

# **Options and elements for accounting post-2020: towards a common accounting framework**

**Commissioned by the Swiss Federal Office for the Environment (FOEN)**

**Sara Moarif**

**May 2014**

**Commissioned by:** Federal Office for the Environment (FOEN), International Affairs Division, CH-3003 Bern  
The FOEN is an agency of the Federal Department of the Environment, Transport, Energy and Communications (DETEC).

**Contractor:** Le Monde Après

**Author:** Sara Moarif

**Note:** This study/report was prepared under contract to the Federal Office for the Environment (FOEN). The contractor bears sole responsibility for the content.

**Disclaimer:** The content is the sole responsibility of the contractor and does not represent the views of the Swiss Federal Office for the Environment (FOEN). It presents the authors views in her personal capacity.

This paper was written to inform thinking about common accounting approaches under the UN Framework Convention on Climate Change (FCCC) processes, primarily by clarifying main ideas. It has not been subject to extensive review and consultation, may not use current UNFCCC terminology, and should be seen as one perspective that hopefully contributes to the important discussions surrounding this issue.

**Acknowledgements:** The author would like to thank Anja Kollmuss for her valuable contributions to this report. Some of the thinking has been shaped by the author's previous work within the OECD/IEA Climate Change Expert Group on the UNFCCC (CCXG), benefiting from the insights of excellent colleagues and delegates.

Questions and comments can be directed to [sara.moarif@gmail.com](mailto:sara.moarif@gmail.com)

Contents

**Summary: accounting approaches for progress with mitigation objectives** ..... 4

**1. Introduction** ..... 9

1.1 Elements addressed under a common accounting framework..... 10

**2. Elements of a common accounting framework** ..... 11

2.1 Understanding mitigation objectives..... 11

2.2 Measuring progress with the mitigation objective..... 15

2.3 Fundamental bases of a common accounting framework: Inventories, GWPs, gases and sectors ..... 17

**3. Elements of common reporting approaches: baselines**..... 18

**4. Political considerations** ..... 21

4.1 Challenges associated with certain target types ..... 21

4.2 Compliance provisions: dealing with over- and under-achievement of targets ..... 22

4.3 Determining comparability of efforts ..... 23

**5. Working towards a CAF: issues and elements to address pre-2020**..... 23

5.1 Understanding mitigation objectives..... 23

5.2. Accounting for progress with mitigation objective..... 24

5.3. Nationally appropriate mitigation actions (NAMAs)..... 26

**Annex: Typology of current mitigation pledges and implications for future mitigation objectives**..... 28

**References** ..... 34

## Summary: accounting approaches for progress with mitigation objectives

Prag, Hood and Barata (2013) define an emissions accounting framework as “the ensemble of systems and processes that are necessary to understand Parties’ pledges under the Convention as well as progress made towards those pledges”. Using this definition, a framework will include elements of reporting, greenhouse gas (GHG) emissions accounting in inventories, and other accounting systems for GHG mitigation objectives that include coverage of metrics, methodologies and scope. It will also include systems that account for emissions from the land-use sector, and for the transfer of emission units between countries using carbon market mechanisms; these two areas are addressed in detail in accompanying papers.<sup>1</sup>

This paper aims to identify the most salient features of common accounting approaches, highlighting elements that need to be emphasised at this stage in the negotiations. Elements to be emphasised at this stage include:

### **Inventory methodology (IPCC 2006), global warming potential (GWP) values and timeframe (AR5, 100-year):**

These elements should be common to all parties. The inventory is the bedrock of all accounting, and given the flexibility provided in the IPCC guidelines, there is no technical reason why all countries cannot use the same set. The timeframe and values used for GWP should also be common, as this greatly affects how GHG impacts are quantified. Countries may continue to explore other options to express impacts of carbon dioxide (CO<sub>2</sub>) and other GHGs, but must agree to common values in the meantime.

**Assessing targets, ex ante and ex post, in absolute net emissions terms, i.e. tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e):** No matter what base year, baseline, and target years used, all countries should account for and report on the quantity of emissions that result from their mitigation objectives. This would require an ex ante estimation of the level of emissions in the period covered by the objective, the amount of emissions that would need to be reduced to meet that objective (if it is a reduction), and the net emissions when adjusting for use of market mechanisms and land-use accounting. Accounting approaches that emphasise actual emissions should be prioritised, though the headline objectives themselves may be expressed in different ways, and compliance toward the targets may also be assessed differently. This would fit better with the notion of carbon budgets, recently espoused in the IPCC’s Fifth Assessment Report (AR5). Countries should become comfortable with this concept, including that for many countries this will likely mean an increase in emissions. Including net emissions associated with objectives could begin to be encouraged under current enhanced transparency provisions under the UNFCCC, e.g. for use in preparing Biennial Reports (BRs) and Biennial Updated Reports (BURs), or used in International Assessment and Review (IAR) and International Consultation and Analysis (ICA) processes.<sup>2</sup>

**Guidance on establishing sound projections:** Should targets be set against a projected emissions reference level (business-as-usual or BAU), for transparency and environmental integrity as well as to facilitate action, countries should follow guidelines ensuring that all elements necessary for sound emissions projections have been undertaken. Work towards standardised guidelines will likely be progressive, and start with common reporting elements that provide clarity on the most important elements of projections. Facilitative guidelines and tools can also be developed to help countries be more consistent, followed by the development of common guidelines. Clarifying elements related to projections could occur during the ICA and IAR processes.

**Accounting for use of market mechanisms:** As this can greatly affect the GHG emissions accounted for, a common accounting approach is essential to understanding actual reductions and avoiding that reductions are claimed by more than one jurisdiction. For more details see Schneider, Kollmuss and Lazarus, 2014.

<sup>1</sup> Canaveira, 2014; Lazarus, Kollmuss and Schneider, 2014; Schneider, Kollmuss and Lazarus, 2014.

<sup>2</sup> For more information on these reporting and review processes, see [http://unfccc.int/national\\_reports/items/1408.php](http://unfccc.int/national_reports/items/1408.php)

**Accounting for land-use sector emissions:** Accounting for this sector can greatly affect the way the target is expressed, and progress with meeting it, particularly given the higher degree of uncertainty it introduces. Use of reference levels, or projections of emissions and removals in the land-use and forestry sector over the mitigation target period, should be commonly applied. A detailed approach is outlined in Canaveira, 2014.

**Guidance on assessing impacts of sectoral, sub-sectoral or a group of policies:** Though determining the impact of a group of policies can be complex and challenging, such an assessment is important for all countries, and becomes relevant within the UNFCCC context for parties with mitigation objectives that are not economy-wide and can take many forms, known as nationally appropriate mitigation actions (NAMAs). Guidance should be developed that allows parties to know sound assessments are being carried out.

For the principal elements relevant to a common accounting framework, some accounting approaches are outlined below. More emphasis is provided on accounting for progress with a mitigation goal or target, i.e. the objective of predictability rather than comparability, as this is an area which currently lacks common standards. A summary of the elements addressed is provided in Table 1 below, along with initial recommendations for a post-2020 common accounting framework.

**Table 1: Overview of elements and approaches that could form the basis of a CAF for post-2020 mitigation objectives**

| Objective     | Elements    | Options for a CAF                                                                                                                                                                                               | Recommendation                                                                                                                                                                                                                                                                                                                                                                                              | Rationale                                                                                                                                                                                                                                                                                                                                         |
|---------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Comparability | Inventories | a. 2006 IPCC Guidelines<br>b. Flexible; i.e. determined by each party                                                                                                                                           | 2006 IPCC Guidelines for all parties.                                                                                                                                                                                                                                                                                                                                                                       | Reflects most recent and advanced scientific guidance; allows for significant flexibility and can be used by countries in line with their capacity.                                                                                                                                                                                               |
|               | Gases       | a. All seven gases currently covered under the Kyoto Protocol <sup>3</sup><br>b. Core set of gases accounted for by all parties<br>c. Account for gases according to key source assessment<br>d. Fully flexible | Essential: Most important gases, as determined by key source assessment, for parties with least capacity. For parties with greater capacity, core set of gases to be common to as many parties as possible (e.g. CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O).<br><br>Ideal, and for countries with greater capacity: All seven Kyoto Protocol gases.                                            | The greater the coverage the better, but for countries with limited capacity and incomplete GHG inventories, focusing on the most important emissions is the first step.                                                                                                                                                                          |
|               | Sectors     | a. As outlined in 2006 IPCC Guidelines<br>b. As outlined in 1996 IPCC Guidelines<br>c. Nationally-determined economic classification                                                                            | As outlined in 2006 IPCC Guidelines; all sectors should be accounted for by all parties, except where irrelevant (e.g. a small country with no agriculture would not have emissions from this sector).<br><br>Sector boundaries that differ from the Guidelines (e.g. economic sectors that do not correspond) must be mapped to demonstrate the boundaries of the mitigation objective and its relation to | As with GHG inventory, improves comparability if all countries using the same methods and definitions.<br><br>Need to allow for mitigation objectives to cover economic sectors that may not be the same as those in inventory; however these can be mapped so it is clear what emissions are being covered and how they are being accounted for. |

<sup>3</sup> Carbon dioxide (CO<sub>2</sub>); methane (CH<sub>4</sub>); nitrous oxide (N<sub>2</sub>O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); sulphur hexafluoride (SF<sub>6</sub>); plus nitrogen trifluoride (NF<sub>3</sub>)

