



Mitigation accounting under the Paris Agreement

Technical paper

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Executive summary

Accounting for nationally determined contributions (NDCs) is an important component of the ‘rule-book’ required for effective implementation of the Paris Agreement. Robust mitigation accounting is needed for effective implementation and to strengthen the multilateral rules-based regime under the Convention. This paper focuses on mitigation accounting as a particular component of the Paris Agreement Work Programme (PAWP), while also identifying linkages to other elements such as transparency.

Some working definitions of key terms are used in this paper – what we mean by counting, accounting and accounting for NDCs; and when accounting is applied. In this paper, counting refers to quantifying data, parameters and assumptions, and performing mathematical operations; accounting generally means comparing against a goal or benchmark; and accounting for NDCs means comparing achievement of the targets in a Party’s NDC and explaining this in a responsible manner. The timing of application may be understood before, during and after a period of implementation (that latter term used interchangeably with common time-frame). Before a period of implementation, a Party should describe the accounting methodologies to be used, as part of the information communicated with its NDC (negotiated under APA item 3 b). During a period of implementation, a Party will provide information that enables tracking progress on implementing its NDC. After a period of implementation, a Party will report information on achievement of its NDC.

Information communicated before the period of implementation sets up accounting. There are several elements of information in the Lima and Paris decisions. Parties should consider the guidance on mitigation accounting (once this is agreed) and indicate what information it plans to report when accounting for its NDC. More specifically, the paper suggests that Parties include definitions of key indicators for accounting, sources of information and methodologies, from among those identified in the section on information for tracking progress of modalities, procedures and guidelines (MPG). While voluntary, many Parties have chosen to include this information – including aspects that are relevant to accounting. These are elaborated in section 1.1; while section 1.2 argues that no new features are needed and very little if any time need to be spent on this aspect.

Turning to mitigation accounting, as negotiated under APA item 3 (c), a three-part structure is offered: methodological issues, land and markets.

While greenhouse gas (GHG) inventories are about counting emissions, they are an essential foundation for mitigation accounting. Given their importance, it is recommended that developed countries should adopt the most recent IPCC guidelines while developing countries are supported in doing so, over time. It is proposed that Parties identify a main mitigation target within their NDC, against which they will account. Methodological consistency can be enabled by well-defined quantifiable reference points. The paper recommends that this should be a base year for absolute targets by developed countries; whereas for developing countries, there would be various reference points related to a range of mitigation efforts, but when they move to reduction and limitation targets, a base year would then be appropriate. Technically, fixed target levels could provide similar clarity and transparency, but given the deeper experience with base years, this form is suggested. Based on the analysis in the sub-section on scope and coverage, the paper suggests that developed countries continue to account for 7 gases and developing countries for the GHGs in their inventories, or at least 3 major gases, moving to broader scope gradually over time.

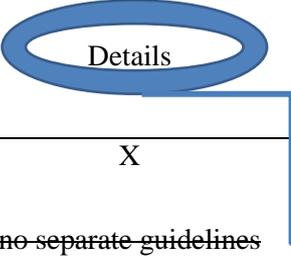
The paper raises major methodological challenges with NDCs containing mitigation targets expressed relative to baselines – uncertainty, gaming, changes in key assumptions, unverifiable as counter-factuals, and complexity. It would be preferable to move away from this type and indeed, Article 4.4 agreed a transition over time. At an absolute minimum, for as long as countries persist in choosing this form, the requirement must be to use the same BAU projection in communicating and accounting for their NDC, there can be no change of baseline during a 5-year common time-frame, and successive NDCs must include more stringent baselines (i.e. resulting in greater emission reductions), in order to remain consistent with the progression and the highest level of ambition of the Party.

Single-year targets are also common in the first set of NDCs, but they lack environmental integrity. Based on analysis of various options in the literature, the paper suggests a NDC GHG balance sheets that would be defined over a period of time (see Figure 5 in the main text). This will assist with reporting on mitigation accounting under the transparency framework; and should be considered an eligibility requirement for participation in cooperative approaches under Article 6.2. Cap-and-trade requires a well-defined cap. More generally on markets, the paper notes that participation in markets is voluntary participation, but argues that, once a Party has chosen to use IMTOs, robust rules must apply. The analysis presented in this paper suggests that, while a supervisory body will oversee the Article 6.4 mechanism, technical expert review teams will need guidance to verify accounting for cooperative approaches – and the implications of ITMOs for mitigation accounting.

Mitigation accounting in relation to land should generally follow the same guidance as applied to other sectors. There are a few aspects specific to the land sector. Specific guidance is needed in relation to natural disturbances, legacy effects and harvested wood products. The paper reviews some proposals to deal with these complex issues.

The negotiations on mitigation accounting need to be understood in technical detail; equally important is an appreciation of the linkages to other issues. The links to the enhanced transparency framework under Article 13 are discussed throughout the paper. Negotiations on markets will likely develop detailed rules, but also need to be referenced in mitigation accounting. The information reported on accounting for NDCs and tracking progress will be important inputs to the global stock-take.

With the Paris rule-book to be concluded in 2018, the paper consider where guidance on mitigation accounting might best be placed – both in decision text and guidelines (the latter typically appended to decisions). Figure 2 illustrates how the relationship between mitigation accounting and transparency of mitigation might work.

	Mitigation accounting	Transparency of mitigation
Decision text	✓ Principles and high level elements 	✓ Principles and high-level elements
Guidelines	X no separate guidelines	✓ Detailed elements on mitigation accounting, including markets, and transparency of mitigation

Principles and high-level elements of mitigation accounting and transparency related to mitigation can each have distinct paragraphs in decision text. However, it would not be practical to develop two sets of guidance, mitigation accounting and another on transparency of mitigation – two sets would be a recipe for inconsistency and uncertainty. Guidance on mitigation accounting, developed pursuant to paragraph 31 of 1/CP.21, and the mitigation component of common modalities, procedures and guidelines (MPG) under Article 13, should result in one set of guidance.

1. Introduction and background

Accounting for nationally determined contributions (NDCs) is an important component of the Paris Agreement on climate change (UNFCCC 2015b). It is considered part of the ‘rule-book’ required for effective implementation of the Agreement and strengthening the multilateral rules-based regime under the Convention. To this end, the Paris decision requested the Ad Hoc Working Group on the Paris Agreement (APA) to elaborate guidance for accounting under Article 4.13, drawing on approaches under the Convention and its legal instruments (UNFCCC 2015a: paragraph 31).

“Parties shall account for their nationally determined contributions. In accounting for anthropogenic emissions and removals corresponding to their nationally determined contributions, Parties shall promote environmental integrity, transparency, accuracy, completeness, comparability and consistency, and ensure the avoidance of double counting, in accordance with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement.” (UNFCCC 2015b: Article 4.13).

Parties have agreed to include the Paris Agreement Work Programme (as the ‘rule-book’ is more formally known) by 2018. In the negotiations under the APA, mitigation is item 3 and mitigation accounting sub-item (c). Accounting for NDCs is closely related to the information when they communicate NDCs (APA item 3 (b)). Sub-item 3 (a) relates to features of NDCs, though there is divergence whether any new features beyond those established in Paris are needed. This technical paper focuses on mitigation accounting, against the background of information. Information against which to account

1.1 Information against which to account

Information in this context refers to countries stating upfront what they will account for in their NDCs, at the time of submitting their NDCs. After implementation of NDCs, Parties then account for the NDCs (see working definitions in section 2.2 below).

Information can be defined by agreement among Parties and is also communicated by Parties together with their NDCs. One can think of a continuum, at the one extreme end of which would be centrally prescribed information and at the other extreme, Parties choosing information without any guidance. In practice, negotiations are likely to end up somewhere along this (heuristic device of a) continuum. Some elements of information were included in the invitation in Lima to submit intended nationally determined contributions (INDCs) prior to COP21. Therefore some guidance exists, though the language of decision 1/CP.20 (UNFCCC 2014: paragraph 14) does not prescribe specific elements: While agreeing that information is to be provided to facilitate clarity, transparency and understanding but leaving open as to which elements countries include. The same language was repeated in the Paris decision, so the decision to offer facilitative guidance has been repeated.¹

Many countries used the elements in the Lima decision to structure the mitigation component of their INDCs. Since countries have a wide range of different starting points, the provisions agreed in Paris allow for a range of approaches, while encouraging a minimum set of information to be provided. The negotiations on information may elaborate further, also informed by the experience of submitting INDCs.

Accounting for NDCs is new given that NDCs are a construct coined in Warsaw (UNFCCC 2013). Some new elements would enable accounting for NDCs, beyond those in the Paris decision (elaborated below). Accounting for NDCs requires that Parties provide information on how they will account for their NDC and to this end, include definitions of key indicators for accounting, sources of information and methodologies, from among those identified in the section on

¹ Except that NDCs will no longer be ‘intended’ (UNFCCC 2015a: paragraph 27),

information for tracking progress² of modalities, procedures and guidelines (MPG). Parties should ideally also identify one or more mitigation targets in the NDCs against which they intend to account (the ‘main’ mitigation target(s)).

There is more experience in relation to developed countries accounting for quantified emission reduction or limitation commitments (QELRCs) under the Kyoto Protocol (UNFCCC 1997) and (less rigorously) for quantified economy-wide emission reduction targets (QEERTs) under the Convention, while developing countries had nationally appropriate mitigation actions (NAMAs) under the Convention being measurable, reportable and verifiable (MRV) (UNFCCC 2007). The provisions for MRV, together with international assessment and review for developed countries and international consultation and analysis, inform the enhanced transparency framework under Article 13 (UNFCCC 2015b). For developing countries, mitigation accounting is new. NAMAs were entirely voluntary, whereas NDCs under Article 4 are legal obligations of conduct for all Parties, so that the context in which developing countries account is very different to the situation prior to Paris.

