. When retired products are landfilled, the rate of decomposition is extremely slow and a proportion of carbon in the product is considered to be stored indefinitely.

In its 1996 guidelines, IPCC introduced a default approach for HWP: emissions from the combustion or decay of wood and wood products are assumed to take place in the country in which the wood was harvested and within a year – basically that wood is oxidized in the removal year. In 1998, an IPCC expert meeting on harvested wood products took place in Dakar (Brown et al. 1999²⁰) and introduced three alternative approaches (see box below):

- **Stock change approach:** estimation of annual carbon stock change of HWP in a country regardless of wood origin.
- **Production approach:** estimation of annual carbon stock changes of HWP where the carbon is from trees harvested in the reporting country.
- **Atmospheric flow approach:** estimation of annual atmospheric fluxes between the atmosphere and forests/HWP within national boundaries and regardless of their origin.

The 2006 IPCC Guidelines include these three different approaches (production approach, consumption approach, atmospheric flow approach) as options for Parties, all of which have been included in the reporting requirements under the Convention for Annex I Parties. Under the Kyoto Protocol a fourth approach to account for HWPs has been developed (Similar to the production, but with different parameters).

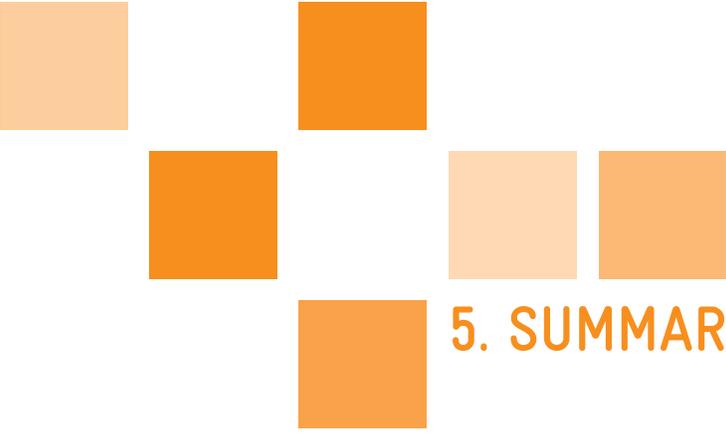
²⁰ <http://www.ipcc-nggip.iges.or.jp/public/mtdocs/dakar.htm>

4. ACCOUNTING ELEMENTS AND DECISIONS RELATED TO THE IMPLEMENTATION OF NDCS

As part of the 2006 IPCC Guidelines, a model was developed to assist Parties in the calculation of emissions and removals from harvested wood products. The three approaches that are currently available for estimating HWP emissions and removals differ in their defined system boundaries. All approaches differ on the treatment given to imports and exports of HWP, i.e. which country (importing or exporting) should report emissions and removals associated with traded HWPs.

If all countries report emissions and removals from HWP using **the same** approach there would be no gaps (i.e. emissions that are not reported by any country) and no double counting (i.e. same emissions reported by 2 countries). On the other hand, the diversity of approaches with different system boundaries can lead to double counting or no-counting of carbon in imported and/or exported harvested wood products. This risk specifically concerns the traded imports/ exports which are part of the activity data used for estimating emission/removals from HWP: whereas the “stock-change” and “atmospheric flow” approaches estimate emissions/removals based on data of the calculated consumption of HWP (imports are considered, see above), the application of the “production” approach is based on HWP production data only. In consequence, the application of the “production” approach implicitly includes exported HWP (in most cases, e.g. sawnwood manufactured in the reporting country is also exported). Since any import equals an export (and vice versa), if countries, which are trading partners (i.e. almost all countries), report with a mixture of the “stock-change” or “atmospheric flow” approach (consumption-based approaches, including imported HWP) on the one hand and the “production approach” (production-based approach, implicitly including exported HWP) on the other hand could lead to emissions that are no longer accounted among the trading parts or they could also be accounted twice. As it may be more likely that countries opt for approaches which lead to less accountable emissions from HWP, the danger that emissions from HWP are no longer accounted through the choices of HWP approaches seems higher than the risk for double counting.