| Objective      | Elements                     | Options for a CAF                                                                                                                                                                                                                                                                                                                                                | Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                |                              |                                                                                                                                                                                                                                                                                                                                                                  | inventory sectors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                | Global warming potential     | <ul style="list-style-type: none"> <li>a. GWP values in IPCC Fifth Assessment Report (AR5)</li> <li>b. GWP values in previous Assessment Reports</li> <li>c. Use of different time horizons for different baskets of gases (e.g. shorter for shorter lived gases)</li> <li>d. Use of other metrics such as global warming temperature potential (GTP)</li> </ul> | <p>The latest GWP values produced by the IPCC in its Fifth Assessment Report (AR5) over a 100-year time horizon</p> <p>Continue exploring alternative metrics such as global warming temperature potential (GTP)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>The AR5 represents the latest scientific knowledge, and the same values should be used consistently by all countries. The complexity associated with using different time horizons for different types of gases, or for emphasising shorter-term impacts, makes the benefits of switching to such a system less convincing. It also removes the flexibility, in terms of mitigation actions, available when gases and sectors are fully fungible. Similarly, while using other metrics such as GTP which emphasise actual temperature impacts are appealing, the current state of knowledge and uncertainty surrounding their values suggests their use may be premature.</p>                                                                                                                                 |
| Predictability | Type of mitigation objective | <ul style="list-style-type: none"> <li>a. Determine a set type of mitigation objective</li> <li>b. Set specific methods to determine a range of different mitigation objectives (e.g. standardised way of determining projected reference levels)</li> <li>c. Flexibility in type of mitigation objectives, including NAMAs</li> </ul>                           | <p>All objectives should fall within the same time period, e.g. 2020-2025 or 2020-2030.</p> <p>Type of mitigation objective will not be determined in a common way, it appears these will vary and be flexible. With this in mind, parties could:</p> <p><b>Discourage</b> the amount of non-GHG metrics included in mitigation commitment; limit the use of projected reference levels (BAU)</p> <p><b>Encourage</b> the use of continuous multi-year targets</p> <p><b>Determine</b> guidance or parameters for the use of non-GHG metrics in intensity targets, e.g. GDP must be in PPP in the same currency for a given year</p> <p><b>Develop</b> guidance for projections</p> <p>For parties other than least developed countries (LDCs), <b>limit</b> the use of NAMAs that are not quantified (either directly in GHG terms or that can be converted to GHGs with relative ease)</p> | <p>Including additional metrics that must be monitored and reported reduces predictability, particularly for objectives set against a modelled reference level (large number of parameters to monitor), as well as for relative targets (e.g. GHG/GDP).</p> <p>Reporting will need to ensure transparency and clarity over the different parameters included in each type of mitigation objective.</p> <p>Single-year and discontinuous targets reduce clarity and predictability, and pose particular challenges when accounting for the use of market mechanisms.</p> <p>From an accounting perspective, the ideal mitigation objective would be expressed in absolute GHG terms (whether increase or decrease) over a continuous multiple-year period, based on a representative historic reference level</p> |
|                | If objectives are            | a. Develop common                                                                                                                                                                                                                                                                                                                                                | Determine common reporting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Parties are already working on the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Objective | Elements                                                                                         | Options for a CAF                                                                                                                                                                                                                                       | Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | set against projected reference levels: baseline or business-as-usual (BAU) scenario projections | <p>methodology for determining BAU projections</p> <p>b. Flexibility in projections but with enhanced reporting</p>                                                                                                                                     | <p>elements focusing on the most important parameters to help ensure clarity surrounding projections.</p> <p>In parallel, develop methodological guidance and tools for the development of BAU projections.</p> <p>Eventually develop standardised guidance for developing sound projections</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>national contributions they will put forward under a 2015 agreement; as such, common approaches are unlikely for determining projections. Standardised guidance could be developed. In the meantime, reporting structures should be used to focus on clarifying key parameters that affect baseline scenario projections, which could then lead to work on common guidance and tools. This is also important to determining the GHG impacts of NAMAs.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|           | Ex ante estimations of mitigation commitment                                                     | <p>a. None made beyond that expressed in the mitigation objective (e.g. 20% below BAU level in 2025, of X MtCO<sub>2</sub>e)</p> <p>b. Expressed in terms of net cumulative emissions over a period</p> <p>c. Expressed differently by each country</p> | <p>No matter the type of mitigation objective, to be expressed in MtCO<sub>2</sub>e as:</p> <ul style="list-style-type: none"> <li>Expected emissions level in the target year or years (for multi-annual targets or carbon budgets)</li> <li>Expected amount of emissions that need to be reduced to meet the objective level</li> <li>Expected net emissions, accounting for market mechanisms and land-use changes if known beforehand</li> <li>For single year targets, estimated emissions over the years of the mitigation target period (as covered in the 2015 agreement)</li> </ul> <p>Ex ante estimation may not be required for NAMAs, depending on complexity and resources needed; should be encouraged where feasible and useful.</p> | <p>There is already a high degree of flexibility surrounding the types of mitigation objectives; given this, the emphasis should be on understanding cumulative net emissions over the period covered under the 2015 agreement. All countries should convert their mitigation objectives into actual emissions levels expected over the period determined by the 2014 agreement, and the volume of emissions they will need to reduce to meet the objective.</p> <p>If a country is implementing many NAMAs across one or more sectors, it may use methods to group these and assess their impact on GHG emissions. For countries with a few individual NAMAs which are difficult to quantify, an ex ante estimation may prove too resource intensive.</p> <p>In many countries, this type of assessment would be undertaken in any case to track progress with meeting the domestic GHG objective.</p> |
|           | Reference year                                                                                   | <p>a. Pre-determined reference year or reference period</p> <p>b. Freely determined reference year of reference period</p>                                                                                                                              | <p>Using the same historical reference across all countries would be ideal for comparability, but appears unlikely. Given this, countries should use years for which most recent inventory data is available for as many countries as possible, and use the average emissions over a period of years.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>Given the objectives will be set for the period after 2020, it would be best to use a more recent reference period, rather than one decades in the past, for which most or all major emitters have data. The average over a period should be used to ensure the reference level is representative of average emissions (not unusually high or low).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| Objective                                             | Elements                                      | Options for a CAF                                                                                                                                               | Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                       |                                               |                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | LDCs, and those countries with less capacity who are small emitters, may require exemptions if they do not have up-to-date inventories; however, it is hoped that capacity building efforts concentrated on inventories will minimise this problem in future.                                                                                                                                                                                                                                                                                                                                       |
| Accounting towards progress with mitigation objective | Ex post assessment of progress with objective | a. Account for achievement of headline target objectives<br>b. Account for cumulative net emissions over period                                                 | Compare emissions level in target year, total emissions over the target period, and total reductions over the target period with values estimated ex ante (in MtCO <sub>2</sub> )<br><br>Include recalculation policy based on thresholds, or occurring every set number of years                                                                                                                                                                                                                                                                                                                                    | Despite variety in mitigation objectives, a CAF should allow net cumulative emissions to be known; parties are to estimate this before the period set out in the 2015 agreement, and then account for emissions at the end of the period.                                                                                                                                                                                                                                                                                                                                                           |
|                                                       | Ex post assessment of NAMAs                   | a. GHG impacts of NAMAs must be assessed<br>b. NAMA impacts to be quantified, not necessarily in GHG terms<br>c. NAMAs only assessed on basis of implementation | Flexible approach, while encouraging the assessment of NAMAs in terms of their GHG impact<br><br>Certain NAMAs can be assessed in relevant non-GHG metrics (e.g. ha of forest coverage, share of renewable energy, RD&D activity)<br><br>For LDCs, even if assessment is based on implementation and not outcome, some metrics or monitoring points should be developed to track progress<br><br>Follow guidelines for developing sound baseline projections<br><br>Development of guidance for estimating the impact of policies, such as the WRI GHG Protocol, in line with the domestic MRV of NAMAs <sup>4</sup> | Assessing the GHG impact of NAMAs is much more complex than sectoral or economy-wide approaches; nevertheless, if these approaches are included as mitigation objectives in the 2015 agreement, it is likely they will take different forms and some flexibility will be needed.<br><br>To the extent possible, their GHG impacts should be assessed using common guidance. If not, other quantified, measurable metrics should be used as a concrete means to assess progress. As with any sound policy process, countries should determine appropriate indicators to measure progress with NAMAs. |
|                                                       | LULUCF/AFOLU                                  | a. Include within mitigation objective<br>b. Exclude from mitigation objective<br>c. Account for separately outside of mitigation objective                     | Should be included within mitigation objective if relevant for a given country.<br><br>Use of reference levels (projections of emissions and removals over the mitigation commitment period) against which progress will be measured                                                                                                                                                                                                                                                                                                                                                                                 | As outlined in Canaveira (2014), AFOLU should be kept fungible with other sectors, and reference levels used for accounting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

<sup>4</sup> Decision 21/CP.19



| Objective | Elements                      | Options for a CAF                                                                                                                 | Recommendation                                                                                                                                                                                                                                                   | Rationale                                                                                                                                                                                                                                                                                                                                               |
|-----------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | Use of market mechanism units | a. To be added or subtracted to total emission level and emission reduction level, ensuring no double counting or double claiming | Units purchased by buyer country subtracted ex post from total emissions, and added ex post to emissions reductions achieved<br><br>Units sold by host country added ex post to total emissions level, and subtracted ex post from emissions reductions achieved | Not accounting for the transfer of emission units is not a feasible option; this must be done by both host and buyer countries. If there are limits placed on the quantity of units that can be used by a buyer country, then compliance with these limits will also be verified through this process. See accompanying papers for detailed approaches. |

## 1. Introduction

Parties under the United Nations Framework Convention on Climate Change (UNFCCC) are currently facing two challenging paradigms in relation to mitigation action. First: managing the present “two-track” structure of commitments, which will remain in place until 2020. This involves a large range of mitigation goals and targets, from both developed and developing countries, expressed at COP16 in Cancun, as well as quantified economy-wide reduction targets for certain developed countries under the second commitment period of the Kyoto Protocol (KP), as determined at COP18 in Doha. Second: preparing for the post-2020 world, in which a new legal agreement applying to all parties will take effect, as determined at COP17 in Durban by the Durban Platform for Enhanced Action (ADP). The form of this agreement is unknown; however, given current discussions under the Ad-hoc Working Group on the Durban Platform (ADP), within which the agreement is being negotiated, it will likely need to accommodate significant diversity in mitigation objectives. The need for clarity around these objectives is urgent given the post-2020 agreement must be concluded in 2015, while the tight time frame also means flexibility is needed.

Parties should therefore consider common accounting approaches as part of the broader examination of rules and principles that might form the basis of the future post-2020 regime, including those surrounding mitigation objectives and their measurement, reporting and verification (MRV). A common framework for accounting and MRV will necessarily need to accommodate diversity and differentiation in mitigation commitments. A future framework should build not only upon existing systems (such as well-developed methodologies for inventories), but also the enhanced transparency regime that begins in 2014 and will develop over the next few years, comprising Biennial Reports (BR) and International Assessment and Review (IAR) for developed countries, and Biennial Update Reports (BUR) and International Consultation and Analysis (ICA) for developing countries. All these processes should be used to test and develop common accounting approaches.

Approaches for determining whether parties are meeting their mitigation objectives can vary on a spectrum, from one that is highly standardised (such as with the Kyoto Protocol), to a “pledge and review” approach that is completely bottom-up and emphasises transparency through enhanced reporting rather than common accounting. The UNFCCC process is currently at different points on the spectrum, between reporting on mitigation pledges presented in Cancun and the Kyoto Protocol. These can all be drawn upon to find a common framework for accounting. Realistically, a common approach to such accounting is unlikely to be highly standardised in the medium term, but rather will need to trade some robustness for inclusiveness.

An ideal approach will respect diversity without sacrificing environmental integrity, will have standards but not result in standardised outcomes. Common approaches are important to understand what parties are doing, and the mitigation outcomes of these actions at a global level. This is particularly relevant for the few dozen countries responsible for the majority of global emissions. They do and will share the most responsibility for mitigation, and should find and agree to common approaches.

This report aims to clarify and simplify elements related to understanding and accounting for progress with mitigation objectives, focusing on a limited set of issues to be addressed at this stage considered most relevant to forming a basis for a common accounting framework (CAF) post-2020. It is not exhaustive, and does not detail how different mitigation objectives could be accounted for, or detailed information for clarifying these objectives.<sup>5</sup>

This section will outline the elements that will be addressed in the paper. Section two will outline the primary elements to be emphasised in a CAF that would be common to all types of mitigation objectives. Section 3 examines the issue of baselines and common *reporting* requirements, given common approaches will not be feasible before mitigation objectives are determined. Section four looks at certain political issues relevant to discussions of common accounting, while Section five briefly looks at the primary gaps and places where current MRV regimes might be strengthened to move toward common approaches post-2020. Guiding examination of these options have been the use of latest scientific information and methods, the notion of environmental integrity (what the atmosphere sees), the principle of common but differentiated responsibilities and respective capabilities, and political realism, generally aiming for a stepwise rather than an all-or-nothing approach.