Information will continue to refer to the elements already agreed. The first of these is a quantifiable reference point, which is important information in order to account for mitigation components of NDCs. Developed countries must have absolute emission reduction targets (AERTs), while developing countries can continue with mitigation efforts, but over time move to economy-wide emission reduction or limitation targets (EERLTs), consistent with Article 4.4 of the Paris Agreement. AERTs are absolute and developed countries have previously had absolute mitigation targets under the Kyoto Protocol (UNFCCC 1997) and / or the Cancun Agreements (UNFCCC 2014). Emission in a historical base year is the obvious reference point. Fixed target levels might serve a similar purpose and have been proposed in some NDCs (Argentina, SA, Brazil), but would need to be a reduction. Also, there is more precedent for base years and hence it seems practical to work with this reference point. While NDCs may have different base years, in order to understand the aggregate effects, reductions against 1990 levels also need to be available. For developing countries, one might expect multiple reference points. For countries that have chosen the carbon or emission intensity of the economy to convey mitigation targets in their INDCs, historical values of that intensity is information against which they would be expected to account. Many countries have chosen projections of baseline emissions, or business-as-usual projections (Hood & Soo 2017). Baselines are notoriously uncertain, as projections will vary depending on key assumptions and input data used to project into the future. For this type, the minimum information provided upfront should include not only the quantified GHG projection up to the target years, but also the inputs and assumptions. Over time, when developing countries move to EERLTs, historical base year emissions will become the obvious reference point. Limitation targets could be stated in absolute tons of emissions (Mt CO₂-eq) over a period of time; however, one reference point would be simpler and such targets should also be reported in reductions against a 1990 base year, to enable aggregation.

For all NDCs that contain multiple mitigation targets, it would be helpful for countries to identify the main target against which they intend to account. This could be more than one target, but clearly identifying against which components of the NDC the Party intends to account.

For example, Australia’s NDC includes both a base year target (against 2005 levels) but also refers to additional policy measures on renewable energy and energy efficiency – and quantifies the former as follows: “Under Australia’s Renewable Energy Target scheme, over 23 per cent of Australia’s electricity will come from renewable sources by 2020” (Australia 2016). While it seems reasonable to read the base year target (in bold text) as the main target, there is no explicit statement that Australia will account for only the base year target, nor is it entirely clear whether or how the renewable energy target will enter accounting. Another example is India: The NDC clearly identifies a box within section IV titled “India’s INDC”, so this seems a good indication that this is the main part of the 38-page NDC document (GoI 2016). However, within that text box, there are 8 points; the first two are general, the next three relate to mitigation, point 6 is on

² More precisely “Information necessary to track progress made in implementing and achieving its nationally determined contribution under Article 4 of the Paris Agreement” (title of Section C of the informal note on APA item 5 version of 14 November 2017) or whatever that section is finally named.

adaptation, followed by finance and capacity. Among the three mitigation points, can analysts assume that the main target is “to reduce the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 level” (GoI 2016)? Does the Government of India plan to account against an intensity target, or also against 40% cumulative electric power capacity from non-fossil fuel based energy and / or a carbon sink of 2.5 to 3 billion tonnes of CO₂-equivalent, each by 2030? It is also conceivable that the latter two are domestic mitigation measures to achieve the intensity reduction – but this is not explicitly stated. Elsewhere in the NDC, India indicates 175 GW of renewable energy installed by 2022, though the placement suggests this is not a core part of its NDC. It would aid clarity if India itself identified a main target for the purposes of mitigation accounting.

On scope and coverage, the AERTs of developed countries are economy-wide by definition in Article 4.4 of the Agreement. Given their capacity and experience, it would be reasonable to expect the inclusion of seven gases (CO₂, CH₄, N₂O, PFCs, HFCs, SF₆ and NF₃). Developing countries may initially have mitigation efforts limited to some sectors but will move over time to the broader scope of economy-wide emission reduction or limitation targets (EERLTs). Developing countries might initially include all the gases in their GHG inventory (GHG-I), or at least the three major gases (CO₂, CH₄, N₂O). As the UNFCCC considers and includes other greenhouse gases (GHGs) based on advice by the Intergovernmental Panel on Climate Change (IPCC), these may be added to the lists. The general trend needs to be to complete coverage and broad scope, in order to address the challenge of rapid reductions in GHG emissions – a key element of Article 4.1 of the Paris Agreement. Increasing scope and coverage in GHG inventories should be required under the enhanced transparency framework under Article 13.

Another element of information are planning processes. In 2020, countries will update or submit new NDCs (UNFCCC 2015a: paragraphs 23 and 24) and all countries will then submit further NDCs every five years under Article 4.9, i.e. another round of submissions in 2025. Countries will have their own ways of undertaking domestic ‘homework’ in preparing their NDCs. It may be helpful for countries to learn from each other by sharing experiences and drawing on literature reflecting on lessons learned (Dodwell, Holdaway, Sura & Picot 2015; Torres Gunfaus, Rudnick, Gonzales, Winkler, Pirazzoli & Zevallos 2014). Mainstreaming the mitigation targets to be included in a NDC into development and sectoral plans seems likely to improve the prospects for effective implementation (Fankhauser & Stern 2016; Gupta & Arts 2017; Winkler, Delgado, Palma-Behnke, Pereira, Vasquez Baos, Moyo, Wills & Salazar 2017). Other analysts suggest that clear information on jurisdiction and goal boundaries will be important (WRI 2014).

Information on assumptions and methodological approaches will include inputs and assumptions relating to the quantifiable reference point, discussed above. In addition, methodological consistency is critical. This is recognised in the Paris decision: “Parties ensure methodological consistency, including on baselines, between the communication and implementation of nationally determined contributions” (UNFCCC 2015a: paragraph 31 (b)).

Fairness and ambition are very important elements of information. Researchers suggest that countries need to explain better how their contributions are fair (Mbeva & Pauw 2016; Winkler, Höhne, Cunliffe, Kuramochi, April & de Villafranca Casas 2017). While most INDCs addressed equity in some way, an expert workshop would be helpful in sharing experience and improving the information submitted with future NDCs. Such a workshop, hosted by the Chair of SBSTA, could develop options, menus, tiers, definitions of oft-used technical parameters and others approaches, all of which would enable Parties to improve how their explanations of how the successive NDCs are fair and ambitious. The IPCC’s Sixth Assessment Report may also assist by including in its assessments literature on relation to equity and ambition in NDCs and providing a summary in its synthesis report. Progression to higher ambition is mandated for each Party in the Agreement – each successive NDC “will represent a progression beyond the Party’s then current nationally determined contribution and reflect its highest possible ambition” (UNFCCC 2015b: Article 4.3). This does not mean all countries apply the same percentage increase, rather progression defines the country’s own previous NDC as its reference point. While Article 4.4 talks to one form for developed countries and a move to a single form for developing countries over time, progression in Article 4.3 must include the stringency of the mitigation target – measured against its own previous NDC. Equity is an enabler of ambition and thus both elements

of information are important to achieve the objective of the Convention and the aims of the Paris Agreement.

The discussion above has tended to focus on information communicated by Parties. As outlined at the outset, the ongoing negotiations on information may add elements. Over time, if elements of information that are currently framed as voluntary, facilitative guidance become common practice, it might be that some become mandatory. This would be in the spirit of the law encoding practice, rather than prescribing upfront.

Given decisions thus far, it is clear that the information communicated by countries when submitting their NDCs is important in establishing some basis for mitigation accounting. Parties communicate upfront which information they will account against, including ideally a main mitigation target, and then account for their NDC after implementation and to demonstrate achievement. Related to this is tracking progress during implementation, a point this paper returns to below.

1.2 No new features?

The negotiations leading up to the Paris Agreement considered a range of features. While some features were included in the final Agreement, consensus could not be reached on all features (Winkler 2017). The Paris decision requested to the APA to consider further guidance on features (UNFCCC 2015a: paragraph 26). However, negotiations under the APA have been characterised by lack of clarity on the distinction between features and information. There is divergence whether any new features are needed. One possible exception is common time-frames, which is relevant to accounting. The Paris Agreement specifies that the frequency of submitting NDCs is every five years (UNFCCC 2015b: Article 4.9), but it could not be resolved whether the time-frame for implantation would be 5 or 10 years. The INDCs submitted prior to Paris included both. Common time-frames are being negotiated under the Subsidiary Body for Implementation (SBI). It appears likely that other possible features that relate to accounting – such as methodological consistency – are treated under information.

1.3 Linkages to other issues under negotiation

Mitigation accounting has linkages to issues negotiated under other agenda items. A link already noted is to the enhanced transparency framework under Article 13. Tracking progress in implementing and achieving NDCs is a specific link (UNFCCC 2015b: Article 13.7(b)). Information is provided before the NDC is implemented, tracking progress happens during the period of implementation³, while accounting for NDC is undertaken after the period of implementation. Hence the negotiations under APA item 3 link to item 5. Internationally transferred mitigation outcomes (ITMOs) generated under Article 6.2 needs to be added or subtracted to account for NDCs, requiring a link to negotiations under the SBI. Reporting the results of mitigation accounting may also be important in the process of preparing inputs to the global stocktake (GST). The inputs to the GST are likely to be biennial communications and an updated synthesis report on aggregate effects of NDCs, but mitigation accounting will be crucial to the quality of information. Inputs, modalities and outputs of the GST are negotiated under APA item 6.

2. General elements of mitigation accounting

The general approach to mitigation accounting is set in Article 4.13 of the Paris Agreement, as introduced above.

Climate change negotiations have been characterised as too technical for the politicians, but too political for the technicians. The approach taken in this paper is to note the political issues (such

³ Paragraph 27 of decision 1/CP.21 refers to “time-frames and / or periods of implementation”. The phrases time-frame and period of implementation are used interchangeable in this paper, to mean the number of years during which a NDC is implemented. Common time-frames remain to be agreed, while a five-year frequency has been set in Article 4.9.

as differentiation) in the present section and then move on to the technical issues of mitigation accounting in section 3.

2.1 General approach to accounting

While the choice of the word ‘guidance’ appears to suggest a softer approach, the use of prescriptive language (‘shall promote’ and ‘shall account’) and the fact that these mandatory obligations are required to be fulfilled ‘in accordance with’ guidance adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA), is a clear indication that the guidance is intended to be binding (Winkler 2017). The practice, of course, will depend on the precise language of the guidance, and the extent to which it incorporates mandatory or discretionary elements (Rajamani 2016). Paragraph 31 of decision 1/CP.21 specifies some considerations: methodologies and common metrics, methodological consistency, striving to include all sources and sinks, and the notion of ‘once in, always in’ for sources—and particularly for sinks; and explanations for exclusions of categories.