Therefore, under the Paris Agreement a single reporting approach for HWP should be agreed to avoid the omission or double counting as indicated in → **Chapter 4**. Only few NDC submissions specifically address the choice of HWP approach and those countries that did so opted for the production approach. Most Annex I KP Parties and some non-Kyoto Parties currently use the production approach for HWP reporting. The production approach would therefore also enable Parties that have already started to report and account for HWP to achieve consistency of time series of emissions and removals in their reporting and accounting prior and post 2020.



5. SUMMARY OF RECOMMENDATIONS

A key difference of the land-use sector in terms of accounting is the fact, that the sector is not only an emission source, but can also sequester CO₂ (i.e., store carbon in the above- and belowground biomass, dead organic matter as well as soils). This feature makes the sector distinct, both in terms of its relevance for mitigation policies as well as in terms of monitoring, reporting and accounting of emissions and removals from sources and sinks. Carbon pools always generate both types of fluxes, positive and negative, either when they are at equilibrium (and such fluxes average out) or when net emission/removal determines a net C stock increase or a net C stock decrease. The sinks in the sector however do not remove CO₂ permanently from the atmosphere. Carbon stored in biomass, litter, or soil can be released relatively quickly. Thus, both a single emission and a single removal at a particular point in time cannot be considered permanent a priori i.e. without knowing whether it contributes to a decrease or an increase in the long-term average C stock of the C pool.

Due to the bottom-up approach of NDCs and the lack of a common agreed accounting rules under the Paris Agreement countries can use different definitions, accounting approaches and methodologies for the determination of the contribution of the land-use sector in their NDCs.

At the same, a wealth of experience have been gained related to the estimation of emissions and removals from the land-use sector, land-use target under the Kyoto Protocol and the Convention, the implementation of CDM, REDD+ activities and NAMAs. This paper intended to use the available experiences to provide guidance related to the key choices of accounting elements for the land-use sector in countries' NDCs in the absence of any agreed guidance and rules at the international level.

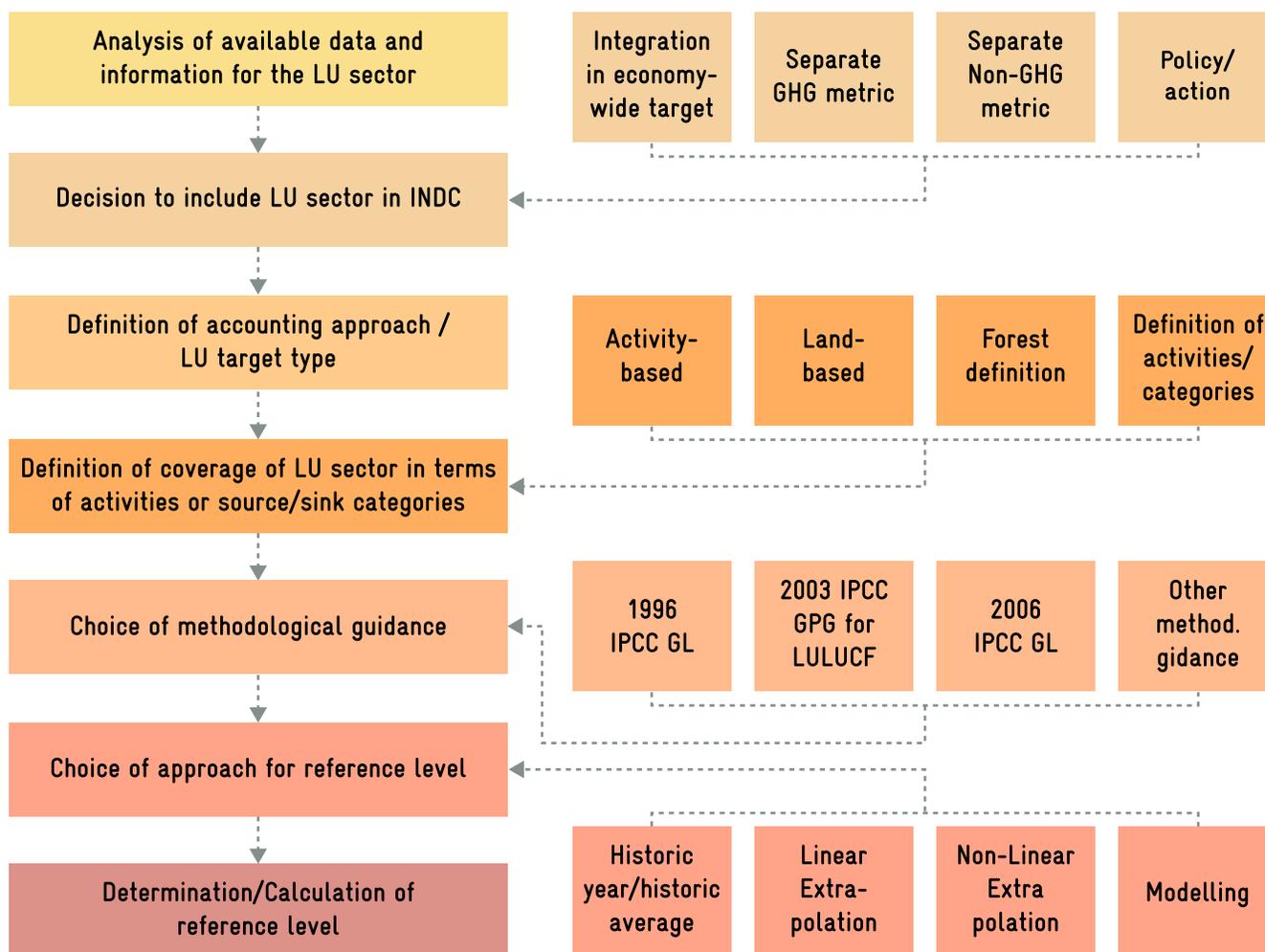
This paper provided an analysis and recommendation for key steps that have to be decided when countries prepare an NDC: These steps include (see → [Figure 5-1](#)):