Compliance is not dealt with in this paper, as it stems from political decisions which would then require certain reporting and accounting systems to determine the status of a country's compliance with its GHG objective. The elements included will likely be essential for determining compliance under whatever regime is established, but are also independent of such considerations; they should be accounted for and reported whether or not they are used to determine compliance.

## 1.1 Elements addressed under a common accounting framework

Prag, Hood and Barata (2013) define an emissions accounting framework as “the ensemble of systems and processes that are necessary to understand Parties’ pledges under the Convention as well as progress made towards those pledges”. A truly common accounting framework would remove the need for some of the current reporting structures under the UNFCCC, which primarily fulfil the function of enhancing transparency and clarifying the mitigation actions of Parties. If all countries used the same scope, metrics and methodologies for their GHG reduction or limitation objectives, this would in large part remove the need for clarifying these (particularly *ex ante*), though reporting would always be necessary (as it is for GHG inventories).

In the absence of a common accounting framework, greater reporting is needed to clarify scope, metrics and overall emissions associated with a given GHG mitigation objective. Even with common accounting approaches, a reporting and review regime is necessary to inform other Parties, to ensure that common approaches are being followed as determined by guidelines and guidance, and eventually to determine compliance.

Common accounting approaches are unlikely in a post-2020 regime under the UNFCCC, at least initially: under current ADP discussions parties are invited to put forward their national contributions as part of the 2015 agreement. It therefore appears likely that in the post-2020 regime:

- There will be range of mitigation commitments which could potentially be as diverse as the range currently seen under the Cancun architecture (outlined in the Annex)
- Common approaches for accounting, which many countries support, will need to include a high degree of flexibility to allow for different national circumstances

---

<sup>5</sup> Please refer to Levin et al. (2014) and WRI (2013a,b) for details on *ex ante* reporting, and guidance on assessing progress with mitigation objectives and policies. The WRI GHG Protocol guidelines are currently being piloted. Please also refer to a forthcoming paper to be released by the OECD/IEA Climate Change Expert Group on the UNFCCC (CCXG) on accounting for diverse mitigation contributions ([www.oecd.org/env/cc/ccxg.htm](http://www.oecd.org/env/cc/ccxg.htm)).

Given this, core elements of common approaches in accounting for progress with GHG objectives will need to be accompanied by greater ex ante reporting given the absence of a truly common accounting framework and the diversity of national mitigation objectives.

The purpose of reporting will be to provide clarity on elements for which common approaches will be difficult to establish, notably:

- The scope of the mitigation objective (what emissions it covers, in what sectors, etc.)
- The methodology used to determine the mitigation objective when this is against a modelled reference level, underlining essential information needed to understand how business-as-usual baselines were established
- Mitigation objectives that take the form of implementing nationally appropriate mitigation actions (NAMAs), which may use common guidelines for measurement and reporting

The elements of a common accounting framework outlined in this paper will primarily encompass:

- Aspects of understanding mitigation objectives, for example common bases for considering reference years
- How progress will be measured, on the basis of total emissions emitted within the scope of the mitigation objective over the period set out in the 2015 agreement
- Common bases for fundamental GHG accounting elements, such as inventories and global warming potentials

## 2. Elements of a common accounting framework

### 2.1 Understanding mitigation objectives

The current range of mitigation pledges for 2020 provides a basis for understanding the diversity of mitigation objectives that may be put forward as part of the 2015 agreement; an overview of these pledges is provided in the Annex.

The range of mitigation objectives comprises the following major options impacting the clarity and predictability of objectives in the post-2020 period, some of which can feasibly benefit from common approaches; these options are outlined in the table below.

**Table 2: Common approaches for certain parameters of mitigation objectives**

| Feature               | Parameters                                    | Elements                                                                                                                                                                                                             | Common approach?                                                                                                                                                                                                                                                    |
|-----------------------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Predictability</b> | <b>How objective is measured</b>              | <ul style="list-style-type: none"> <li>- Absolute: in amount of emissions (tCO<sub>2</sub>e)</li> <li>- Relative or Intensity-based: tCO<sub>2</sub>e relative to something else, such as economic output</li> </ul> | <ul style="list-style-type: none"> <li>- Common accounting for GHG emissions (using same methodologies)</li> <li>- Parameters set for use of second metric (e.g. gross domestic product - GDP)</li> <li>- Common accounting for use of market mechanisms</li> </ul> |
|                       | <b>Against what it is measured: Reference</b> | <ul style="list-style-type: none"> <li>- Historical base year or period, e.g. emissions in 2008 or average of 2008-12</li> <li>- Modelled reference (BAU)</li> </ul>                                                 | <ul style="list-style-type: none"> <li>- Define parameters for historical reference</li> <li>- Common accounting for use of market mechanisms</li> </ul>                                                                                                            |

| Feature         | Parameters                                          | Elements                                                                                                                                                                                                                                                                                      | Common approach?                                                                                                                                                                                                                                   |
|-----------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |                                                     | emissions in a given year),<br>e.g. projected emissions<br>in 2030 or over 2025-30                                                                                                                                                                                                            | Common approach difficult:<br>- Guidance for BAU modelling<br>- Enhanced reporting on modelled<br>BAU for transparency                                                                                                                             |
|                 | <b>No reference</b>                                 | - Absolute reduction<br>amount by the target year<br>or over the target period<br>in tCO <sub>2</sub> e<br>- Absolute reduction in<br>intensity level by the<br>target year or over the<br>target period (e.g. in<br>tCO <sub>2</sub> /GDP)<br>- Carbon neutrality target<br>for a given year | - Common accounting for GHG<br>emissions (using same<br>methodologies)<br>- Parameters for use of second<br>metric (e.g. GDP) are defined<br>- Common accounting for use of<br>market mechanisms (particularly<br>important for carbon neutrality) |
|                 |                                                     | How and against what an objective is set can be combined in different<br>ways. For example an intensity-based target can be set against a<br>historical reference level, a modelled reference level, or no reference<br>level                                                                 |                                                                                                                                                                                                                                                    |
|                 | <b>Inclusion of<br/>market based<br/>mechanisms</b> | - Objective specifies that<br>no international market<br>mechanisms will be used<br>- If used, objective<br>potentially specifies<br>quantity or upper limit for<br>use (e.g. x% of overall<br>reduction objective);<br>potentially specifies<br>which mechanisms will be<br>used             | - Common accounting approach for<br>use of market mechanisms <sup>6</sup>                                                                                                                                                                          |
|                 | <b>Action-based<br/>objective</b>                   | - NAMAs: large variety                                                                                                                                                                                                                                                                        | - Common approach difficult:<br>guidelines for estimating emission<br>reductions from NAMAs                                                                                                                                                        |
| <b>Coverage</b> | <b>GHG gases</b>                                    | - All Kyoto gases<br>- Single gas or some gases,<br>but not all                                                                                                                                                                                                                               | - Common approach difficult: clarity<br>provided through reporting                                                                                                                                                                                 |
|                 | <b>Sectors<sup>7</sup></b>                          | - Economy-wide<br>- One or more sectors, but<br>not economy wide                                                                                                                                                                                                                              | - Use IPCC methodologies for sector<br>boundaries.<br>- Where these are not completely<br>covered: clarity provided through                                                                                                                        |

<sup>6</sup> See Schneider, Kollmuss and Lazarus, 2014.

<sup>7</sup> We use the term “sector” broadly, as these can be defined differently according to the country setting the target. A sector could cover activities include within IPCC sector and sub-sector categories set for GHG inventories (fuel combustion, or electronics industries), or be defined in a much more disaggregated way, for example the sector definitions used for statistical purposes by the European Community which uses specific NACE codes (*Nomenclature statistique des Activités économique dans la Communauté Européenne*) grouped into 21 broad categories (such as “manufacturing”) which in turn are subdivided into further sub-categories (“manufacture of motor vehicles”).

| Feature           | Parameters                       | Elements                                                  | Common approach?                                                                                                                           |
|-------------------|----------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|                   |                                  |                                                           | reporting<br>- Common accounting approach for inclusion of LULUCF/AFOLU                                                                    |
| <b>Time frame</b> | <b>Target period<sup>8</sup></b> | - Continuous multi-year<br>- Discontinuous single year(s) | - All objectives should be fall within the same time period<br>- Beyond this common approach difficult: clarity provided through reporting |

Any conditionality surrounding implementation of the pledge or its legal nature, while important for the political predictability of a mitigation objective, will have little concrete impact on accounting approaches.

From an accounting perspective, objectives set against a projected (modelled) emissions level in a future year are less preferable. This is because these involve the development of baseline emissions projections, which include a broad set of metrics along with policy and economic assumptions that would need to be monitored and then verified. In addition, baseline projections are likely to change over time, and a target may be reached much earlier or later than initially projected. For this reason, intensity-based targets against a historical reference year or period are preferable, as they will generally only involve the monitoring of a single additional metric (for example, GDP or population), and will therefore be easier to monitor and reduce the uncertainty surrounding estimating emissions levels. For most developing countries, a mitigation objective involving an increase in emissions will likely not be unusual, and there should be political comfort surrounding this. A common accounting approach would emphasise estimating and assessing the amount of emissions, and understanding their trajectory in time.

Approaches that might commonly be applied across these various parameters are outlined below, on the understanding that it is unlikely a specific approach could be imposed across countries. For the sake of comparability and ease of accounting, it would for example be preferable to have the same reference year and target year or period across all countries. However it may be difficult, given experience to date, to impose a common reference year for all countries, or impose a specific target type (absolute or relative). The options below therefore outline a common approach within which specific decisions about the parameters of mitigation objectives can occur, a form of “bounded flexibility”.

### **2.1.1 Metrics and historical reference years**

Historical reference year or base year emissions should be calculated for sectors and gases covered by the mitigation objective in accordance with IPCC methodologies. Given future targets will apply only from 2020 onwards, the base year chosen should be as recent as possible, given data availability and coverage constraints (i.e. should be as available, and be as common across parties as possible). For example, targets put forward in time for 2015 would at best be able to use emissions data up to 2012. However, many developing countries, including major emitters, may not have inventory data up to the most recent year. While data quality may vary and coverage may not be complete, the historical reference should be one for which most major emitters have good data.

Ultimately, determining the base year or base period under a future agreement is a political issue, and is in essence arbitrary. Thus far 1990 has been used as a base year for the Kyoto Protocol, and offers continuity and comparability for countries bound by the Protocol until 2020. A 2015 agreement that looks to the future should

<sup>8</sup> A discontinuous target could specify multiple target years, e.g. X% below reference level for year 5 and Y% below for year 10.

Continuous targets are those that lack any time gaps in coverage between target years, and thus enable comprehensive and cumulative tracking of emissions.

arguably establish its objectives on a more recent basis, focusing on reducing emissions from their “current” levels rather than a level of emissions decades in the past.

From an accounting perspective, the selection of a single base year runs the risk of being arbitrary; it must be representative of average emissions. An alternative is to choose an average for a range of years, particularly for situations when emissions vary considerably from year to year. Given the economic and financial crisis of 2007-08, it may be feasible that a base period of average emissions over 2010-12 be used as the start of the target period. The same base year should be used across all sectors for an economy-wide target. It is likely that due to data limitations different base years or base periods be used for different gases (e.g. fluorinated gases). Of course, the scope of gases covered in the base year or base period emissions should be the same as those included in the mitigation objective.