As general matter, guidance needs specificity. Specificity is important to sufficiently precise guidance to reviewers of information. Furthermore, “guidance to reviewers will need to align with the accounting guidance that must be developed under Article 4, paragraph 13, and Article 6” (Dagnet, Van Asselt, Cavalheiro, Rocha, Bisiaux & Cogswell 2017). That said, specificity need not be prescriptive, for example, providing a range of options (each well specified) will enable all Parties to implement the guidance. The desire for flexibility in a facilitative system needs to be balanced with the requirements for some common elements to ensure consistency and comparability. With much flexibility given by the nationally determined nature of the contributions themselves, clear rules for mitigation accounting are needed to ensure environmental integrity. Yet rules so rigid that they cannot be used have no utility. The appropriate balance between specificity and flexibility needs careful consideration. It is also important that rules be pragmatic and facilitative.

The approach to developing further guidance might do well to build on experience. Existing guidelines may be a useful starting point in developing guidance for accounting for NDCs. Such guidelines could include UNFCCC reporting guidelines on annual GHG inventories (decision 24/CP.19); IPCC guidelines for national GHG inventories (2006 and earlier versions); the Kyoto Protocol reference manual and others. Clearly, the context differs – the Kyoto Protocol prescribed clearer mitigation targets for Annex I Parties than the Paris Agreement. The guidelines for biennial reports by developed countries included elements of accounting for their QEERTs; while guidelines for measurement, reporting and verification (MRV) by developing countries were in the content of transparency, but not with any explicit reference to accounting (UNFCCC 2011). Nevertheless, existing guidelines contain agreed language and using them as a starting point has the advantage of not reinventing the wheel on some technical issues.

Clear methodological guidance is needed to implement the Paris Agreement. A clear structure is helpful in this regard. The guidance on technical elements can be organized under broad categories of issues. As in the present paper, broad categories of methodology, land and ITMOs provide a general structure for guidance.

The general approach should be to develop the most complete and rigorous guidance possible, as part of the Paris Agreement Work Programme (PAWP) in 2018. That said, the complexity of issues suggest guidance will not be perfect, and good practice is to revise guidance once some experience has been gained in applying it. Thus, the guidance itself should provide for revision a few years after implementation of the first NDCs, i.e. INDC submitted prior to Paris and that became first NDCs on ratification (UNFCCC 2015a: paragraph 22; UNFCCC 2016b). Accounting guidance will apply to second NDCs, while Parties may choose to apply guidance to first NDCs (UNFCCC 2015a: paragraph 32). Given that some Parties’ first NDC have a period of implementation up to 2030, a ‘prompt start’ to mitigation accounting is desirable. This could take the form of a decision that Parties submit supplementary information on mitigation accounting up to 2030 as part of biennial communications. At COP24 in 2018, Parties may also decide to develop further technical guidelines on certain aspects, e.g. while broad land sector

guidance is to be agreed in 2018, further work might be needed on harvested wood products (as a purely illustrative example), if not complete in time.

Having considered general approaches, the paper turns to the purpose and definitions of accounting.

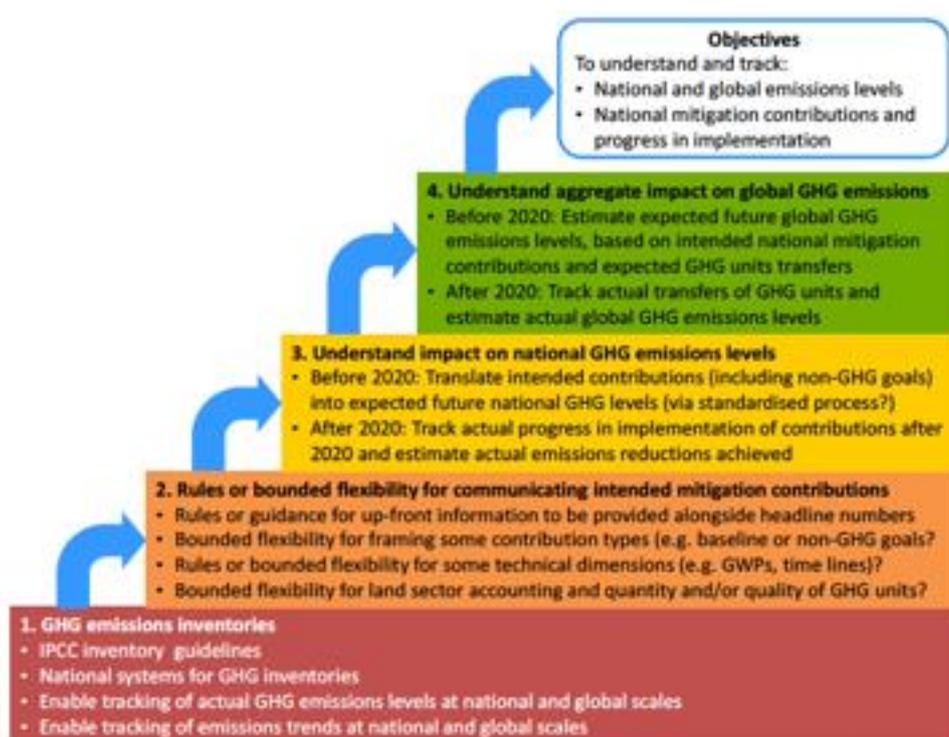
2.2 Purpose and definitions of accounting

Accounting for nationally determined contributions (NDCs) is an important component of the ‘rule-book’ required for effective implementation of the Paris Agreement and to strengthen the multilateral rules-based regime under the Convention. In providing guidance on accounting for NDCs, the purpose should be clear. A key purpose of accounting is to “explain / record your targets in a responsible manner” (Pei & Fan 2017). One might elaborate that accounting aims to build mutual trust among Parties and to explain to the public what Parties will do.

Another approach to purposes is to identify objectives and the means to achieve them. Hood, Briner and Rocha (2014) outline four building blocks, each containing several elements, that would be needed to address the objectives of mitigation accounting. The concept is shown in Figure 1, noting that it was developed prior to Paris and so might benefit from modification in the light of the Agreement.

Figure 1: Four building blocks needed to deliver the full range of accounting objectives

Source: (Hood et al. 2014)



Definition of terms is helpful to avoid misunderstanding. For the purposes of this technical paper, accounting is used in different senses:

Counting refers to quantifying data, parameters and assumptions, and performing mathematical operations (adding, subtracting, multiplication and more complex formulae)

Accounting generally means comparing against a goal or benchmark

Accounting for NDCs means comparing achievement of the targets in a Party’s NDC and explaining this in a responsible manner

Methodologies for counting in the context of mitigation include approaches, parameters, formulae used to calculate GHG emissions,⁴ removals and reductions for a GHG inventory, but also include other aspects, for example values for GDP used in intensity targets. The working definitions make clear that accounting for NDCs has is normative elements (in the reference to responsibility), whereas counting is technical (e.g. adding and subtracting emissions and methodologies to do so). Broader definitions will be needed in relation to adaptation components of NDCs, but these are beyond the scope of the present technical paper.

2.3 Principles

The principles for mitigation accounting are stated in Paris Agreement. Article 4.13 includes the ‘TACCC’ principles (transparency, accuracy, completeness, consistency and comparability) as well as environmental integrity and avoiding double counting. For guidance, the question is whether the recitation of the principles suffices or whether each principle needs to be elaborated to be used by Parties and others interested in the results of mitigation accounting.

The Article starts with promoting environmental integrity, which is very general and enabled by applying all other principles.

This technical paper follows the approach suggested by Hood, Briner and Rocha (2014), who note that the “meanings of the TACCC elements are already well established in Intergovernmental Panel on Climate Change (IPCC) and UNFCCC guidance for national greenhouse emissions inventories”. To take GHG inventories as a fundamental basis to account for mitigation targets in NDCs makes good sense, and thus the meanings of the principles as interpreted for inventories can be applied to mitigation accounting too.

“Transparency means that assumptions and methodologies are clearly explained and documented to facilitate replication and assessment

Accuracy is a relative measure of the exactness of an estimate, which should not be systematically over or under the actual level, and uncertainties should be reduced as far as possible

Completeness (in the context of national inventories) means that there is full coverage of sources, sinks, and gases in the IPCC guidelines, across all geographic areas

Comparability means that estimates should be comparable among Parties, through use of agreed methodologies and formats, including IPCC guidelines

Consistency refers to coherence across time, with estimates using the same methodologies and data sets in the base year and subsequent years, and any updates applying across all years.” (IPCC 2006)

Completeness in the context of NDCs would assume complete coverage and all gases. Consistency has particular meaning, with methodological consistency needed between communication and accounting for NDCs, and time-lags between the communication of NDCs and their period of implementation (typically five years).

Some modification may be needed to account for targets in NDCs expressed in non-GHG terms. It is useful to consider two cases: 1) where domestic mitigation measures are included in addition to another target expressed in GHG terms; and 2) where all targets are in non-GHG terms. In case 1, mitigation accounting can still be applied to the GHG target. In case 2, the targets would need to be converted into GHG terms for the purposes of *mitigation* accounting. While contributions are nationally determined under the Paris Agreement, the manner in which Parties account for NDC must be “in accordance with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement” (UNFCCC 2015b: Article 4.13). In case 2, if Parties choose not to convert non-GHG targets (nationally determined) into GHG terms for the purposes of mitigation accounting, this has several implications. Firstly, at the individual level,

⁴ It is noted that some NDCs have only non-GHG targets. Whether such NDCs need an ‘NDC GHG balance sheet’ (e.g. for transfer of ITMOs) is a distinct matter. The focus here is on accounting for *mitigation*. And focused work is needed on the GHG emissions, removals and reductions.

no *mitigation* accounting is possible, as mitigation is by definition about GHG emission reductions and removals. Accounting for the NDCs in non-GHG terms is still possible, using other metrics such as the MW of renewable energy capacity installed or hectares of land. Secondly, at the inter-national level, comparability is not enabled, comparing GHG and non-GHG targets. That said, the meanings above of transparency, accuracy and consistency can be applied to GHG and non-GHG targets. Thirdly, the collective understanding of aggregate effects is made difficult for the Secretariat in updating a synthesis paper. Fourthly, expressing a target in GHG terms should be an eligibility requirement to participate in cooperative approaches. One cannot trade against a cap if that cap is not well defined, and ITMOs are *mitigation* outcomes. There is a methodological requirement of convertibility which needs to be defined multilaterally. Overall, however, the guidance for accounting should focus on elaborating elements related to GHG – after all, the focus is on mitigation..