1. The determination that the NDC should include the land-use sector and the definition of the target type for the land-use sector
2. The definition of the coverage of the land use sector
3. The choice of methodological guidance
4. The definition of a reference levels and baselines

The analysis of the submitted NDCs shows that most countries that have decided on the first step and second step, whether they include the land-use sector in their NDC and which type of target they adopt for this sector. But not all countries implemented these two initial steps, and 8 countries only announced that they will take this decision at a later stage and meanwhile continue with data collection in this sector to be able to take an informed decision.

Only few countries provide clear information related to step 3, the exact coverage of the land-use sector in their NDCs. This was not required as part of the NDC submission and therefore it is difficult to assess whether most countries determined the coverage at domestic level, but did not report this information as part of their NDC submission, or whether a final decision on the exact scope is still outstanding or potentially open to changes. However, many submissions are drafted in a way that it seems more likely that countries may not have taken a final decision.

► **Figure 5-1: Decisions and options related to the inclusion of the land-use sector in an NDC**



Source: Öko-Institut

62 countries have not yet indicated which IPCC methodological guidance they intend to use for the GHG inventories under the Paris Agreement. This shows that also related to the 4th step, not all countries have taken a final decision yet. Relatively few countries provide a separate projected reference level for the land-use sector or indicate a clear base year for a net-net accounting approach. Some countries explicitly mention that they intend to update the projected reference level which they included in the NDC. This indicates that some Parties may not have taken a final decision related to the reference level which they intend to use, and that many countries have not yet calculated such reference level or intended to update this calculation.

From this perspective it seems to be useful to provide guidance related to accounting elements in the NDCs even after the first NDCs have been submitted.

5.1 DEFINITION OF TARGET TYPE

The paper presented four options for target types in the land-use sector, which are summarized in → **Figure 5-1**:

- The integration of the land-use sector in an economy-wide target
- A separate land-use target next to an NDC covering the remaining sectors of the economy
- A separate land-use target in non-GHG metrics
- Action or policy-based targets in the land-use sector.

From the four options presented related to the general accounting approach for the land-use sector, the option of the **inclusion in a general economy-wide mitigation target** is simple and straightforward and should be considered in particular when countries opt for an economy-wide NDC either in form of an absolute emission reduction target or a target compared to a BAU projection. Such decision includes the choice of a reference level for the land-use sector which is further discussed in section 4.4. When a target compared to a BAU projection is used, the land-use sector can be integrated into this projection with its own relevant assumptions and driving forces.