For an intensity target, such as GHG/GDP, the output data, or GDP, must also be reliable, verifiable, and gathered from an official source. For GDP, countries should use the same metric in purchasing power parity (PPP) in USD for a specified year when assessing performance against the intensity target. If other relative metrics are used, these should also meet similar parameters to ensure consistency and data quality.

### ***2.1.2 Single-year vs. multiple-year***

Countries that express their mitigation objectives as a specific reduction in emissions in a given year, whether against a historical base year or projected reference emissions level, could simply account for reductions in the target year, e.g. 2030. However, this is problematic for four reasons:

- First, because emissions in a given year can fluctuate for a variety of reasons, reductions achieved in a specific year are not necessarily indicative of mitigation effort;
- Second, governments could feasibly initiate command-and-control policies in the target year, e.g. shut down some economic activity, or buy a large amount of offsets in the target year alone, to reach their target;
- Third, of greater importance is the total amount of emissions over the period i.e. getting closer to “what the atmosphere sees”;
- Finally, as highlighted by Prag, Hood and Barata (2013), expressing targets in a single year is particularly problematic when accounting for emissions units being bought or sold.

For this reason, use of a single-year target should be discouraged. Alternatively, in the absence of a continuous multi-year target, a discontinuous target over multiple years would be preferable; for example, a target for 2025, and then a separate target for 2030. While accounting for emissions in between the target years might not be required for compliance purposes, this kind of target provides greater certainty of a low- or lower-emissions pathway than a single-year target. However, while they may offer more certainty on pathways and trajectories, discontinuous year targets remain problematic when market mechanisms are used, as they make targets less comparable and can lead to fewer cumulative emission reductions compared to the same single-year target without using market mechanism units, or compared to multi-year targets (Lazarus, Kollmuss and Schneider, 2014).

All mitigation objectives should fall within the same target period, with multiple year targets falling within this (either continuous or not), and single-year targets also falling at the end of the period (e.g. all single year targets should be for 2030 if that is the end of the period determined under the 2015 agreement).

### ***2.1.3 Nationally appropriate mitigation actions (NAMAs)***

Nationally appropriate mitigation actions are difficult to include in a common accounting framework. They are by nature extremely varied, operate along a range of timeframes, in sectors and sub-sectors that do not easily map onto IPCC categories, may not always have GHG mitigation as their primary objective, and their GHG



impacts may be difficult to determine. There is currently much scope to improve our understanding of NAMAs in existing reporting and review regimes (see 5.3).

Post-2020, mitigation objectives expressed as NAMAs would ideally be more restricted to enable some common accounting elements. While many NAMAs may be appropriate and result in robust GHG mitigation, those included in an international regime with requirements for transparency and quantification may be more limited. NAMAs could, for example, be restricted to those for which avoided or reduced GHG emissions can be quantified in terms of CO<sub>2</sub>e. Without such quantification, it is not possible to account for progress toward meeting the mitigation objective.

For the sake of capturing a broader range of mitigation objectives, a less restrictive approach could also occur in parallel, for countries with less capacity and low emissions. For example, countries may have mitigation objectives formulated as NAMAs that are not directly expressed in GHG terms, but are nonetheless quantified and can be monitored, such as share of renewable energy sources in final energy consumption, or specific increases in forest cover or specific decreases in deforestation levels. Additional information would allow for an estimation *ex ante* and an assessment *ex post* of the actual GHG impact of these measures; such a calculation may not be required for compliance purposes, but could be required as part of the accounting and MRV framework.

Parties have also suggested a commitment to implement a given NAMA, but not a commitment to achieve a given result (GHG or other) stemming from its implementation. For example, a party would commit to implementing, in a domestically legally-binding manner, a carbon tax, without committing to any estimated GHG emissions abated as a result. While no *ex ante* assessment of GHG impacts would be required, metrics would be in place and progress could be monitored during the NAMA's implementation period and after its completion. In cases where it is difficult to precisely determine the actual GHG outcome of a NAMA, for example through a carbon tax, countries could also express their objective as a range, or make special provisions to use carbon market units to make up any shortfalls in the GHG outcomes of their NAMAs.

Accounting for progress with NAMAs is inherently more challenging than accounting for progress with a broader GHG target. Estimating the GHG impacts of NAMAs involves the development of counter-factual scenarios which can be complex (and should follow good practice guidance as for all baseline development), robust monitoring, and finally *ex post* verification (see WRI, 2013b for a thorough overview). The process is resource intensive and challenging even for most developed countries. Under a future regime, countries putting forward quantified NAMAs as their mitigation objective against which compliance may be determined should bear this in mind.

## 2.2 Measuring progress with the mitigation objective

Despite the variety of ways in which targets may be formulated, progress with meeting a mitigation objective would be on the basis of actual, absolute cumulative emissions over the period covered by the 2015 agreement. GHG inventories provide an assessment of actual emissions, but for the purpose of mitigation objectives accounting is likely to be different or narrower in scope, and should also include *ex ante* estimations of emissions.

Other than NAMAs, even a country with a mitigation objective that covers all its economy will not account for progress solely through its inventory; through use of market mechanisms and land-use sector accounting, these are likely to be different. It is also possible that objectives may not cover all sectors (as in China and India's CO<sub>2</sub> intensity pledges to 2020), in which case the scope of emissions to be measured will be narrower. In addition, *ex ante* estimations are important for parties collectively to have a better sense of the direction of future emissions and trajectories, and provide a basis for assessing their own progress towards objectives.

Some countries may express their objectives as continuous multi-year targets, with either annual emissions levels or average annual emissions levels over the target period. However, many other countries might use

relative targets, likely intensity based, or single-year targets, or targets set against a modelled reference level. A common approach would be for all countries to translate these objectives into absolute quantities of GHG emissions. These should also be provided over the entire target period, to allow for total cumulative emissions to be estimated.

The common accounting approach post-2020 would require that all targets be expressed, *ex ante*, in:

- Expected emissions level in the target year or years (for multi-annual targets) associated with the mitigation objective. For example, the actual emissions level associated with decreasing emissions X% or increasing them Y% relative to 2010. Note that for relative targets and those set against a baseline, this will require varying degrees of assumptions and calculations (see WRI, 2013a for examples) and enhanced reporting for these to be clear.
- For single-year or discontinuous multi-year targets, estimated emissions levels over the years of the mitigation target period (as covered in the 2015 agreement). From a domestic policy perspective, it is unlikely that a country would establish an objective without planning for a trajectory or means to meet the objective. This would require countries to estimate emissions falling within the scope of their objective over the entire target period.
- Expected amount of emissions that need to be reduced to meet the objective level, over the entire period. Once again, more reporting will be required to provide clarity on this figure for relative targets, as well as reductions that are set against a baseline.
- Expected net emissions over the period, accounting for market mechanisms and land-use changes if known beforehand.

The details of how these are accounted for are not dealt with here, though ideally these would follow a common approach, or start with following common guidelines. It is unlikely these will be agreed in the short-term, and these elements are presented as the basis for which common accounting should be developed. Clarity on how GHG emissions are estimated, based on the parameters of the individual GHG mitigation objective, will require greater *ex ante* reporting. This *ex ante* estimation would be provided as part of determining how a country will assess progress towards its objective. It is against these figures that emissions at the end of the period covered by the objective will be compared. The monitoring and regular reporting of these emissions amounts will allow for regular views into how countries are performing against their objectives.

A country would therefore compare, *ex post*, actual net emissions over the target period (and in the target year, should it have a single-year target) to those estimated *ex ante*. It would also compare net reductions over the target period with those estimated. This *ex post* assessment would account for the purchase or sale of any international units, and would ideally be subject to a common accounting system (as outlined in Schneider, Kollmuss and Lazarus, 2014). Expressing and reporting objectives in this way should form part of a common accounting framework whether or not such accounting applies for *compliance*. Once again, parties will need to accept that some mitigation objectives may lead to an absolute increase in emissions over the target period; this will likely be the case for many developing countries.

During the mitigation target period, countries must be required to monitor key parameters, such as changes in use of inventory methodology, global warming potential (GWPs), and scope (gases or sectors) that would lead to changes in emissions estimate or base period reference levels. This is all the more important for GHG objectives set against modelled reference levels (see section 3.1). A recalculation policy should be put in place, requiring recalculation if changes in key parameters exceed a certain threshold amount. This could be combined with automatic recalculation every X number of years, and in the case of unexpected changes. Specific guidance for threshold levels should be developed based on country experiences.



WRI (2013a) provides detailed guidance to estimate ex ante emissions estimations and determine ex post emissions, assuming necessary input data for emissions and indicators (base year emissions, baseline scenario emissions, activity data, GDP, etc.) have already been calculated, are available, and are consistently monitored throughout the commitment period.

While such ex ante information will be relatively straightforward to provide for GHG reductions against a base year or towards a specified net amount, the calculation will be more complex and involve more clarification for reductions against a modelled reference year and for any intensity-based targets. Given the range of countries to be included under a future 2015 agreement, providing guidance and guidelines for such estimations will be important, as will ensuring sufficient reporting to understand how the numbers are determined, in the absence of a common approach for all countries.

### **2.3 Fundamental bases of a common accounting framework: Inventories, GWPs, gases and sectors**

Inventories form the bedrock of all accounting, but alone are insufficient to understand and gauge progress towards meeting mitigation commitments. This is partly because of difficulties with land-use, land-use change and forestry (LULUCF) accounting and the use of international market mechanisms (Prag, Hood and Barata, 2013).

Under a 2015 agreement, it is also possible that not all mitigation objectives will cover the entire scope of a country's emissions inventory. This makes robust inventories all the more important, as it becomes essential to understand what is occurring in a country's emissions outside the scope of its particular mitigation objective, to assess whether emissions leakage is occurring to these areas, and to understand its overall emissions trends.

Even more importantly, baseline projections, estimated emissions reductions, and determining emissions reductions that occurred within a country's target, all require sound emissions data and use of consistent methodologies for comparability.

A common accounting framework should therefore include:

**Consistent use of the 2006 IPCC Guidelines for inventories, including the gases and sectors included therein.** It should also specify how parties are to respond to further improvements in methodological guidance. For example, that parties will transition to new sets of guidelines should these be developed, and within what time frame.

Reporting requirements should be updated, post-2020, for countries to report on total emissions without removals (excluding agriculture sub-categories in the agriculture, forestry and other land-use (AFOLU) sector) and with removals (including AFOLU), consistent with the 2006 IPCC Guidelines sectoral structure.

The 2006 IPCC Guidelines sectors and sub-sectors will provide the basis for data collection, and the reference for delineating all other sector boundaries under the mitigation commitment, if different. Parties will be required to clearly map the boundary differences between the GHG inventory sectors, and those covered by national mitigation targets. For gases, coverage will depend on key categories, and therefore might be limited for some countries due to cost and resource constraints, or because the gas is not a sufficiently significant source of emissions.

In order to encourage transition to the widespread use of the 2006 Guidelines by all countries (this is not required of non-Annex I countries to date), efforts should be made to understand where and why difficulties in such a transition occur. Some developing countries (for example South Africa) already use these Guidelines; it could be worthwhile to share experiences with their use. If the issue is one of changing data collection systems as well as and undertaking new training, for example, these specific issues could perhaps be addressed through targeted provision of support.

**Consistent use of GWP values from the latest scientific assessments.** For 2020, this will be those from the IPCC's Fifth Assessment Report. As with inventory guidelines, the CAF should require that parties use the latest GWP values as these are updated, within a specified timeframe for transition.