Avoiding double counting is perhaps the least lofty of the principles in Article 4.13. Avoiding double counting means not using the same tons reduced (or other ‘outcome’) for more than one NDC. There should be no double counting, or more precisely double claiming. This has operational meaning. One meaning relates to markets, that ITMOs not be used by both the buyer and seller. Article 6.5 specifies that emission reductions from the 6.4 mechanism shall not be used to demonstrate achievement of both host and another Party’s NDC. It is also conceivable that mitigation projects supported by non-market mechanisms might be counted twice; for example, a grant-funded project in one country might be claimed in its NDC and also referred to in the donor country’s NDC – double claiming the mitigation outcome. Clearly, the Paris Agreement indicates that double counting is not permissible.

2.4 Timing of application

Timing of application refers to *when* accounting for NDCs takes place. This is not a single point in time: accounting for NDCs is important before, during and after a period of implementation:

- *Before* a period of implementation, a Party should describe the accounting methodologies to be used, as part of the information communicated with its NDC (negotiated under APA item 3 b)
- *During* a period of implementation, a Party will provide information that enables tracking progress on implementing NDC, which is towards achievements but not yet complete; and
- *After* a period of implementation, a Party will report information on achievement of its NDC.

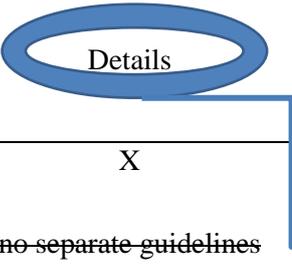
The application of accounting before implementation relates to APA item 3b, while the mitigation accounting during and after implementation relates to APA item 5 – notably to tracking progress under Article 13.7, technical expert review and facilitative multilateral consideration of progress. While mitigation accounting is negotiated under item 3c, it is therefore clear that there are particularly close linkages to 3b and 5, information and transparency particularly the tracking of progress under Article 13.7 (b). On the latter, it may be that mitigation accounting, including principles and other elements, is included in a decision, while detailed technical aspects would best be integrated with a section on tracking progress in the modalities, procedures and guidelines pursuant to Article 13.

Applicability is a related but distinct matter, of mitigation accounting applying to which rounds of NDCs. In the Paris decision, it was agreed that “Parties shall apply the guidance” for second and subsequent NDCs, and may choose to apply them for their first NDC (UNFCCC 2015a: paragraph 32).

2.5 Mitigation accounting, transparency of mitigation and markets

Guidance on mitigation accounting, developed pursuant to paragraph 31 of 1/CP.21, and the mitigation component of common modalities, procedures and guidelines (MPG) under Article 13, should result in one set of guidance. It would not be practical to develop two sets of guidance, mitigation accounting and another on transparency of mitigation. Two sets of guidelines would create the risk of inconsistency between the two and uncertainty (for example in the minds of reviewers) as to which guidelines apply in a particular situation. It is also worth keeping in mind that the MPG will continue to exist alongside arrangements under the Convention (including for national communications and MRV), at least as long as not all Parties to the Convention have ratified the Paris Agreement (as of March 2018, 175 of 197 had done so – still leaving 22 countries that have not). Figure 2 illustrates the relationship between mitigation accounting and transparency of mitigation; with elements in decision text and guidelines (typically appended to decisions).

Figure 2: Elements of mitigation accounting, transparency of mitigation and markets, and their placement in decision text or guidelines

	Mitigation accounting	Transparency of mitigation
Decision text	✓ Principles and high level elements 	✓ Principles and high-level elements
Guidelines	X no separate guidelines	✓ Detailed elements on mitigation accounting, including markets, and transparency of mitigation

On the other hand, specific guidance *is* needed under Article 6 (see section 3.3 on the links between markets and mitigation accounting). This paper assumes that some elements of the specific guidance will be in separate guidance, for example if registries are established. What is relevant to mitigation accounting is guidance that is needed particularly with reference to transfers based on the use of cooperative approaches. It would be useful to include cross-cutting elements within the guidelines on mitigation accounting, for example requirements for NDC GHG balance sheets are useful for both mitigation accounting and a necessary condition for transfers of internationally transferred mitigation outcomes (ITMOs). As Figure 2 shows, this guidance is nested in accounting, and placed in the MPG on information to track progress. This means that mitigation accounting / tracking progress, including any use of ITMOs, will be reviewed by TER teams. Reviewers will need specific guidance (unless the supervisory body under Article 6.4 were tasked with checking consistency with market guidelines and / or use of ITMOs).

In the same vein, facilitative multilateral consideration of progress (FMCP) is a process mandated under Article 13: “Each Party shall participate in a facilitative, multilateral consideration of progress with respect to efforts under Article 9, and its respective implementation and achievement of its nationally determined contribution.” This should be the single process for accounting for NDCs under Article 4, i.e. no duplicate process for accountability should be set up pursuant to Article 4.13.

2.6 Flexibility and differentiation

Important issues raised by Parties across the APA and other agendas include differentiation and flexibility, with political linkages that go beyond the scope of this technical paper. This paper takes the approach of applying nuanced differentiation in particular aspects of information and methodologies for mitigation accounting, consistent with the Paris outcome.

In general, nuanced differentiation means avoiding extremes. Neither guidelines in two parts nor a single accounting approach applied in an undifferentiated way to all parties is consistent with the Paris outcome. That said, differentiation is a broader issue, which appears likely to be decided politically and relatively late in negotiating the PAWP.

Mitigation accounting is neither common nor differentiated. In relation to information and accounting, specifically, is important to recognise different starting points, capacity and support needs to provide information and improve accounting over time.

An example of nuanced differentiation is flexibility in methodologies for mitigation accounting. Flexibility is given by tiers for GHG inventories; choice of approaches for the land sector; and participation in market mechanisms and / or use of ITMO. Flexibility is not unlimited – Care needs to be taken that flexibility on GHG inventories under Article 13.7 (a) does not conflict with requirements for robust mitigation accounting. Countries are encouraged to move to higher tiers over time, and once approaches to land or ITMOs have been chosen by a country, robust strict rules should apply – to ensure environmental integrity. Approached in this manner, flexibility need not come at the expense of clarity and certainty of what a NDC means.

3. Specific elements of guidance on mitigation accounting

Having considered information (section 0) and general elements of mitigation accounting (section 2) above, this technical paper now turns to specific elements of mitigation accounting. These elements are organised under methodological issues, land and markets in sections 3.1 to 3.3, before 3.4 brings together these elements in overall accounting for mitigation NDCs.

Drawing on the existing literature Hood, Briner & Rocha (2014) suggested a list of elements that might be need to understand a mitigation contribution – though this was prior to Paris. Their list built on earlier studies by the OECD (Briner & Prag 2013) and is broadly consistent with work on the GHG Protocol Mitigation Goal Standard (WRI 2014). The present technical paper includes the elements above, though differing in the emphasis on baselines. Also note that the papers above were written before the Paris Agreement in 2015.

While acknowledging that many developing countries have chosen to express mitigation components of their NDC as reductions against a baseline or business-as-usual scenario, there are three problems with this approach. The one is that baselines have high degrees of uncertainty – even compared to intensity targets (Torres Gunfaus et al. 2014). While methods to approach high degrees of uncertainty in GHG baselines have been studied (Merven , Durbach & McCall 2015), projections remain uncertain. Secondly, baselines are open to gaming. Thirdly, significant changes can occur – some beyond the control of the country – in key assumptions driving baselines projections – including relative prices of technologies and economic growth projections – sometimes within short time-frames. Fourthly, baselines are counter-factual and thus cannot be verified. Fifthly, the foregoing elements provide a sense of the complexity of baselines and capacity to project them rigorously may be lacking in some countries that have chosen this form.

The experience with project-based baselines in the CDM demonstrated that project developers have an interest in presenting a high baseline in order to sell higher reductions for the same level of effort (Ellis, Winkler, Morlot & Gagnon-Lebrun 2007; Schneider 2009; Spalding-Fecher & Schneider 2017). Countries expressing a mitigation target have an interest in presenting their efforts against a higher baseline. Intensity targets at least can be assessed against historical levels. At an absolute minimum, for as long as countries persist in choosing this form, the requirement must be to use the same BAU projection in communicating and accounting for their NDC, there

can be no change of baseline during a 5-year common time-frame, and successive NDCs must include more stringent baselines (i.e. resulting in greater emission reductions), in order to remain consistent with the progression and the highest level of ambition of the Party (UNFCCC 2015b: Article 4.3). If countries do report baseline projections *ex ante*, with full transparency of methodologies and assumptions, do not vary the baseline during the period of implementation and do not change their mitigation targets itself, then the reductions from baseline might as well be stated as a fixed level target. In other words, the baseline and the reduction from baseline – with rigorous accounting methodologies and requirements – become difficult to distinguish. This may become redundant through when considering the third problem, namely that the Paris Agreement provides that developing countries will move over time to economy-wide emission reduction or limitation targets (UNFCCC 2015b: Article 4.4), i.e. a single form – which is not a deviation below BAU. Given these consideration, it seems more helpful to focus on other elements of mitigation accounting, starting with methodological issues.

3.1 Methodological issues

3.1.1 Greenhouse gas inventories

Greenhouse gas inventories (GHG-I) are a useful means for accounting for NDCs with GHG targets. In Article 13, the sub-paragraph on GHG-I is twinned with another on tracking progress in implementing and achieving NDCs (UNFCCC 2015b: Article 13.7 (a) and (b)). Most countries refer to GHG emissions in the mitigation component of their NDC. The NDCs using only non-GHG metrics for targets are relatively small share of global emissions; conversely, mitigation NDCs with GHG targets cover most of global emissions, as reported in a synthesis report (UNFCCC 2016a) and various unofficial tools (CAT 2017; Pauw, Cassanmagnano, Mbeva, Hein, Guarin, Brandi, Dzebo, Canales, Adams, Atteridge, Bock, Helms, Zalewski, E, Lindener & Muhammad 2016; WRI 2015). This technical paper argues that inventory-based accounting is a foundational element for mitigation accounting under the Paris Agreement. “The development of an inventory is an important first step toward designing a mitigation goal.” (WRI 2014) In order to understand how to reduce emissions, it is necessary to understand emissions, and GHG-I are a mandatory requirement already.