For an assessment of the ambition and the effort of NDCs as well as for tracking progress with NDCs, it is important that the assumed contribution from the land-use sector is presented separately from the assumed mitigation targets in other sectors. If land-use and other sectors would be merged into one target that covers total emissions including the land-use sector, the contribution would become very intransparent and difficult to understand.

A **separate land-use target** is recommended, when the higher uncertainties related to the future emissions and removals from the land-use sector can be better accommodated through a separate land-use sector target which does not add the higher uncertainties to the achievement of the overall economy-wide target.

Separate mitigation targets for the land-use sector in non-GHG metrics are an option, in particular when countries lack data related to historic emissions and removals from the land-use sector. In such situation other quantifiable metrics can be chosen that are still measurable and verifiable, but for which monitoring of progress is easier. Such non-GHG metrics should be carefully chosen and defined, e.g. by drawing on existing statistics and data collections.

A general option for mitigation NDCs in particular for developing countries is also the determination of specific **mitigation actions and policies in the land-use sector**. This can be a valuable option for developing countries when there is a lack of capacities or data that allows the determination of reliable emissions and removals from the

5. SUMMARY OF RECOMMENDATIONS

entire sector. Taking into account that there is the need to monitor the implementation of and progress with NDCs, it is recommended that such mitigation actions or policies are identified together with non-GHG indicators that allow the tracking of progress. These non-GHG indicators should be appropriate to monitor the progress with the implementation and could be similar to the parameters indicated in the previous section related to non-GHG metrics.

The specific choices of the policy-based targets and non-GHG metrics should be made based on the monitoring capacities developed in the country in relation to the land-use sector as well as based on an analysis of the significant sources and sinks and the important mitigation areas.

5.2 COVERAGE OF LAND-SECTOR ACTIVITIES

In the selection of source/sink categories or activities as part of their NDCs Parties should be guided by the following principles or questions:

- Are all activities, land-use categories or pools that contribute significantly to emissions and removals from the sector included?
- Which activities or categories have significant mitigation potential and are part of planned mitigation actions?
- Which activities or categories will be affected by planned adaptation actions or expected climate change impacts?
- Are there national objectives in the land-use sector in favour of the inclusion of activities or categories that are not significant contributors?
- Is the national monitoring system able to produce reliable data for the monitoring of emissions and removals from these activities or categories or can such system be developed until 2020?

A straightforward approach to define the coverage of the land-use sector in an NDC is the use of the land-use categories included in the most recent GHG inventories (land-based approach). This builds in the use of existing resources and supports the improvement of GHG inventories as part of the enhanced transparency framework under the Paris Agreement.

As it is often difficult to provide estimates for all source/ sink categories and pools that are provided in the IPCC guidelines, countries should focus first on the significant source/ sink categories as part of the definition of NDCs. Significant sources can be identified in the inventory or from planned mitigation actions and the planned adaptation actions affecting main categories. However, there may be a difference between the most significant source/sink categories and those categories that offer considerable mitigation potentials in a country. For the choice of source/sink categories as part of an NDC, an additional consideration should be the mitigation potential as either emission reduction or increased long-term C stock related to a specific source/ sink category. This could lead to a decision that countries may add certain source/sink categories to their NDC and their inventories which they have not estimated in the past.

For developing countries that already engaged substantially in REDD+ activities, another option for the coverage of the land-use sector as part of the NDCs is the use of the REDD+ activities (activity-based approach). When countries already invested considerable resources and work in the planning and implementation of REDD+ activities, it seems a straightforward decision to continue with such activities after 2020 and include them in the NDC because monitoring systems may already be under development. For countries that host REDD+ activities, it is generally recommended to explain the relationship between their NDCs and the REDD+ activities (e.g. whether accounting will be based

on emissions / removals from REDD+ activities or whether REDD+ activities mainly are considered as measures to achieve the NDC, but mitigation impacts are accounted on the basis of GHG inventories), because this enhances the transparency and understanding of the NDC.

Under the Kyoto Protocol an activity-based accounting approach was chosen for developed countries where accounting for some activities is mandatory (afforestation, reforestation and deforestation and forest management for the 2nd commitment period) while other activities (Cropland Management, Grazing Land Management, Wetland Drainage and Rewetting) can be accounted for on a voluntary basis. For the post-2020 period, Kyoto Parties will need to decide whether they will continue with the accounting of Kyoto LULUCF activities as part of their NDCs or whether they will base their accounting of the land-use sector on the GHG inventories. In the first case, it is essential that countries specify which exact Kyoto LULUCF activities are included in the NDC. It is very unlikely that developing countries chose to start accounting on the basis of the Kyoto definitions of LULUCF activities because this approach would require significant additional efforts and resources compared to an approach that uses the Convention inventory as a basis.