Parties have agreed to continue exploring the development of Global Temperature Change Potential (GTP); it is seen as advantageous since more appropriate for a long-term temperature limitation goal (below 2C by 2100), and does not overestimate the impact of shorter-lived GHGs (notably methane, and certain HFCs). However, physical uncertainties associated with GTP are currently greater (*e.g.* climate sensitivity), there are no standard GTP values developed for all gases, and the choice of time horizon appears to impact the metrics more than the use of GWP or GTP (Cook, 2012). Significant improvements in GTP development should be monitored, and provisions should allow parties to consider switching from GWP to another metric such as GTP when sufficiently robust.

**Full fungibility between gases and sectors.** Recent discussions on common metrics have presented the option of moving away from the current full fungibility approach under the Kyoto Protocol, for example by grouping together gases with similar atmospheric lifetimes in separate “baskets”, or setting separate targets and requirements for the LULUCF sector (Cook, 2012). The advantage of moving away from this approach is unclear from a global perspective (it might be more advantageous for certain countries with emission sources concentrated from a specific gas or sector), and would require a great cost in changing the institutional and technical structure of accounting for emissions and commitments. The political and economic argument for maintaining full flexibility in how a country allocates emission reductions across its jurisdiction remains compelling.

### ***Use of international market mechanisms***

If a country uses units outside its mitigation objective boundary, it must be clear how many reduction units were sold or acquired. Offset units could come from within a country's own geographic boundaries, *i.e.* from sectors or areas not covered by its goal/target, but also from other international sources. In the latter case, it is essential that double claiming of units be avoided – one country cannot count reductions that are being accounted as such in another country.

Having international tracking and registry mechanisms for internationally traded units is likely a requirement to avoid double counting. If a country does not have a means to clearly account for units bought and sold internationally, it is questionable whether it should engage in the international carbon market. In order to determine a country's overall global mitigation, the means in which it accounts for use of units, notably when these are used, must be accounted for transparently, as detailed by Schneider, Kollmuss and Lazarus, 2014.

### ***Land-use sector emissions***

The principal challenge associated with land-use sector included in a mitigation objective is accounting for fluctuations in emissions and removals that are of non-anthropogenic origin.

Post-2020, as indicated above, countries should maintain an accounting framework that allows for full fungibility between sectors, and uses the AFOLU structure of the 2006 IPCC Guidelines. As detailed in Canaveira (2014), a preferred accounting option post-2020 is for countries to account for land-use emissions against a projection of emissions and removals over the commitment period. The use of different “entry points”, and building capacity over time, would ensure flexibility and applicability to all parties.

## **3. Elements of common reporting approaches: baselines**

There are a range of important elements associated with providing greater ex ante clarity on different types of mitigation targets (Levin et al., 2014). This section underlines baselines as a priority area for which common

reporting should be required, and the key items to be included, drawing on previous and more detailed work (Clapp and Prag, 2012; DEA, OECD and URC, 2013; Stanton and Ackerman, 2011; WRI, 2013a). These are presented as common reporting requirements, given the difficulty with establishing common approaches for mitigation objectives that countries are currently developing for the post-2020 period.

The accounting challenge with targets set against a baseline is associated with the assumptions about future developments, covering economic, social, policy and other assumptions. Baselines used for measuring progress toward mitigation objectives need to provide a realistic counter-factual to the objective (Clapp and Prag, 2012).

Sound baseline projections require clarity on certain key elements. In the absence of common approaches to developing projections, clarity should be sought on the following eight key elements which significantly affect baseline projections:

1. **The choice of base year/start year for the projections:** Historical reference period refers to the base year or period used as a starting point for the projection; the same precautions should be used as for the base year against which mitigation objectives are set (must be representative, *i.e.* emissions shouldn't be uncharacteristically low or high). Historical emissions data should be based on inventories using IPCC methodologies. The timeframe of the projection should at a minimum match that of the goal/target, though it can also go beyond it (e.g. to *at least* 2030 if the target is for 2030). In some cases the base year will be the latest year for which inventory data is available, while in others the base year emissions levels may themselves be a projection (DEA, OECD and URC, 2013). This must be clarified, and parties must also provide an explanation of the base year chosen, with the ICA and IAR process used to clarify that the base year is representative (*i.e.* emissions were not uncharacteristically low or high).
2. **Inclusion of policies and measures:** Assumptions must be made about whether baseline projections include or exclude the effect of existing policies that impact GHG emissions, and which policies are considered "existing". Countries must clarify whether policies are included in the projection or not, which policies are included, and from what date they are either considered to be implemented (*e.g.* only the impact of policies implemented until 2009 are included). Once political decisions are made on the base year and length of commitment under the 2015 agreement, more detailed guidance on how to include policies in baseline scenarios should be developed.
3. **Scope:** the boundary of the baseline projection must be clearly defined, similarly to that of the mitigation objective (see 5.1.2); ideally, the projection should follow the same boundaries as that of the mitigation objective (in terms of gases, sectors, etc.).
4. **Underlying assumptions on key socio-economic drivers:** Of the various assumptions used in establishing the projection, key drivers are those that have a substantial impact on projected GHG emissions. Countries should transparently report on the following four elements commonly affecting projections:
  - Changes in GDP
  - Changes in population
  - Energy prices
  - Change in sectoral composition of GDP, *i.e.* in economic structure (*e.g.* from agriculture to industry, or from industry to services)

Conservative assumptions should be used when uncertainty for certain assumptions and drivers is high (*i.e.* those more likely to underestimate emissions in the baseline scenario). Assumptions should be reported transparently, as they are essential to understanding the projection. Other important key assumptions which are less crucial include: Energy-use growth; Technological development; Changes in land-use practices

(unless particularly significant for a given country's mitigation objective); other key drivers, according to national circumstances.

5. **Use of market mechanism units:** Any *ex ante* limits on purchase or sale of units should be included in the projection, either raising or lowering the final emissions level in the target year, and thus affecting the emissions trajectory and total number of emission reductions required. A country must transparently indicate if it intends to buy or sell units, how many, and whether these are all to be bought or sold in one year (*e.g.* the target year), in several years (*e.g.* at set milestones or a mid-target point), or on an annual basis throughout the target/goal period.

Arguably, an upward limit on the use of carbon market units should be set in advance, to allow for an assessment of the mitigation action undertaken domestically by the country. This could be determined politically within the 2015 agreement, and would lead to greater clarity on the amount of units that might be bought or sold within the target period. If no limits on the use of units are set in advance, these should not be included in the projection given this would introduced an added layer of uncertainty. Instead, parties would account for these *ex post*.

6. **Uncertainty and sensitivity:** Countries should be asked about the sources of uncertainty, and the results of any sensitivity analysis that has been undertaken. Sensitivity analysis for GDP growth assumptions is critical, and should be a minimum area of scrutiny. For certain countries, uncertainty regarding changes in land-use may also be high, and should be emphasised. For assumptions and parameters with high uncertainty, conservative values should be used (*i.e.* those more likely to underestimate emissions in the baseline scenario).
7. **Data quality:** Certain data sources used in developing projections can have significant impacts on projection outcomes. Countries should, as a priority area, clarify data sources for emission factors and for socio-economic data (*e.g.* using purchasing power parity rather than exchange rates for GDP).
8. **Recalculations:** Finally, updates and revisions to the projections, including base year or base period data, should be required according to thresholds, for example:
  - o When key factors or drivers that would affect projections change by X% compared to assumptions
  - o When a change in relevant factors results in an X% change in projected emissions
  - o An agreement, as part of MRV provisions, to revise projections, including base year emissions values, every X number of years (in line with National Communications or biennial reporting)
  - o When unexpected changes occur in key drivers, outside of a regular revision cycle

For the percentage change thresholds, a number or range of numbers could be determined based on common practice to date. This information could be drawn out from domestic practices in BURs and BRs, and explored under the ICA and IAR processes.

- **Land-sector emissions:** The importance of this element will depend on the individual GHG profile of the country; it may or may not be a key element in line with the eight listed above. As detailed in Canaveira (2014), parties should develop projections of emission and removals from the land sector, or reference levels, and account against these. Rules for developing reference levels should include:
  - o Use of the default IPCC 20-year transition period for land-use changes, which would allow the impact of recently introduced management changes to be excluded from projections for the future commitment period up to a maximum of 20 years (after which it would be considered business as usual)

- Embedding a background level of natural disturbances in forest into the reference level, allowing for abnormally high emissions to be excluded from accounting

Additional elements on which clarity is important for determining sound baselines, but are perhaps less crucial initially, include:

- **Modelling approach:** Modelling approaches have an important impact on the projections; given the diversity of approaches used, it is challenging to compare projections between countries. Clapp and Prag (2012) suggest guidance could be provided as to which model types are suitable for which purposes, so that similar types of targets/goals will use similar model types. At a minimum, countries should report the model used. Ideally, this will be a country-specific model; if not, generic or open source models can be used (e.g. MARKAL, LEAP). WRI (2013a) also suggests that where this is not possible, countries use an existing baseline scenario developed by a third party (e.g. IEA, US EPA or EIA), though this latter approach is unlikely to be relevant for smaller countries.
- **Conservativeness:** Though not a technical issue, options for ensuring that baseline scenarios used to set targets are ambitious could be included in future guidance. This could include several approaches, such as:
  - Including a greater number of policy measures in the baseline scenario, which would reduce emissions compared with their exclusion from the baseline
  - Using conservative approaches when setting baselines, that is, using values that are likely to underestimate emissions rather than overestimate them
- **Exclusion criteria:** Refers to a sub-set of assumptions used in baseline projections that in effect rule out certain policies and technologies on practical or ideological grounds. This can include cost minimisation that excludes certain technologies, or ruling out certain forms of energy or taxation that would be politically infeasible. Countries should transparently report the different exclusion criteria to understand the implications of their baselines.

## 4. Political considerations

### 4.1 Challenges associated with certain target types

This recommendation for a CAF suggests that all mitigation objectives be expressed in absolute emissions and emission reductions, whether or not they are domestically or internationally expressed in other forms. Translating these into “budgets” over a continuous multi-year period has several advantages, including from the perspective of accounting for the use of market mechanisms (Lazarus, Kollmuss and Schneider, 2014). There must be political comfort and acceptance of the notion that for some countries this will mean an absolute increase in emissions levels. Even where an absolute target represents an increase, the greater certainty associated with this type of target makes it preferable to a relative target with which there is significant uncertainty surrounding the level of increase of emissions. In this case, what is more important is ensuring that parties’ emissions trajectories are moving towards reduction, stabilisation, or increases in line with their objectives.

It is possible that for compliance purposes some countries are only held accountable to a single-year target. Given the environmental integrity problems associated with this, it may be necessary to distinguish between accounting required for *compliance*, and a common accounting approach whose purpose is to ensure technical comparability and predictability from an environmental perspective. Parties will need to develop comfort around reporting total emissions amounts over the entire target commitment period, and this may occur only incrementally over time.

## 4.2 Compliance provisions: dealing with over- and under-achievement of targets

Accounting under a common accounting framework may not completely overlap with a future compliance regime. The elements which may be used for compliance purposes could be more restricted, accounting for specific elements related to a given type of objective which could be a single-year target, and/or a relative target.