Irrespective of whether a country has expressed its target in GHG terms or not, all Parties are obliged to publish national GHG-I. This has been a Convention commitment since 1992, to “[d]evelop, periodically update, publish and make available to the Conference of the Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties” (UNFCCC 1992: Article 4.1 (a)). This commitment has been built upon, including in Durban, with both Annex 1 and 3 to decision 2/CP.17 including reference to GHG-I (UNFCCC 2011). In implementing the Paris Agreement, the enhanced transparency framework requires regular reporting of GHG inventory under Article 13.7 (a).

While regular reporting of a GHG-I is a common obligation, flexibility is helpful in the detail included. Tiers are one means of flexibility, as indicated above. More generally, it would be useful to move to using the most recent IPCC guidelines for GHG-I, with developed countries being required to update and developing countries encouraged to adopt the most recent guidelines. The latter provision should understand the difference in capacity and that some countries may need support from developed countries. If a frequency for updating guidelines for GHG-I were defined (say 10 or 5 years), the implications for countries with limited resources must be taken into account and any undue burden on such countries avoided. Many developing countries, including South Africa, voluntarily choose to use the 2006 guidelines, even though the mandatory requirement is only for 1996 guidelines.

If recalculations of the GHG-I become necessary (which has not been infrequently in the past), both the GHG-I and NDC may need to be adjusted, without making it a new NDC (see section 3.1.2 below). Overall, the goal should be continual improvement over time by all countries in the quality information in their GHG-I.

3.1.2 Methodological consistency

Methodological consistency in the context of mitigation accounting most importantly refers to consistency between communication, reporting and accounting for NDCs. The use of consistent methodologies assists in this regard. Methodological consistency is on the one hand very detailed and technical, while on the other hand, some high-level elements are already agreed.

The Paris decision, in requesting the APA to develop guidance on accounting for NDCs, specifically asked the Parties to “ensure consistency between the communication, reporting on implementation and accounting for achievement of its NDCs, including by means of consistent use of methodologies, parameters, choice of assumptions and definitions” (UNFCCC 2015a: paragraph 31 (b)). Methodological consistency in this sense therefore must be included in the decision on the PAWP. Similarly, paragraph 31 (a) provides that Parties “shall account for anthropogenic emissions and removals in accordance with methodologies, guidelines and common metrics” assessed by the IPCC and adopted by the CMA. Again, this should be carried forward in the decision to be taken at COP-24 (December 2018).

Consistency is one of the TACCC principles (see section 2.3 above) and other principles are relevant to methodological consistency. It may be useful to differentiate analytically between three sets of elements between which consistency should exist. Firstly, within a GHG inventory, consistency between numbers in a time-series. This dimension of consistency is covered in IPCC guidelines, though complexity exists with recalculations. Secondly, consistency between the communication of NDCs and accounting for NDCs. Note that paragraph 31 (b) refers to consistency between communication and implementation of NDCs; this is related but understood here as tracking progress during a period of implementation, whereas accounting the achievement of NDCs is defined to be after the period of implementation. In both respects, consistency is needed in the way that mitigation targets are described at the point of communication, and how they are measured during and after the period of implementation. Thirdly, consistency is needed between mitigation accounting and GHG inventories.

Drawing on definitions agreed for GHG-I, the application of each of the principles might be spelled out for mitigation accounting. However, negotiations on principle might not reach agreement. Any reviewers of information need to understand how the principles are to be applied, so guidance needs to be sufficiently detailed. At a minimum, Parties must report transparent, accurate, complete, consistent and comparable information in biennial communications. This will enable mitigation accounting tracking of progress in implementing and achieving its NDC, under Article 13.7 (b); the later information will undergo technical expert review as part of the enhanced transparency framework.

A mitigation goal standard considers both recalculation during or after the goal period (WRI 2014), analogous to tracking progress of implementation during and accounting for achievement of a NDC after the time-frame. “To maintain the consistency of time-series data and enable meaningful comparisons of emissions over the goal period, emissions and other values may need to be recalculated as a result of changes in methodology, changes in emissions drivers, or changes to the goal” (WRI 2014). Of the proposed reasons, changes of drivers are likely not be in a country’s control, methodological changes may be the country’s choice (unless required by a decision), while changes to the goal are fully under the country’s control. This technical paper argues that provisions for recalculation would be mandatory for factors beyond the control of a country, though not applied during the time-frame or period of implementation of a NDC, but rather applying them to the next 5-year time-frame. In cases where external factors change and could not be foreseen, the recalculations must adhere to methodological consistency, i.e. they must be applied to both the initial reference points (including base years and baselines), as well as to targets contained in their successive NDC. Changes to mitigation targets in a NDC during a 5-year time-frame seem unlikely; however, the Paris Agreement does make provision for adjustment, as long as this is to a higher level of ambition (UNFCCC 2015b), and recalculations would be required due to the more stringent mitigation target. Where changes to, say GWP values, require a recalculation of the inventory, then in an inventory-based approach to mitigation accounting, the mitigation targets in the NDC should also be recalculated. However, it would be

important to separate technical recalculation for the political matter of submitting successive NDCs. So, when is a recalculation a ‘new NDC’? Some consideration is needed of what constitutes a ‘new NDC’ as distinct from a recalculation of a mitigation NDC.

Emissions from fuel used for international aviation and maritime transport (commonly referred to as international bunker fuels or just bunker fuels) have been addressed by the UNFCCC since 1995, including methodological work under the SBSTA.⁵ Under the Kyoto Protocol, Annex I Parties are to reduce or limit emissions from bunker fuels, “working through the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO), respectively” (UNFCCC 1997: Article 2.2). The IPCC guidelines for GHG-I provide that these emissions be calculated, but excluded from national totals and reported separately. Unlike negotiations on cooperative sectoral approaches pursuant to the Bali Action Plan, bunker fuels are however not explicitly included under the Paris Agreement. Meanwhile, a synthesis article concludes that the complexity of shipping poses barriers to reducing its emissions, while “the more simply structured aviation sector is pinning too much hope on emissions trading to deliver CO₂ cuts in line with 2 °C” (Bows-Larkin 2015), pointing to the need for more demand management. The emissions trading referred to is the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) scheme, a market-based mechanism agreed under ICAO after several years. CORSIA will not generate units but buy units from other sectors, with implications for corresponding adjustments. For the purposes of mitigation accounting, methodological consistency suggests that countries in accounting for NDCs follow any guidelines for accounting for emissions from international bunker fuels developed by ICAO and IMO. Whether market mechanisms developed by these bodies would be recognised under Article 6 is a distinct matter, being negotiated under the SBSTA.

Similarly, F-gases are a rapidly growing source of emissions, while some are also ozone-depleting substances. F-gases should be reduced consistent with the Kigali Amendment to the Montreal Protocol on substances that deplete the ozone layer, including its baseline and freeze dates, timetables for scheduled HFC phase-down (with flexibility in timing for developing countries) and funding support (UN 2016). The mitigation measures are thus handled under the Kigali Amendment, but might be accounted for by Party towards its NDC.

There is no similar agreement on black carbon. Unlike F-gases, black carbon is not reported under the Convention. No GWP value is reported for black carbon in the IPCC’s Fifth Assessment Report, though its radiative forcing is assessed (Myhre, Shindell, Bréon, Collins, Fuglestvedt, Huang, Koch, Lamarque, Lee, Mendoza, Nakajima, Robock, Stephens, Takemura & Zhang 2013). Calculating a GWP value would be very complex and raises concerns that there may be no basis for fungibility for black carbon with GHGs. There are no existing methodologies for GHG inventories. This no reference to black carbon to the informal note on transparency under APA item 5 (November 2017). How mitigation accounting will work for the Party that has chosen to include black carbon in its NDC remains an open question. For the purposes of this technical paper, it is assumed that black carbon is treated as a very different matter.

3.1.3 Scope and coverage

The scope and coverage of mitigation targets in NDCs is important for accounting. For this technical paper, scope refers to GHGs; while coverage refers to sectors and sources. Consistency is important in two respects. Firstly, scope and coverage must be consistent between the information provided before implementation and accounting for NDCs after implementation. Secondly, consistency in inventory-based accounting requires that scope (the gases included) and coverage (sectors covered) be the same in the GHG-I and NDC.

Beyond consistency, the Paris decision provides for increasing scope and coverage over time: Parties are to “strive to include all categories of anthropogenic emissions or removals” in their NDCs, apply an approach of ‘once in, always in’ and explain why any categories are excluded (UNFCCC 2015a: paragraph 31 (c) and (d)).

⁵ See useful history of bunker fuels at http://unfccc.int/methods/emissions_from_intl_transport/items/1057.php

This technical paper has argued for greater scope and coverage in information for developed countries, with developing countries increasing over time with assistance. The same scope as for information is proposed in mitigation accounting.

In terms of coverage, the working definition of ‘economy-wide’ used in this technical paper is that economy-wide includes all sectors and sources. Developed countries have agreed and put forward economy-wide targets, so scope covers all sectors in their economies. Developing countries have flexibility in mitigation efforts now and some may not cover all sectors, but are encouraged to have their NDCs become economy-wide over time (UNFCCC 2015b: Article 4.4). Market mechanisms should not be limited to sectors outside an NDC, as this would create a perverse incentive not to include more sectors – and over time, all sectors, with NDCs becoming economy-wide.

3.2 Land

3.2.1 Challenges accounting for the land sector

The land sector is often considered to face particular challenges, noting that it includes both emissions and removals (Smith, Bustamante, Ahammad, Clark, Dong, Elsidig, Haberl, Harper, House, Jafari, Masera, Mbow, Ravindranath, Charles W. Rice, Abad, Romanovskaya, Sperling, N. & Tubiello 2014). Both emissions and removals are referenced in the Paris Agreement (UNFCCC 2015b: Article 4, paragraphs 1, 13 and 14). Yet many dimensions of mitigation accounting are the same as for other sectors. Before suggesting an approach to mitigation accounting in the land sector, the challenges of the sector and existing experience are briefly discussed.

According to the IPCC’s fifth assessment, AFOLU contributes about a quarter of global GHG emissions (Smith et al. 2014). Others have put the potential contribution to mitigation between 20 and 25%, while noting the large uncertainties in these estimates “due to countries projections and accounting rules” (Grassi, House, Dentener, Federici, den Elzen & Penman 2017). The UNFCCC Secretariat is aggregating the effects of NDCs, also noted uncertainty in accounting for LULUCF emissions and projections as a “major challenge” and reported aggregate effects as a range (UNFCCC 2016a). Some of the uncertainty is due to complexities of the sector, but rules that are so flexible as to be poorly defined contribute to uncertainty. “The Kyoto LULUCF rules granted largely unconstrained flexibility, allowing countries to choose their accounting method, according to their national circumstances. The only constraint was that adequate information was to be provided to facilitate clarity of the accounting method.” (Winkler, Mantlana & Letete 2017). Given these challenges, some authors have referred to accounting in the land sector as “governance by expertise” approach taken to land-based mitigation to date, reducing environmental integrity and suggesting that avoiding “technicalization of politics” might not serve mitigation accounting under the Paris Agreement best (Dooley & Gupta 2016).