It is important that the coverage of source and sink categories in the NDCs is clearly defined when the NDC is established and that the same coverage is maintained throughout the monitoring of progress and achievement for the entire period until 2030 (see the suggested principle: “once in, always in”). Inconsistent coverage over the time series, in particular leaving out of emission sources during the implementation that were considered in the reference level may compromise the assessment of progress and environmental integrity.

In the selection of source/sink categories or activities Parties should be guided by the principle of symmetric accounting and ensure including all significant activities, pools or land-use categories. This could be achieved by applying the following provisions:

- Account for all significant activities/ land uses and land use changes. For an activity-based accounting this can be defined using significant activities. For a land-based accounting approach, this could potentially be defined by using the key category concept established under the Convention reporting that defined the most relevant source/ sink categories for each Party.
- To avoid asymmetries due to carbon pool selection, it will be desirable to report and account for all pools at least for key categories and those pools that are significantly affected by the activities, management activities or land-use changes that occur. If this is not possible asymmetries should be minimized as far as possible.
- To avoid asymmetric accounting over time, activities and land areas covered once in a commitment should continuously be accounted for (‘once in, always in’). This accounting principle is already reflected in paragraph 31 (c) of the decision adopting the Paris Agreement.

5.3 CHOICE OF METHODOLOGICAL GUIDANCE

In the absence of specific IPCC methodological guidance agreed under the Paris Agreement, countries can use existing IPCC methodologies or even use their own methodologies. Generally, the latest IPCC guidelines documents advance the methodologies in the land-use sector and updated default emission factors or other country-specific parameters, in particular also for developing countries. This leads to more accurate estimates if default parameters are used.

It is recommended to check which IPCC guidelines document addresses the country- specific situation in the best way. If for example wetlands, coastal areas and mangroves play an important role in a country, the most detailed and most

5. SUMMARY OF RECOMMENDATIONS

appropriate methods that allow a monitoring of mitigation actions in these areas are only contained in the latest 2013 IPCC supplement on wetlands.

The improvements between different sets of IPCC guidelines over time can lead to substantial changes in the estimated emissions and removals for a particular source category, e.g. when default emission factors are revised upwards or downwards. It is therefore very important that consistent methodologies are used for the determination of the baseline or reference level and during the implementation of a mitigation commitment.

5.4 DEFINITION OF REFERENCE LEVELS

The methods presented in **Table 3** for forest reference levels show the range of options that Parties have available for defining land-use or forest reference levels as part of their NDCs. The current information provided in the NDC submissions of Parties mostly neither include any detailed explanation of the type or methods of forest reference level used, nor an indication of the quantitative reference level for forest emissions and removals or the land-use sector. Thus, for a future implementation of the Paris Agreement, additional information will be necessary for the international community to understand the forest reference levels and baselines for other land-use categories chosen.

► **Table 3:** Methodological options for construction of a FREL/FRL and potential advantages and risks (adapted from UN-REDD Programme 2015b)

CONSTRUCTION APPROACH	ADVANTAGES	RISKS
Historical average	Simple, transparent Represents a clear benchmark for progress in mitigation	May over- or underestimate future emissions or removals, depends strongly on the exact historic period chosen and can give quite different results for different historic periods. Requires the availability of longer time series of data
Linear extrapolation	Simple, transparent	May over- or underestimate future emissions or removals, e.g. deforestation rates are unlikely to remain constant over long time periods when the forest area is continuously decreasing
Non-linear extrapolation	Better for non-linear trends	Difficulty to predict how non-linearity will apply in the future. A non-linear extrapolation assuming a wrong function may over- or underestimate more strongly than a linear extrapolation.
Modelling approach	Can reflect the relationship to drivers	Less transparent, requires assumptions on the development of drivers, requires higher capacities for model development and implementation
Modelling approach that includes relevant policies	Can better reflect likely future changes driven by policies	There are high uncertainties related to the ex-ante prediction of emission changes due to policies, in particular the aggregated effects of several policies.