Rewarding overachievement can have drawbacks; carryover of surplus emissions under the Kyoto Protocol's first commitment period proved controversial as many surplus emissions were considered "hot air", i.e. not the result of mitigation efforts, and depressed carbon markets. Parties may not wish to reward overachievement that is not the result of mitigation actions, though isolating effects of various factors can be complex. In addition, any system of rewarding overachievement would need to account for a situation where countries deliberately understate their mitigation objective to ensure they will overachieve their targets. Parties that overachieve their targets may also experience pressure to continuously adopt significantly more ambitious mitigation objectives, which may be politically challenging and reduce the incentive to overachieve. Any system that will create rewards for overachievement would thus need to be thoroughly discussed and consider any perverse incentives that might be triggered. It may be considered that the benefits of over-achieving a target are sufficient, both domestically and in terms of international reputation, to avoid any explicit reward system.

If the objective is to incentivise overachievement, establishing of a set of continuous multi-year target periods, as under the Kyoto Protocol, would allow a country to carry over any emissions reductions made above those required under their objective to the next period, making future compliance easier. This form of incentive is attractive given that additional mitigation tends to become costlier, as cheaper "win-win" and "low hanging fruit" solutions get exploited. Where an objective is an absolute target based on a historic reference level, over-achievement is straightforward to determine: a country has over achieved if its emissions are lower than its target (including provisions for use of market mechanisms). Where the target is relative and based on a historic reference level, over- and under-achievement can be similarly determined, with significant transparency needed regarding the relative metric (e.g. population or GDP). This is particularly the case for GDP figures, which tend to be revised regularly and which can in some cases be calculated in ways that are not very transparent. The basis for the GDP figure will need to be clear *ex ante*, and the same figure must be used throughout the target period to measure progress.

For a single-year or non-continuous target, it might be difficult to automatically allow for carry-over any emissions reductions or avoided emissions to a subsequent single-year target. This will depend on the level of comfort surrounding the environmental integrity of meeting the single-year target (i.e. what the actual cumulative emissions were over the target period, and what the rules for using market mechanisms were).

If a country has set its target as a reduction against a baseline, simply determining over- and under-achievement may be difficult. This would require no changes in the baseline scenario, or a detailed accounting for any changes in underlying assumptions and changes to the baseline emissions levels. Parties would then need to agree to what target the country in question is accountable – the target as originally proposed, or the modified target. The monitoring and reporting requirements would be burdensome, as would any required international review mechanisms to provide confidence in revisions to baseline scenarios. For example, if baseline emissions change significantly because of changes in underlying parameters, for example GDP growth, then parties need to consider whether any over-achievement of the target should be rewarded or not.

For under-achievement of objectives, a compliance regime could penalise parties in various ways. A more facilitative system could also be in place, where regular monitoring allows parties experiencing difficulty with meeting their objective to sit in a special session and discuss their challenges, as well as what is required for them to meet their objective (including support). In the case of penalties for non-compliance, these could be financial, requiring the country to pay for the amount it has over-emitted based on the global carbon price, or



could involve pressure or an obligation (depending on the nature of the legal agreement) on the country to adopt a more stringent objective for the next target period. This pressure could take the form of new requirements for countries that do not meet their objective. For example, a country may be subject to a special session of the implementation and technical subsidiary bodies of the UNFCCC (SBI and SBSTA) to undergo an *ex ante* review of its next target, with room for additional discussion and debate. A country may also be subject to a greater reporting burden to provide information on progress with its objective, for example on an annual rather than a biennial basis. Penalties may also be lightened if a country decides to take on a different type of target, for example if a country with a relative target adopts an absolute target for the subsequent target period.

### 4.3 Determining comparability of efforts

Technical comparability of targets can be facilitated through MRV provisions, as well as broadly common accounting frameworks. However, political comparability, that of the level of “effort” a party is making, can be more difficult. Politically, it would not be feasible to establish common metrics of “effort”, such as share of GDP spent on mitigation, or comparison of the cost of mitigation in different countries related to their level of GDP. National circumstances differ greatly, and it is difficult to imagine parties agreeing to a formulaic approach to assess effort.

Greater transparency provisions, along with assessment and review processes, should be avenues for countries to gain mutual reassurances about the level of efforts being made for mitigation activities. Information on national systems, assessments and evaluations undertaken, policies being put in place domestically and progress with their implementation, are all elements that provide an indication of the work being done by a given government to meet its commitments and undertake mitigation activity more generally.

Countries could also base their assessment of effort in comparison with a “scientific ideal” for mitigation. This would require each country to undertake an assessment of mitigation potential, including a cost-benefit element in line with national circumstances, and indicate the level of mitigation that could be technically achieved over the target period. During the assessment and review processes, the level of mitigation being achieved could be compared with this assessment; countries closer in line with their technical mitigation potential could be considered to be making a high level of effort.

## 5. Working towards a CAF: issues and elements to address pre-2020

### 5.1 Understanding mitigation objectives

The work programmes under the UNFCCC for both developed and developing countries on clarifying and understanding mitigation pledges emphasise understanding the pledges *ex ante*, in terms of the emissions reductions expected. *Ex post* understanding is likely to occur mostly in the reporting, consultation and review processes newly established under the Convention. However, what is needed *ex ante* should be informed by what will be required *ex post*. In this sense, it is useful to think of where current gaps in the pre-2020 transparency system occur, and where these can be strengthened over the course of the next years to build capacity and comfort with more common approaches.

To understand parties’ mitigation targets and goals, it is important for an accounting framework to elucidate the different parameters associated with these pledges, so as to understand a) what level of emissions or emissions reductions can be expected, and b) what parameters progress will be measured against.

Currently, approaches to express mitigation targets differ quite widely, as seen in the Annex. Not only are there differences in goal types, but also in scope (sectors and gases), base years, baseline projections, timeframe (most for 2020, but some for later, e.g. South Africa also has 2025 target), and whether international carbon market units will be used (e.g. most developed countries will use such units).



Keeping in mind the type of framework for post-2020 targets that parties might work towards, particular gaps that should be addressed today include clarifying the scope of mitigation targets, understanding baseline projections (as outlined in section 3.1), and the use of international units (this element is addressed in Schneider, Kollmuss and Lazarus, 2014).

In moving towards a CAF for post-2020 mitigation objectives, one priority element that should be clarified under the new reporting and review structures are the coverage of the mitigation target (for other important elements, see Levin et al., 2014). The sectoral coverage of a target/goal might not map perfectly with IPCC sector and sub-sector categories in an emissions inventory, as economic sectors will vary by country and not necessarily resemble inventory categories. However, coverage should be clarified with specific information defining the boundary around the target/goal, namely:

- The gases included in the target/goal boundary
- The sectors that fall within it
- Definition of these sectors

Careful definition of the target or goal's scope, and mapping this in detail against IPCC inventory categories used by the party, is needed to understand an individual mitigation pledge.

Additional information that would help clarify scope and coverage, but is initially less essential, includes:

- The geographic boundary of the target/goal
- The direct and indirect emissions included within the target/goal boundary (can include assessment and disclosure of significant sources of leakage – either outside goal boundary or to another jurisdiction)

In the course of biennial reports, IAR and ICA processes, as well as during national Communication Reviews, understanding the coverage and scope of mitigation targets should be emphasised. Note that for Annex I parties this process has progressed over the past few years, through the development of common reporting tables and clarification exercises.

## 5.2. Accounting for progress with mitigation objective

Moving towards common accounting approaches for assessing progress with countries' mitigation goals or targets pre-2020 is primarily a political challenge, and can only occur incrementally.

For developed countries, progress with meeting targets will be accounted for relatively consistently, as they are required to produce annual inventories, report regularly in National Communications and Biennial Reports, and are subject to review and common reporting formats. The primary gaps pre-2020 concern use of carbon market units, as well as inconsistency in the inclusion and accounting of LULUCF.

However, there is a high degree of diversity and inconsistency in mitigation goals up to 2020, a less robust MRV structure for non-Annex I parties, and uncertainty as to how well countries will implement and follow MRV requirements under BRs and BURs. As such, emphasising clarity on certain accounting elements for all countries up to 2020 could provide stronger bases for moving toward greater commonality in accounting approaches.

The guiding principle is that of environmental integrity, emphasising total, cumulative emissions. As for post-2020 mitigation objectives, current mitigation pledges for 2020 could also be expressed as estimated net emissions and emissions reductions over the pledge period, which would then be compared *ex post* with the emission reductions and net emissions that occurred. This allows for parties to understand the potential impact of mitigation pledges (analysis as undertaken by the UNEP Gap Report), and allows parties to track achievement of targets from an environmental integrity perspective.

Except for Kyoto Protocol parties, total emissions do not form the basis for measuring progress with targets pre-2020, nor are they explicitly encouraged in reporting. However, given this should form the basis for a future CAF,

parties should encourage each other to think in these terms, and to report mitigation objectives accordingly. Requesting information on these elements should be prioritised under the current reporting and review frameworks; doing so in a non-compliance and facilitative environment, as the pre-2020 review mechanisms are, might be useful in increasing countries' comfort with the idea of cumulative emissions over the entire pledge period, and the notion of trajectories and pathways.

Annex I parties (including non KP parties), will likely provide this information in Biennial Reports and National Communications through their projections. If not, this information can be solicited during the In-depth Review process for National Communications, and potentially through the IAR process for biennial reports.

The current reporting and review process must also be used to elicit clarification regarding:

- Whether indicators and emissions are being consistently monitored: This includes economic data important to understanding to what extent the country's progress is matching its projections if its target is set against a modelled reference level. It also emphasises the importance of inventories; significant efforts must be made pre-2020 to ensure that more complete and robust inventories for all major emitters are available for the post-2020 period.
- Changes and recalculations in the projections: Countries should be encouraged to monitor and update projections in line with the timing of National Communications or biennial reporting structures. While the original BAU projection against which a target is set will remain the basis for assessing progress, changes in the projection going forward should be used to gauge how much reduction or avoidance of emissions is actually being achieved under the target.

### ***5.2.1 Encouraging convergence in use of accounting elements***

Recommendations for a common accounting approach post-2020 will require familiarising parties with these elements during the pre-2020 period. Two principle areas of emphasis are highlighted below.

#### ***Use of most recent scientific guidance***

During the pre-2020 period, Annex I parties will move to consistently using the 2006 IPCC Inventory Guidelines and Fourth Assessment Report (AR4) Global Warming Potential (GWP) values. These should form part of a CAF post-2020 (with GWP values updated from the AR5), including for sectors and gases, because they represent the most recent scientific guidance for these elements.

The IAR and ICA processes should emphasise use of most recent scientific developments for all parties, and distinguish this technical issue from that of country grouping and type of mitigation pledge. Parties that do not use most recent guidance could be asked to explain their choice, and exactly what barriers or constraints prevent them from doing so. Strengthening of inventories, using most recent guidance and GWP values, should be a priority area for technical and capacity building support pre-2020.

In terms of gases, countries could be encouraged to monitor certain gases without being required to include them in their inventory; for example, some developing countries might put in place means of monitoring NF<sub>3</sub> emissions if these are likely to be relevant given their industrial activities, even though they are not required to report these emissions. This would ensure that the gases could be included if they became a significant source of GHG emissions in the future. Such encouragement could occur within the ICA process, through an assessment of trends in certain gases alongside economic development trends and projections.