The Kyoto approach to land accounting can be considered as a “two stage” accounting process, with land being the second stage after inventories. Under the Paris Agreement, this could be replicated, or a “one stage” inventory approach adopted. Absent specific guidance on land, Parties will choose whichever approach gives them most leeway, which is typically not consistent with environmental integrity.

3.2.2 Extensive experience with guidance on land

While accounting for land sector faces challenges, there is extensive experience to draw upon. The Paris Agreement explicitly points to this experience, saying that in the context of NDC, when mitigation with respect to emissions and removals (code for land sector) “Parties should take into account, as appropriate, existing methods and guidance under the Convention, in the light of the provisions of paragraph 13 of this Article” (UNFCCC 2015b: Article 4.14).

Existing guidance on land includes: Guidance on accounting for Harvested Wood Products (2/CMP.7, 2006 IPCC Guidelines, IPCC KP supplement); definition of LULUCF categories and activities (Annex to Decision 16/CMP.1, Paragraph 1, 2/CMP.7, Annex to Decision 13/CMP.1 IPCC 2006); guidance related to REDD+ (Decision 1/CP.16, 4/CP.15; 13/CP.19; 14/CP.19); guidance on how to account for natural disturbances (IPCC KP supplement, Decision 2/CMP.7);

guidance on the use of reference levels in the LULUCF and REDD+ Decisions (2/CMP.6, 2/CMP.7, IPCC KP supplement, Decision 1/CP.16, 4/CP.15; 13/CP.19; 14/CP.19); and procedure for technical corrections of forest reference levels to ensure methodological consistency (Decision 1/CMP.6, 2/CMP.7, 1/CMP.16; 13/CP.19).

Hood, Briner & Rocha (2014) provide a useful analysis of existing guidance, worth quoting in some detail:

“There is significant experience on which to build future LULUCF accounting arrangements. A “land-based” approach is used for UNFCCC inventory reporting, in which emissions are reported for six broad categories of land use (forest land, cropland, grassland, wetlands, settlements, and other land). An “activity-based” approach is used to account for LULUCF under the Kyoto Protocol (KP) first (2008-2012) and second (2013-2020) commitment periods, in which emissions are reported by categories of activities rather than by land type. One of the main characteristics of the KP approach is that Parties are able to select (at least partly) the LULUCF activities that they will account for against their commitments. In the first commitment period only afforestation, reforestation and deforestation were mandatory (Article 3.3 of the KP); while revegetation, forest management, cropland management and grazing land management were optional (Article 3.4). For the second commitment period, forest management became mandatory and wetland drainage and rewetting was introduced as additional elective activities under Article 3.4.

“Another shift in accounting rules for the second KP commitment period was the introduction of reference levels for forest management activities. The Forest Management Reference Level (FMRL) is a value of annual net emissions and removals from forest management; against which the actual net emissions and removals reported for forest management will be compared for accounting purposes. Guidance on how to construct the FMRL was provided, and the FMRLs proposed by each Party underwent technical assessment. This could be seen as an example of “bounded flexibility” (Briner and Prag, 2013) since Parties established their own FMRL, following guidance negotiated among Parties; and Parties had the chance to assess and agree with the proposed FMRLs. The application of the FMRL approach will be reviewed after the submission of the first National Inventory Report for the KP 2nd commitment period,²¹ so the success of this approach cannot be fully evaluated yet.

“In a related area of negotiations; the recent development of REDD+, in particular the “Warsaw REDD+ Framework” (UNFCCC, 2013b) is intended to not only improve monitoring, reporting and verification of emission and removals in developing countries, but also the development and implementation of REDD+ policies. This framework also uses a kind of reference level approach: forest reference emission levels and/or forest reference levels expressed in tonnes of CO₂ equivalent per year are the benchmarks for assessing each country’s performance in implementing REDD+ activities, and will be subject to technical assessment (UNFCCC, 2011b).” (Hood et al. 2014)

There is extensive experience with guidance to draw upon. The context of the Paris Agreement differs to the Kyoto Protocol or REDD+ under the Convention, so some aspects may need to be modified – but there is no need to reinvent the wheel. Rather, the approach should be to draw on the best elements of existing experience, and to circumscribe flexibility where it has given too much latitude to ensure environmental integrity.

3.2.3 Elements of guidance common to all mitigation

The approach in the following section suggests developing guidance that treats the land sector as one among many where possible, and offers specific guidance only where needed.

Scope and coverage would largely follow the guidance as for other sectors (see section 3.1.3 above). The approach of ‘once in, always in’ should lead over time to coverage of the entire land sector. Continued inclusion should apply to both carbon pools and activities; there should be no ‘pick-and-choose’ as under Article 3.3 and 3.4 of the Kyoto Protocol. Countries should strive to include all anthropogenic emissions and removals within each activity; and over time include all

activities in accounting. Once all carbon pools are included, the specific approaches taken (land- or activity-based) make little if any difference.

Methodological consistency must be applied in general and to any land-specific aspects of the guidelines. As for all other sectors, the information provided before implementing a NDC must be of appropriate quality to enable tracking of progress and accounting for NDCs. Providing information on quantifiable reference points should include the elements in section 0 above; additional guidance on FMRL from the REDD+ experience may be valuable / can be improved upon.

3.2.4 Elements specific to land sector

Elements that are specific to the land sector include harvested wood products, natural disturbances and legacy effects. Unlike other sectors, the emissions included in a GHG inventory for the land sector may include significant fluxes of both anthropogenic and non-anthropogenic origin (WRI 2014). The two dominant sources of non-anthropogenic fluxes are (1) natural disturbances, and (2) earlier land-use management that continues to influence emissions and removals during the goal period. Dealing with these issues gives rise to special accounting rules for the land sector (WRI 2014). The focus of mitigation accounting is to explain whether targets have been achieved – but the targets are not legally binding. Effort may also be assessed by Parties reporting their domestic mitigation measures – an obligation of conduct under Article 4.2.

Legacy effects derive from earlier land-use management, such as forest age-class structure and associated patterns of harvest and replanting. Earlier management may continue to influence emissions and removals during the time-frame of a NDC. The effects of earlier practices and current mitigation need to be clearly accounted for. One way may be to review any departure from background trends is to increase mitigation effects. Generally, it would be simpler not to use any special accounting rules for legacy effects, but to use the same methods as for GHG-I calculations (WRI 2014). Clarity in assumptions for reference levels, may help distinguish age structure and legacy effects from policy and external assumptions; Parties should make clear how and why the reference level diverges from historic data. Whether this will satisfy countries that experience large fluctuations in GHG-I due to disturbances or legacy effects remains to be seen. If any non-anthropogenic emissions are to be excluded, then the country should explain this on the basis of applying the IPCC Managed Land Proxy. For any event considered *force majeure* or a natural disturbance, the approach must be explained in a manner consistent with the TACC principles

Natural disturbances may include discrete events such as fires, windstorms, hurricanes, landslides, and tsunamis, or more continuous disturbances such as a pest outbreak or prolonged drought. For countries experiencing high frequency of natural disturbance, inventory-based accounting methods may reflect changes in emissions and removals caused by natural disturbance events in addition to the effects of mitigation measures.

The GHG Mitigation Goal Standard requires reporting whether harvested wood products (HWP) are included in accounting, that an IPCC methodology and / or good practice guidance be used and notes this does not guarantee consistency with others (WRI 2014). This raises the possibility of double counting and consideration needs to be given to agreeing a single approach for HWP.

3.3 Markets

If a country chooses to make use of internationally transferred mitigation outcomes (ITMOs), then it has an implication for mitigation accounting.

Article 6 incorporates three distinct elements, of which two relate to markets - Article 6.2 (with 6.3) on cooperative approaches and Article 6.4 (with 6.5, 6.6 and 6.7) on a mechanism. Article 6.8 defines non-market approaches. For mitigation accounting, accounting for market mechanisms requires guidance. This guidance is being developed under the SBSTA. The outcome of the SBSTA negotiations need to be understood together with those on mitigation accounting under APA item 3 and tracking progress under APA item 5.

Participation in market mechanisms is voluntary, no Party is required to make use of any mechanism or internationally transferred mitigation outcomes (ITMOs) from cooperative approaches. However, if a country chooses to make use of ITMOs, then robust accounting guidance must be applied. Accounting guidance for all cooperative approaches must be equally stringent – but it relates to mitigation accounting at the point of transfer.

There is an on-going debate whether units created under Article 6.4 become ITMOs upon transfer – the rational approach seems to be that they do. A supervisory body will provide some form of centralised governance under Article 6.4. This may include elements such as a central registry with country accounts, that might help in unit tracking, circulation and retirement. Centralised supervision is not given for ITMOs under Article 6.2, which means that verification would be undertaken by technical expert review teams and specific guidance is required.

There may be eligibility criteria for participation on a market mechanism or to use ITMOs in accounting for NDCs, such as a Party having ratified the Paris Agreement and having a quantified reference point (see the NDC GHG balance sheet). The guidance developed for the enhanced transparency framework should include provisions requiring Parties to provide TACCC information on ITMOs and technical expert review teams to review the application to guidance to ITMOs.

Corresponding adjustments are the basis identified in the Paris decision to avoid double counting under cooperative approaches (UNFCCC 2015a: paragraph 36). To operationalise corresponding adjustments, since the acquiring country can add ITMOs in accounting for its mitigation NDC, the transferring country will have to deduct the same ITMOs (identical quantity of tons of CO₂-eq) from its mitigation NDC. Hence, transferring and acquiring of ITMOs can only be allowed against a NDC GHG balance sheet (see section 3.4). Figure 3 illustrates how this would work against GHG-I emissions; a similar version is presented in a workshop report (OECD & IEA 2017), against NDC targets.