Source: adapted from UN-REDD Programme 2015b

A transparent reporting on land-use, land use change and forest reference levels can be deducted from the requirements that are already in place for REDD+ FREL/FRLs or for forest management, and afforestation/ reforestation / deforestation activities reference levels under the Kyoto Protocol should include the following key information:

- **Forest definition:** The forest definition used for the construction of the reference level;
- **Data used:** What type of historical data from which period has been used and how has the historical data been taken into account
- **Coverage:** Activities or source/sink categories, gases and carbon pools included.
- **Approach chosen for reference level construction:** Type of approach and rationale for the choice.
- **Monitoring approach for implementation:** Approach for monitoring and estimation during the implementation period which is defined by the national land-use sector monitoring systems and the data available in the system (e.g. expected use of satellite data, forest inventories, models for soil carbon) and how the monitoring approach is consistent with the reference level.

If countries decide to use projected reference levels or baselines in the LULUCF sector, it is recommended to use the existing guidance for forest reference levels either related to REDD+ activities or related to the Kyoto Protocol. Even in a situation in which guidelines have not been adopted for mandatory use, it is helpful for all experts involved in the task of setting reference levels to have a systematic methodology that has been developed by a wide network of scientists across all countries. This is likely to be more comprehensive as if national experts have to develop their own approaches. In this regard the availability of existing guidance for projected reference levels (as presented above) is an advantage in the land-use sector compared to other sectors.

If countries opt for a mitigation target that is compared with a BAU projection, it is very likely that the land-use sector is integrated into the BAU scenario in a similar way as other sectors. The assumptions and methods used will not be very different compared to the establishment of a separate forest reference emission level as for REDD+ or under the Kyoto Protocol and it would still be useful to consider the existing guidance elaborated for REDD+ or by the IPCC guidelines in such approach. It is important that countries provide transparent information how the BAU scenario for the LULUCF sector was constructed.

A net-net accounting approach in which the land-sector emissions are compared to a base year is a simple and straightforward approach for those countries that elect NDCs in which they account against a base year. However, for countries with a declining net sinks, this approach creates debits and additional mitigation efforts are needed from other sectors to compensate for the declining sink. Therefore, the net-net accounting against a base year approach has in the past not been very attractive for countries with large net sinks that see few potential to further enhance those. However, a number of countries have chosen a net-net accounting approach as part of their NDC (Australia, Canada, USA, Dominican Republic, and Moldova).

For the purposes of REDD+ activities, reference levels are often determined based on average GHG emissions from forests for a historical period, not a single base year (e.g. emissions from deforestation). Thus countries may wish to express its NDC contributions in the forest sector through REDD+ actions under the UNFCCC.

If countries want to avoid the high uncertainties that are linked to forest reference emission levels, there is the option to express the NDC in terms of absolute quantified levels or non-GHG metrics that should be achieved until 2030.

From those countries that submitted NDCs, few countries have clearly indicated the reference level they intend to

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use and several have indicated that they have not yet completed the work to establish a forest reference emission level. Thus, related to the assumptions chosen for the reference level or baseline, additional information is necessary to clarify the way how emission and removals from the land-use sector will be accounted towards the targets during the implementation of the NDC.

For all types of reference levels it is important to maintain consistency related to the methodologies, definitions, the coverage of sources and pools between the emission and removal estimates in the reference level and the monitoring of progress in the implementation period. A lack of consistency may compromise the assessment of performance and environmental integrity.