#### ***Ex post recalculations***

Under a common accounting framework, parties should follow guidance for recalculating the base year emission values and baselines for their emissions targets. A range of criteria would require a recalculation; the ICA and IAR processes should put forward specific questions regarding whether:

- Key factors or drivers that affect projections have changed compared with assumptions
- A change in relevant factors has resulted in a change in projected emissions
- There have been changes in the use of inventory methodology, GWP values used, or scope (gases or sectors)
- Unexpected changes have occurred in key drivers or factors that would require recalculation of base year emissions or baseline

Over the course of experience with ICA and IAR, a set of commonly applied approaches to dealing with the above issues might emerge and serve as a basis for setting specific guidance under a CAF. This could take the form of a range of threshold percentages for changes in key factors, in projected emissions, or base year emissions, or of an average number of years established for routine recalculation of base year and baseline.

### 5.3. Nationally appropriate mitigation actions (NAMAs)

While not always directly included in common accounting approaches, the issue of mitigation policies is relevant to better understanding countries' efforts in terms of mitigation action, even in cases where they have economy-wide targets. Indeed, a country's emissions may decrease or slow down largely independently of concerted action taken to limit emissions. It remains politically important for countries to monitor and report on their mitigation actions, and environmentally important that countries assess the impacts of their mitigation policies using projections of baselines and mitigation scenarios.

Several developing countries have expressed mitigation objectives in non-GHG terms. In many cases, these are not quantified in any way, but can refer to either general or specific policies to be implemented.

In some cases GHG reductions could potentially be estimated with greater ease, and NAMAs have been put forward in a quantified way for which the GHG equivalent may be estimated with provision of additional information. This is the case for goals that apply to specific sectors or sub-sectors, and include a quantified or quantifiable target. Examples include (UNFCCC, 2011a):

- Increase in forest cover by a certain percentage or hectares (ha) from a base year (CAR, China, Gabon, Mauritania, Morocco, Togo, Tunisia, Burkina Faso)
- Establishing certain area (in ha) of sustainably managed forest by target year (Gabon, Ethiopia)
- Reduce deforestation by certain amount in target year (Colombia)
- Increase amount of non-fossil fuel energy: by capacity (MW) by certain year (CAR, Ethiopia, Morocco, Gambia); by share of total energy use by certain year (China, Peru); by share of total energy capacity (Colombia); by share of electricity generation (Ghana)

In other cases, countries have listed a series of individual mitigation actions designed to reduce or avoid emissions within a particular sector or sub-sector (*e.g.* transport, electricity production, waste, forestry). In situations like this, WRI (2013b) provides guidance for determining when to group together a series of policy actions and estimate their impact together, accounting for overlaps and interaction between them. While a fully common approach to such assessments is not practicable, parties would benefit from guidance when assessing progress with their mitigation actions, particularly where these comprise their mitigation pledges; guidance in the form of WRI's forthcoming GHG Protocol should be considered for this purpose.

Given the range of mitigation actions countries' have put forward as targets pre-2020, it is particularly important to support inventory development in these countries in parallel. This will allow for a better sense of emissions and removals outside the potentially narrow boundary of a specific set of mitigation actions, and allow better policy planning for mitigation actions in the future.

At a minimum, where countries do not have quantifiable NAMAs, the BURs and ICA process should emphasise monitoring and reporting of policy implementation, and encourage the use of metrics to measure progress. Parties should be asked specific question about measures taken to implement mitigation actions, and be required to report on progress with previously specified measures and action items. Emphasising implementation could reasonably be expected to strengthen capacity to undertake more specific mitigation actions in the future.

## Annex: Typology of current mitigation pledges and implications for future mitigation objectives<sup>9</sup>

Understanding the current range of mitigation pledges and targets provides a useful basis for assessing what future mitigation targets may resemble.

Most countries with significant GHG emission have made emission reduction pledges either under the UN Convention on Climate Change (UNFCCC)<sup>10</sup> or under the Kyoto Protocol. Countries with economy-wide or multi-sector pledges and targets account for almost 80% of global GHG emissions, though many of the features of the reduction pledges vary substantially.

The diversity in the mitigation pledges made by countries for 2020 provides the opportunity to examine the nature of different pledges more carefully. This may be useful to inform discussion on the nature and type of commitments that may be preferable in a post-2020 climate regime<sup>11</sup>, as well as on the accounting framework needed to account for these pledges post-2020. The essential elements of the pledges, and the available options they suggest for pledges in the future, are also presented in Table 1-A below.

Only the 37 Parties that have a quantified emission limitation and reduction objective (QELRO) inscribed in Annex B to the Kyoto Protocol<sup>12</sup> have to account for their emissions and use of GHG units according to internationally agreed accounting rules. However, for the period from 2013-2020, many non-Annex I countries (NA1) and several Annex I (A1) countries without a Kyoto commitment also made mitigation pledges. For these countries, rules to account for the emission reductions and use of GHG units have not (yet) been agreed, though New Zealand has indicated it will use a Kyoto Protocol approach to account for its pledge, and Japan has indicated it could use this approach in certain areas. Mitigation pledges and actions by NA1 countries are referred to as nationally appropriate mitigation actions (NAMAs). These can vary widely, involving specific policy measures, general policy objectives, sector-wide mitigation activities or targets, and individual projects such as construction of a single renewable energy installation.

The pledges are diverse in terms of scope, predictability, applicability, coverage and use of units from market mechanisms. Table 1-A summarises the most relevant features that define the type and scope of the existing pledges. We do not discuss the level of ambition, i.e. to what extent the pledges are in line with the 2 degree target and equity considerations.

TABLE 1-A: FEATURES OF EXISTING PLEDGE TYPES AND AVAILABLE OPTIONS

| Feature               | Parameters                                   | Existing pledges                                                                                                                                            | Available options for future                                                                                                                                           |
|-----------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Predictability</b> | <b>Reduction target: How is it measured?</b> | <ul style="list-style-type: none"> <li>- "Absolute": in GHG terms (tCO<sub>2</sub>e)</li> <li>- "Relative" or "Intensity-based": GHG relative to</li> </ul> | <ul style="list-style-type: none"> <li>- Target is absolute (a specified quantity of emissions or emission reductions)</li> <li>- Target is intensity-based</li> </ul> |

<sup>9</sup> This section was elaborated by Anja Kollmuss and Sara Moarif.

<sup>10</sup> [COP-16 Cancún agreements](#) from 2010 include voluntary mitigation pledges made by developed and developing countries to control their emissions of greenhouse gases; UNFCCC (2011). Compilation of information on nationally appropriate mitigation actions to be implemented by Parties not included in Annex I to the Convention. <http://unfccc.int/resource/docs/2011/awglca14/eng/inf01.pdf>, UNFCCC (2011). Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention A1 Pledges: <http://unfccc.int/resource/docs/2011/sb/eng/inf01r01.pdf>

<sup>11</sup> At COP 18 in 2012, Parties to the UNFCCC agreed to a timetable for a new global agreement which will include all countries. The global agreement should be adopted by 2015 and implemented by 2020.

<sup>12</sup> UNFCCC (2012), Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol <http://unfccc.int/resource/docs/2012/cmp8/eng/l09.pdf>

| Feature           | Parameters                                     | Existing pledges                                                                                                                                                                                                                                                                                                                                                                                          | Available options for future                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |                                                | some other variable (tCO <sub>2</sub> e per intensity indicator, such as GDP)                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                   | <b>Reference: What is it measured against?</b> | <ul style="list-style-type: none"> <li>- Historical reference: base year</li> <li>- Projected reference: set against projected BAU emissions in a target year</li> <li>- No reference year, fixed reduction amount for the target year</li> </ul>                                                                                                                                                         | <ul style="list-style-type: none"> <li>- Reference emissions level is historical (single year or average over a period)</li> <li>- Reference emissions level is projected (single year or over a period)</li> <li>- No reference level, fixed reduction amount or emissions level for a target year</li> </ul>                                                                                                                                                                          |
|                   |                                                | For NAMAs: <ul style="list-style-type: none"> <li>- Units of energy (kWh, toe, etc.)</li> <li>- Area (hectares)</li> <li>- None or unclear</li> <li>- Absolute amount of GHGs (tCO<sub>2</sub>e) avoided or reduced estimated in some cases</li> </ul> Reference: <ul style="list-style-type: none"> <li>- Set against historical level</li> <li>- Target for a future year</li> <li>- Unclear</li> </ul> | <ul style="list-style-type: none"> <li>- Difficult to standardise what the NAMA will measure, against what, and across what time period: will require greater reporting</li> <li>- NAMAs should have quantified indicators to measure progress</li> <li>- Assessing GHG impacts should follow common good practice guidance and guidelines</li> <li>- Note for LDCs, especially if also small emitters, qualitative monitoring of implementation may be the minimum required</li> </ul> |
| <b>Coverage</b>   | <b>GHG gases</b>                               | <ul style="list-style-type: none"> <li>- All Kyoto gases</li> <li>- Uncertain (could be some or all of the Kyoto gases)</li> <li>- Single gas (e.g. CO<sub>2</sub> only)</li> </ul>                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>- All gases covered by the Kyoto Protocol; additional IPCC gases as determined by parties</li> <li>- “Core” set of gases for all countries, some gases optional</li> <li>- Variable</li> </ul>                                                                                                                                                                                                                                                   |
|                   | <b>Sectors<sup>13</sup></b>                    | <ul style="list-style-type: none"> <li>- Economy-wide</li> <li>- One or more sectors, but not economy wide</li> <li>- NAMA: Sector, sub-sector or single action</li> </ul>                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>- Economy wide</li> <li>- One or more sectors, but not economy wide</li> <li>- NAMAs: variable (from single action to multi-sectoral)</li> </ul>                                                                                                                                                                                                                                                                                                 |
| <b>Time frame</b> | <b>Target period<sup>14</sup></b>              | <ul style="list-style-type: none"> <li>- Continuous multi-year</li> <li>- Single year</li> </ul>                                                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>- Continuous multi-year</li> <li>- Discontinuous single year(s)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                       |

<sup>13</sup> We use the term “sector” broadly, as these can be defined differently according to the country setting the target. A sector could cover activities include within IPCC sector and sub-sector categories set for GHG inventories (fuel combustion, or electronics industries), or be defined in a much more disaggregated way, for example the sector definitions used for statistical purposes by the European Community which uses specific NACE codes (*Nomenclature statistique des Activités économique dans la Communauté Européenne*) grouped into 21 broad categories (such as “manufacturing”) which in turn are subdivided into further sub-categories (“manufacture of motor vehicles”).