Figure 3: Transferring country adding and acquiring country subtracting identical quantities of ITMOs against inventory emissions

Source: (OECD & IEA 2017)

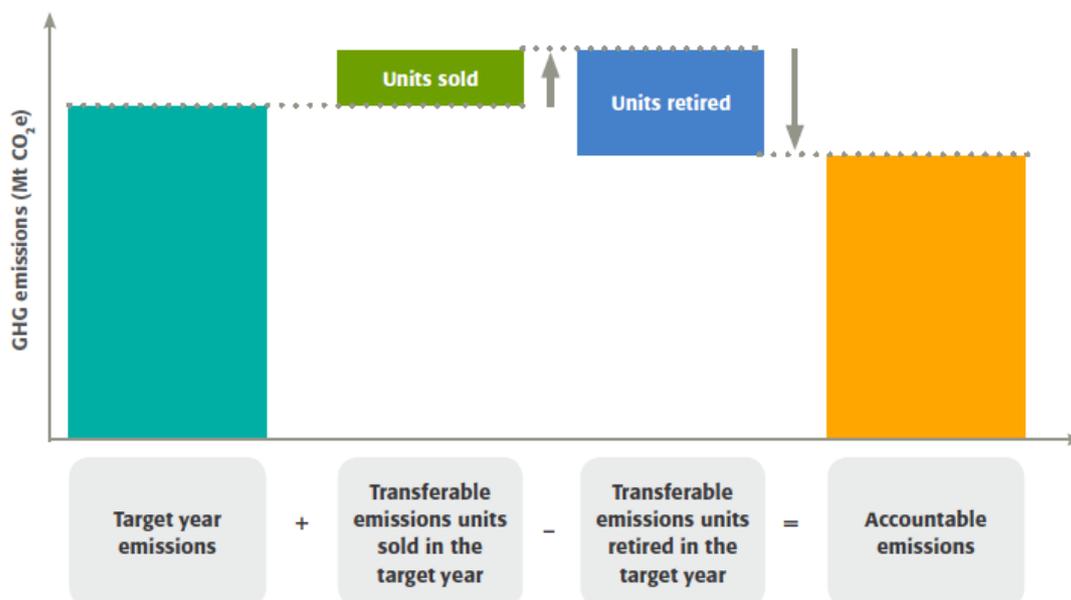


A Mitigation Goal Standard presents a similar concept to a NDC GHG balance sheet, ‘accountable emissions’ (WRI 2014). Figure 4 illustrates the case where the land sector is calculated like the inventory, rather than as an off-set (as under the Kyoto Protocol, where the net change in land sector emissions is calculated separately with separate rules). The version

shown below a ‘user’ retires more units than it sells. The accountable emissions are calculated as emissions in the target year plus transferrable emissions units sold in the target year minus transferrable emissions units retired in the target year, all in units of Mt CO₂-eq. The approach in Figure 4 is thus presents trading against a target year. Whether under Article 6 there will be units that can be retired is remains an open question.

Figure 4: Calculating accountable emissions

Source: (WRI 2014: Figure 9.3 in the original)



* For users that do not treat the land sector as an offset.

The concept of ‘accountable emissions’ is motivated as follows:

“At the end of the goal period, goal achievement is assessed by **comparing allowable emissions to accountable emissions**, or the quantity of emissions and removals that users apply toward achieving the goal. Accountable emissions include emissions and removals within the goal boundary in the target year as well as sales and retirement of transferable emissions units, if applicable, and change in net land sector emissions, depending on how the land sector is treated in the goal design. Transferable emissions units sold in the target year(s) are added to target year emissions in the goal boundary, and transferable emissions units retired and applied toward the goal are subtracted to prevent double counting of units.” (WRI 2014)

A cognate concept of a NDC GHG balance sheet is proposed below. Whether emissions from the land sector are a net sink or source changes the overall sign. This can be treated in accounting using an inventory approach or be calculated separately. Similarly a country might buy or retire fewer units (deductions) than it sells (addition), in which case it would be a net addition.

More fundamentally, to ensure environmental integrity, the mitigation target in the NDC of a country wishing to provide or buy ITMOs cannot be a single-year target. Examples discussed in an OECD/IEA workshop illustrate that the emissions outcomes is extremely uncertain (OECD & IEA 2017), while another study notes that the use of single-year goals increases the uncertainty associated with estimates of national and global cumulative emissions (Briner & Moarif 2016). A country with a single-year mitigation target in its NDC that wished to transfer or acquire ITMOs would have to report a quantity of tons of CO₂-eq over the common time-frame for NDCs, in order to be eligible to use ITMOs. A country with a non-GHG target in its NDC would, in addition, have to convert non-GHG units to a quantity of tons of CO₂-eq for the purposes of transferring or acquiring ITMOs.

3.4 Accounting for mitigation targets, measures and aggregate effects towards achieving goals of PA

The focus in this technical paper so far has been on mitigation accounting for NDCs of individual countries. This section considers some further elements at the individual level as well as accounting elements that enhance *ex ante* understanding of the aggregate effect of NDCs, and thus achieving goals of the Paris Agreement.

This paper has motivated for countries with NDCs with multiple targets to identify a ‘main target’ in their upfront information (see section 1.1). Examples of Australia and India (purely for illustrative purposes) indicated that there is not complete clarity whether mitigation measures on renewable energy were included for the purposes of accounting. The identification of a ‘main target’ (or possibly more than one) for accounting should not detract from the importance of domestic mitigation measures, which are critical to implementation. In tracking progress during implementation and accounting for achievement after implementation, the same main target provides an essential starting point for mitigation accounting. However, as argued in section 3.3, it will be necessary to convert single-year target to a quantity of tons of CO₂-eq over the common time-frame; and for countries with non-GHG targets to convert them to use ITMOs.

An NDC GHG balance sheet would be a useful tool at both individual and aggregate level. Broadly speaking, the balance sheet would start from a GHG inventory; if this does not already include land, add emissions and subtract sinks; and add or subtract net transfers / receipts of ITMOs, in Mt CO₂-eq over a five-year period of implementation. A Party would define the more detailed parameters for a NDC GHG balance sheet in upfront information, and then update the balance sheet to track progress in implementing and achieving NDCs will aid understanding of the aggregate effects of NDCs. The NDC GHG balance sheet would be a means for Parties to provide information to track progress, under Article 13.7(b), at an individual level. It will further aid clarity, transparency and understanding to understand the domestic mitigation measures which countries will implement as in order to achieve the objectives of their NDCs (UNFCCC 2015b: Article 4.2).

NDC GHG balance sheets will assist with understanding aggregate effects, particularly *ex ante*. The synthesis reports produced by the Secretariat (UNFCCC 2015c, 2016a) rely on information in NDC. If these included main mitigation targets and information on NDC GHG balance sheet to be used, it would reduce dependence of information from modelers and assumptions made and be based more firmly on Parties’ information. Tabular formats have been developed for such purposes and could be a useful format for some of the following information, while other information might be in narrative text: the main target(s) for accounting, parameters for NDC GHG balance sheet, domestic mitigation measures, and elements from the guidelines for biennial update reports (BURs) by developing countries. Elements of BURs that provide a useful starting point include: anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol, including the name and description of the mitigation action, including information on the nature of the action, coverage (i.e. sectors and gases), quantitative goals and progress indicators; information on methodologies and assumptions; objectives of the action and steps taken or envisaged to achieve that action; information on the progress of implementation of the mitigation actions and the underlying steps taken or envisaged, and the results achieved, such as estimated outcomes (metrics depending on type of action) and estimated emission reductions, to the extent possible (UNFCCC 2011: Annex III of decision 2/CP.17). In the context of the Paris Agreement and new elements, including NDCs, some elements may need to be added to already in guidelines for BURs (Elliott, Levin, Thwaites, Mogelgaard & Dagnet 2017: see Appendix D). Projections of future emissions up to 2030 and 2040 would be helpful from all Parties, but are currently mandatory for developed and encouraged for developing countries. Additional information should be provided by each developed country: on policies and measures, organised by sectors and gases, and information on how the implementation of PAMs since their last national communication or biennial report and how implementation will achieve the country’s absolute economy-wide emission reduction target (AERT) or if not, what additional PAMs the country will implement.

A NDC GHG balance sheet is a tool for mitigation accounting, provides information to track progress; and is proposed as an eligibility requirement use of ITMOs and an element to aid mitigation accounting.

Parties would be required to produce a NDC GHG balance sheet, starting with emissions in its GHG inventory, adjusted for net effect of emissions from sources and removals by sinks (if not included in the GHG inventory) and any internationally transferred mitigation outcomes, in order to track progress in implementing and achieving its NDC. The balance sheet would take GHG inventory emissions as the starting point; add emissions from sources and subtract removals by sinks; add transfers and subtract receipts of ITMOs, for each of the five years in a period of implementation. This should be done by all countries, with the possible exception of whose NDC contain only policies and measures expressed in non-GHG terms as mitigation targets, with no other 'main' target. Even for such countries, a NDC GHG balance sheet would be helpful and could be limited to the purpose of mitigation accounting and / or use of ITMOs only.

Uncertainty in the elements of the NDC GHG balance sheet should be noted. The accuracy of GHG inventories should be improved over time. The land sector is a source of significant uncertainty, partly due to having both sources and sinks, but also due to uncertainty in data. While ITMOs are not yet clearly defined, carbon credits generated by project-based mechanisms depend on baselines, while units from emissions trading schemes may have less uncertainty. These uncertainties need to be managed and there are well-known tools to do so. Producing a NDC GHG balance sheet every two years will in itself reduce uncertainty, as more historical data is used and there is less reliance on projections.

Given the lack of environmental integrity inherent in single-year targets, NDC GHG balance sheets must be defined over a period of time – the common time-frame. Figure 5 shows a NDC GHG balance sheet, similar to Figures 3 and 4 above, but over a five year time-frame. It assumed emissions excluding the land sector are similar across the period, but that removals from sinks and emissions from sources vary over time. Similarly, a country may retire ITMOs in one year, or transfer them to another country, or do both. These variations would be averaged out, if the NDC GHG balance sheet were defined over the five-year period.