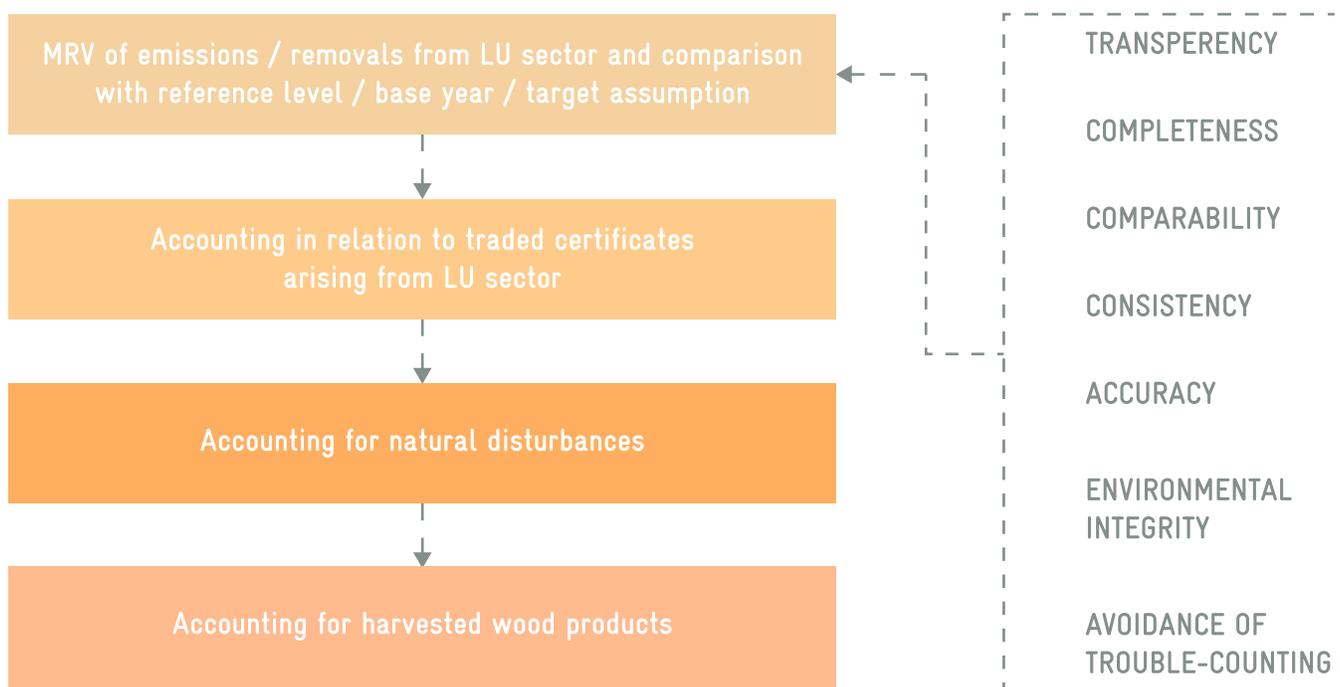
While the options presented in → **Table 2** have been considered as benchmarks for the emissions and removals in the forestry sector, emissions and removals from other land-uses such as cropland management or grassland management have in the past mostly not been compared to complex projected benchmarks, but to historic years or periods. Management practices and land use changes for croplands and grasslands affect mainly C in soils which is estimated by complex models in GHG inventories and linked to high uncertainties. The projection of all parameters used in such models may result in very complex projections with high uncertainties for the reference level while the comparison to a historic situation is simple and straightforward.

5.5 ACCOUNTING ELEMENTS DURING THE IMPLEMENTATION OF AN NDC

In addition to key accounting decisions related to the determination of the NDC presented above, there are specific accounting elements related to the land-use sector which are relevant during the implementation of the NDC for the tracking of progress and achievement of the NDCs. These elements relevant during the implementation of NDCs include (see also → **Figure 5-2**)

1. the monitoring and reporting of emissions/ removals from the land-use sector compared to the reference level, base year or target assumptions,
2. the accounting related to traded certificates arising from the land-use sector,
3. the accounting of natural disturbances and
4. the accounting for harvested wood products.

► **Figure 5-2:** Accounting steps that have to be addressed for the land-use sector during the implementation of an NDC



Source: Öko-Institut

The principles of transparency, completeness, consistency, comparability, accuracy have been defined in the IPCC and the UNFCCC reporting as key principles for the monitoring of GHG emissions and removals. Environmental integrity and the avoidance of double-counting are key principles for the accounting of emission reductions or sink enhancements towards mitigation targets and the implementation should be generally guided by those principles.

Parties under the Paris Agreement discuss further guidance related to transparent reporting and to for the tracking of progress with NDCs. Therefore, no further detailed discussion has been added to this paper which would potentially pre-empt international guidance which is currently developed.

5.6 TRACKING OF PROGRESS WITH THE IMPLEMENTATION AND ACHIEVEMENT OF NDCS IN THE LAND-USE SECTOR

The domestic implementation of the NDCs with an economy-wide scale and mitigation actions implemented for their achievement require an evaluation whether the methods used in the GHG inventory are fit for the purpose of tracking the effects of all mitigation actions. In the land-use sector there are frequently gaps and improvements of the GHG inventory are necessary to enable countries to fully reflect the effects of the mitigation actions. As the implementation

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of inventory improvements can take time, it is recommended to start such evaluation at an early stage and to include such considerations in the elaboration and design of mitigation actions.

In the land-use sector, mitigation actions are often implemented as actions in specific regions, programmes or initiatives because the regions in countries may be different related to forest types, crop types or livestock systems. The implementation of the mitigation actions depend on many different stakeholders at regional and local level. This may imply that different regional activities may need to be integrated into a domestic accounting system. It is important to define the data and information flows between the stakeholders that implement the actions at local and regional level and the national entities that are responsible for the tracking of progress of the national target. It is also important to ensure consistency of definitions, accounting approaches and methodologies and data used at local, regional and national level to ensure that the individual approaches are comparable and can be added up and aggregated across the different administrative levels to a national estimate.

Apart from the GHG inventories, there are several other tools and methodologies that assist countries in the tracking of progress with the mitigation actions and the emission reductions. The most common tool used are specific indicators to track progress. Several countries also implement registries for domestic mitigation actions to ensure a consistent information flow and accounting approaches in the implementation of mitigation actions. The most sophisticated approach to track progress are ex-post evaluation methods for individual mitigation actions that calculate the GHG impacts achieved after the action has been implemented for a certain period.

5.7 ACCOUNTING FOR NATURAL DISTURBANCES

In the development of NDCs countries should consider whether the land-use categories or activities included in their NDCs are subject to natural disturbances and whether such disturbances can have strong impacts on the emissions and removals (regularly or in extreme years). Due to the local or regional nature of natural disturbances the potential influence can especially striking in small countries relative to total emissions whereas in large countries the absolute amount of emissions from natural disturbances can be very high. If a significant risk is identified, the country may want to consider whether it is possible to apply the methodological approach provided in the 2013 IPCC supplement under the Kyoto Protocol, the only accounting method currently available to exclude such emissions and removals. If the land-sector is included in projected baselines, countries could assume a certain, regular level for emissions/ removals from natural disturbances in the baseline.

5.8 ACCOUNTING RELATED TO TRADED CERTIFICATES ARISING FROM THE LAND-USE SECTOR

If the CDM continues to be a market mechanism acknowledged under the Paris Agreement, an NDC that covers afforestation/ reforestation will need to subtract CERs generated and sold outside from afforestation / reforestation projects from the net removals generated by afforestation/ reforestation activities that are accounted as part of the NDC to avoid double counting.

The same situation related to double counting could occur for certificates from voluntary carbon markets in the land-use sector, if countries to which such certificates are sold would use them to achieve their NDC while the originating country also accounts for the emission reduction or enhanced sequestration.

Many countries expressed the support for the development of an international market –based mechanism under the Paris Agreement also highlighted the need for robust accounting and MRV rules. From an accounting perspective there should be international registries for such units that are linked and supervised in order to track the units that have been issued and used towards fulfilling the targets under the agreement. Without international accounting rules and related mechanisms such as registries, the tracking of potential double-counting would be very difficult for an individual country.

For the establishment of an NDC, It would be useful if countries indicate in their NDC whether they intend to use international market mechanism, for developing countries the use will mostly imply the use as an instrument to finance emission reductions or removal activities. It would also be useful to identify whether future double counting could potentially occur and establish rules from an national perspective how the country will deal with this situation.

5.9 ACCOUNTING FOR HARVESTED WOOD PRODUCTS (HWPS)

The accounting of Harvested Wood Products implies that it is no longer assumed that harvested wood is immediately turned into CO₂ emissions, but that the C contained in the harvested wood is stored in wood products (e.g. wood used for construction purposes, but also paper) and is only released when these wood products decay. Four different approaches have been developed as part of IPCC Guidelines for the accounting of harvested wood products.

Under the Paris Agreement a single reporting approach for HWP should be agreed to avoid the omission or double counting of emissions and removals which can result from different combination of approaches in different countries.



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