Figure 5: NDC GHG balance sheet based on GHG inventory (top including land, bottom excluding land), sources and sinks in land sector and transfer and acquisition of ITMOs, over five-year time-frame

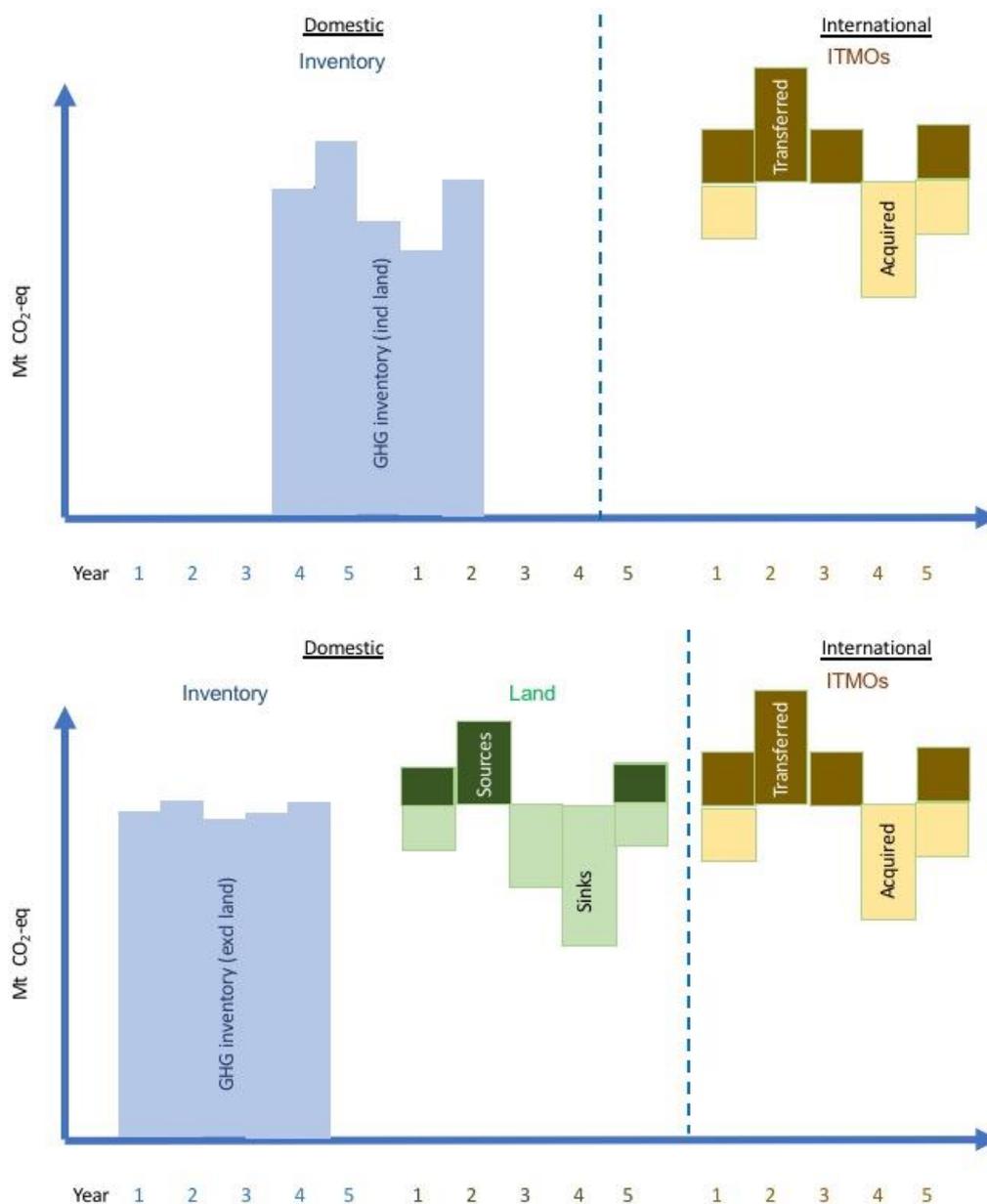


Figure 5 illustrates a concept, and details will need to be elaborated. A five-year NDC GHG balance sheet could be for the full five years, or each of the five years. The former option seems preferable in that it would provide temporal flexibility, that is, if emissions were slightly above average in a particular year, this would not detract from achieving the NDC, as long as they were below average to the same extent in another year within the period of implementation. Parties with single year targets – typically the end year – would need to define their balance sheet; a simple method being a straight line interpolation between the latest GHG inventory and the target level. Another question arising is whether any units that may be created under Article 6.4 would be fixed to a given year or could be used in future years, within or beyond the period? As discussed in section 3.3 above, the technical expert review teams will likely need to verify ITMOs. To further develop important details related to NDC GHG balance sheets, the SBSTA should develop a format I(including tabular formats, as appropriate), taking into account the elements above.

Consideration must also be given to assistance for developing countries with limited capacity to develop such balances.

3.4.1 Technical expert review and accounting for NDCs

The focus of this technical paper has been on mitigation accounting, while emphasising the close connecting to tracking progress in implementing and achieving NDCs under the enhanced transparency framework. The information provided by Parties is subject to technical expert review (UNFCCC 2015b: Article 13.11) and facilitative multilateral consideration of progress (see the following section), which are closely related to mitigation accounting.

Technical expert review (TER) is a necessary part of mitigation accounting. While the NDCs as such will not be reviewed, accounting for NDCs will be multi-laterally agreed under Article 4.13. This paper has argued that detailed guidance on mitigation accounting should form part of transparency guidelines (section C) under Article 13.7 (see section 2.5 and Figure 2 above). With this approach, accounting for NDCs will be reported regularly, and that information will form part of technical expert review. This also means that there is some flexibility in reporting on accounting, but accounting is not nationally determined.

TER can provide assurance relating to the parameters and methodologies used in calculating the quantifiable reference point (base year emissions for AERTs and EERLTs; emissions intensity or others). For as long as countries choose to express their mitigation targets against baselines, information including methodologies, assumptions and resulting projections which must be reported regularly to track progress should undergo stringent and rigorous review, to provide assurance that there has been no gaming. TER teams should also be asked to review information contained in NDC GHG balance sheets, in the context of tracking progress in implementing and achieving NDCs.

A study suggests paying particular attention in the first round of review to tracking progress:

“The scope of the first TER should pay particular attention to information necessary to track progress made in implementing and achieving NDCs. An in-depth review of the accounting methodologies and other information relevant to the clarity and transparency of NDCs in the first review of each NDC cycle would help make the assessment of progress more robust in subsequent reviews in the same NDC cycle.” (Dagnet et al. 2017)

Thus NDCs will be reviewed at an individual level, including information on tracking progress in implementing and achieving NDCs under Article 4 (Art 13.7 b). However, the purpose of mitigation accounting is not limited to individual NDCs, but can also assist with understanding aggregate effects and be an input to the global stock-take.

3.4.2 Facilitative multilateral consideration of progress

Facilitative multilateral consideration of progress (FMCP) potentially comes closest to the sense of ‘accountability’. Following TER, the notion is that countries interact in a multi-lateral setting, as a facilitative process to measure progress towards and achievement of their NDCs. FMCP should include accountability for mitigation targets in NDCs.

The experience with multilateral review under International Assessment and Review (IAR) and consultation under International Consultation and Analysis (ICA) has shown that achieving the facilitative spirit is not easy. Some specific problems need to be fixed, such as groups of countries in ICA presenting very different biennial update reports. More generally, engagements in IAR and ICA on the one hand have put presenting countries on the spot, while on the other hand the reports of these sessions have been lacking in substantive content. Any facilitative advice or helpful recommendation another country may have offered (e.g. sharing experience of solving a similar problem) has effectively been lost. The written exchange with countries submitting biennial reports and biennial update reports, and other countries submitting questions, has produced more substantive documentation.

While TER and FMCP fall under Article 13, the relationship to accounting and accountability is strong, and hence they have been considered here. The paper now turns to consideration of the aggregate effects of mitigation NDCs.

3.4.3 Aggregate effects

Achieving goals of the Paris Agreement requires collective effort and understanding of aggregate effects. The long-term goal for mitigation articulates a goal for Parties collectively:

“In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.” (UNFCCC 2015b: Article 4.1).

Note that the long-term goal for mitigation refers back to the temperature goals in Article 2.1, themselves collective goals. Collective effort means that each Party must implement and achieve its NDC – and increase ambition in successive NDCs. The first NDCs (converted from INDCs on ratification) “collectively lower greenhouse gas emissions compared to where current policies stand, but still imply a median warming of 2.6–3.1 degrees Celsius by 2100” (Rogelj, den Elzen, Höhne, Fransen, Fekete, Winkler, Schaeffer, Sha, Riahi & Meinshausen 2016).

A further step in mitigation accounting must therefore be understanding the aggregate effects, including *ex ante* based on information communicated by Parties. *Ex post*, information from GHG inventories will be a good basis for understanding the aggregate effects. The UNFCCC Secretariat has produced good synthesis reports on the aggregate effects twice, once prior to Paris considering INDCs (UNFCCC 2015c) and after Paris, also taking into account the pursuit of efforts to 1.5 °C (UNFCCC 2016a). The secretariat should be requested to update the synthesis report prior to each global stocktake. This will provide important input to the global stocktake under Article 14, in addition to the NDCs communicate by Parties themselves. The outcome of the global stocktake will inform Parties in their consideration of successive NDCs.

4. Conclusions

This technical paper has considered mitigation accounting, the information that is required upfront and links to broader issues under negotiation. Section 1 provided context, most importantly the information against which a Party plans to account, with less attention to features and a brief consideration of linkages to other issues. On mitigation accounting, general elements have been suggested in section 2 and specific elements in section 3. The Executive Summary summarises the key issues and proposals.

In conclusion, rather than repeating the points already made, it may be worth reflecting on the process to agree rules for mitigation accounting. Politically, it will be important to ensure balanced progress on mitigation accounting together with transparency of mitigation, adaptation and support. The guidance offered does not have to be identical nor strictly parallel. But if no specificity is seen in guidance on transparency of adaptation, for example, then the PAWP as a package seems unlikely to be capable of agreement. As a practical matter, guidance on mitigation accounting, developed pursuant to paragraph 31 of 1/CP.21, and the mitigation component of common modalities, procedures and guidelines (MPG) under Article 13, should result in one set of specific guidance (see section 2.5 including Figure 2).

Further work will be needed to achieve a good outcome on mitigation, as a contribution to the Paris Agreement Work Programme and to strengthen the multi-lateral rules-based regime under the UNFCCC and its Paris Agreement. A good outcome will require focused textual proposal, which in turn require a basis of better understanding among Parties. It is hoped that this technical paper might contribute to better understanding and provide a basis for considering textual proposals.

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