<sup>14</sup> A discontinuous target could specify multiple target years, e.g. X% below reference level for year 5 and Y% below for year 10. Continuous targets are those that lack any time gaps in coverage between target years, and thus enable comprehensive and cumulative tracking of emissions.

| Feature                                                                    | Parameters                                  | Existing pledges                                                                                                                                                                                                           | Available options for future                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Additional features impacting certainty and comparability of pledge</b> | <b>Conditionality</b>                       | <ul style="list-style-type: none"> <li>- NAMAs: variable</li> <li>- Unconditional (unilateral action)</li> <li>- Conditional (requiring financial support from donor country, or other political prerequisites)</li> </ul> | <ul style="list-style-type: none"> <li>- NAMAs: variable</li> <li>- Unconditional</li> <li>- Conditional on financial support</li> <li>- Conditional on political requirement</li> </ul>                                                                                                                                     |
|                                                                            | <b>Inclusion of market based mechanisms</b> | <ul style="list-style-type: none"> <li>- Pledge explicitly includes the use of international market units for pledge attainment.</li> <li>- Pledges do not specify the use of international market units</li> </ul>        | <ul style="list-style-type: none"> <li>- Commitment specifies that no international market mechanisms will be used</li> <li>- Commitment specifies volume and nature of international market mechanisms that will be used</li> <li>- NAMA specifies whether and in what quantities market mechanisms will be used</li> </ul> |

The reduction targets, reference year and time frame (predictability) in Table 2 are used as the basis to categorise the existing mitigation pledges under the Convention into eight broad groups for the period of 2013-2020. Table 3 lists the countries and their pledge types and Figure 2 shows the eight pledges types in terms of share of global CO<sub>2</sub> emissions of the countries with that respective pledge type (data based on UNEP, 2012). Noteworthy is that countries that have made continuous multi-year emissions commitments account for only approximately 14 % of global CO<sub>2</sub> emissions.

Loosely grouped, there are pledges which set a fixed quantity of emissions or emissions reductions (“absolute” target) against a historical reference level, which we have distinguished according to single- and multi-year targets:

- **Absolute reductions relative to historic base year emissions, continuous multi-year targets:** The 37 countries with a QELRO in the second commitment period of the Kyoto Protocol have absolute reduction targets for 2020 relative to historic base year emissions. The targets are translated into quantified emissions budgets over the commitment period from 2013-2020. Assigned amount units (AAUs) are issued once for the entire period of the continuous multi-year target.
- **Absolute reductions relative to historic base year emissions , single year targets for 2020:** Under the Convention, some countries made absolute emission reduction pledges for 2020, yet these are not translated into multi-year targets. Such targets are measured in tonnes of CO<sub>2</sub>e reduced below the historic base year emissions. Five A1 countries and four NA1 countries have made this type of pledge.

Pledges which set a fixed quantity of emissions or emissions reductions against a projected reference level:

- **Absolute reductions relative to BAU emissions in target year, single year targets:** Nine countries have set absolute reduction targets relative to a projected business-as-usual (BAU) emissions level in the target year. Such targets are measured in tonnes of CO<sub>2</sub>e reduced below the BAU emissions. When countries specify their BAU emissions ex-ante for the target year it is possible to establish the absolute target ex-ante. If the target was a multi-year target then it could be translated ex-ante into a quantified emissions budget over the target period. If countries did not specify their BAU emissions ex-ante BAU emissions would have to be monitored and established ex-post. Seven of the eight countries in this category (Indonesia, Israel, Mexico, Papua New Guinea, Singapore, South Africa, South Korea) have set their BAU emissions. Chile is in the process of doing so. All these countries have single year targets.



Pledges which set a fixed quantity of emissions without any reference level:

- **Absolute reduction to a specified emissions level in target year, single year targets:** Costa Rica and Maldives aim to have zero net emissions by 2020, while Papua New Guinea has such a target for 2050 (following an intermediate 2030 target). These targets would be measured in terms of absolute emissions. Note these are not visible in Figure 1-A as these countries' share of global emissions is too small.

Pledges which set a relative level of emissions (relative to GDP in both cases) against a historical reference level:

- **Intensity-based reductions relative to historic base year emissions, single year targets:** China and India have set targets based on relative reductions to be achieved per economic output compared to a historic base year. Such targets are usually measured in terms of tonnes of CO<sub>2</sub>e reduced per GDP.

Pledges which are NAMAs, which we have distinguished into those that are quantified in some way and those that have not been quantified:

- **GHG-quantified nationally appropriate mitigation actions (NAMAs):** Eight countries have made pledges which can be classified as "GHG-quantified" either because they: a) have specific quantified targets which could be translated into GHG terms with additional information, such as share of forest cover to be increased, rate of deforestation to be decreased, or share of renewable energy sources to be reached in the energy mix, by a given year, or; b) directly quantify the GHG reduced or avoided by the NAMAs they have pledged to undertake. These are distinguished from the NAMAs classified below because progress with the pledged NAMAs can be measured and verified.
- **Non-quantified policy-, sectoral-, and project- level nationally appropriate mitigation actions (NAMAs):** 32 countries have made pledges that are based on implementing certain activities without quantifying the expected impact of such activities in GHG terms or in any other terms which could help determine their GHG impact. These NAMAs also do not specify how implementation of activities will be measured, and take the form of statements expressing non-quantified objectives, such as to increase renewable energy generation or to improve energy efficiency, often without specification of time frames.
- **No pledges:** 34 countries with emissions representing more than 0.1% of global emissions (in 2010) have no reduction pledges.

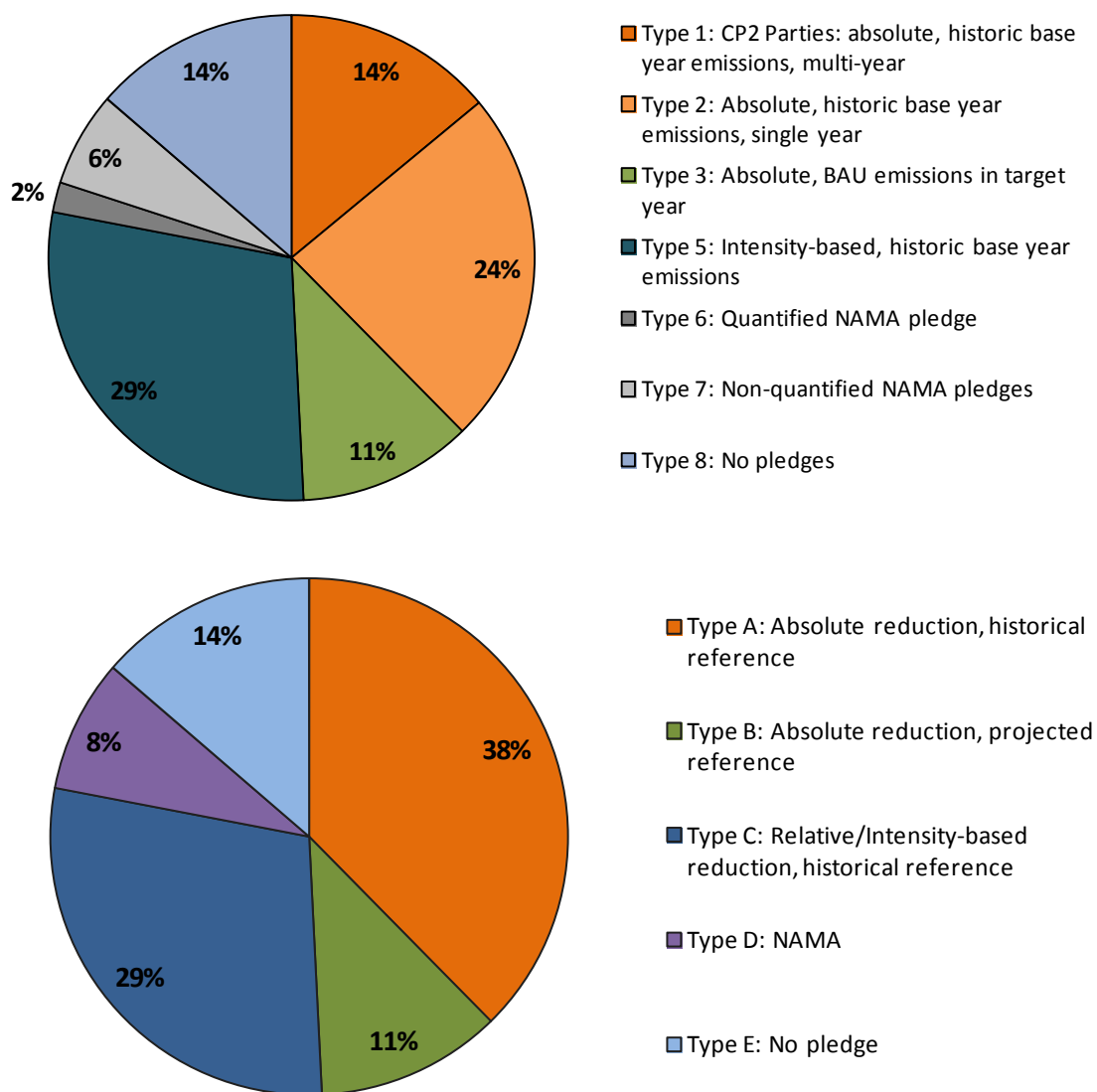
Table 2-A below lays out these different target types, while they are represented as share of global CO<sub>2</sub> emissions in Figure 1-A, using both detailed and higher-level typologies.

TABLE 2-A: TARGETS OF COUNTRIES BY PLEDGE TYPE

|                                                                | Relative to historic base year                                                                                                                                                                                                                                                                                                        |                                   |                    | Relative to BAU emissions in target year     |                                                                                                                                                                   | Not related to BAU                           |                                |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------|
| Reduction target                                               | Country                                                                                                                                                                                                                                                                                                                               | Reduction target by 2020          | Historic base year | Country                                      | Reduction target by 2020 from 2020 BAU                                                                                                                            | Country                                      | Reduction target               |
| Absolute reductions, multi-year targets                        | Type 1:                                                                                                                                                                                                                                                                                                                               |                                   |                    | No such multi-year pledges have been made    |                                                                                                                                                                   | No such multi-year pledges have been made    |                                |
|                                                                | Australia                                                                                                                                                                                                                                                                                                                             | 5%                                | 2000               |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Belarus                                                                                                                                                                                                                                                                                                                               | 8%                                | 1990               |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Croatia                                                                                                                                                                                                                                                                                                                               | 5%                                | 1990               |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | EU27                                                                                                                                                                                                                                                                                                                                  | 20%                               | 1990               |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Iceland                                                                                                                                                                                                                                                                                                                               | 15%                               | 1990               |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Kazakhstan                                                                                                                                                                                                                                                                                                                            | 15%                               | 1990               |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Monaco                                                                                                                                                                                                                                                                                                                                | 30%                               | 1990               |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Norway                                                                                                                                                                                                                                                                                                                                | 30%                               | 1990               |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Switzerland                                                                                                                                                                                                                                                                                                                           | 20%                               | 1990               |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Ukraine                                                                                                                                                                                                                                                                                                                               | 20%                               | 1990               |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Share of global CO2 emissions (in 2010): 14%                                                                                                                                                                                                                                                                                          |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |
| Absolute reductions, single year targets                       | Type 2, A1 countries:                                                                                                                                                                                                                                                                                                                 |                                   |                    | Type 3:                                      |                                                                                                                                                                   | Type 4:                                      |                                |
|                                                                | Canada                                                                                                                                                                                                                                                                                                                                | 17%                               | 2005               | Brazil                                       | 36.1% to 38.9%                                                                                                                                                    | Costa Rica                                   | Carbon neutrality by 2021      |
|                                                                | Japan                                                                                                                                                                                                                                                                                                                                 | 25%                               | 1990               | Chile                                        | 20%                                                                                                                                                               | Maldives                                     | Carbon neutrality by 2020      |
|                                                                | New Zealand                                                                                                                                                                                                                                                                                                                           | 10%                               | 1990               | Indonesia                                    | 26%                                                                                                                                                               | Papua New Guinea                             | Carbon neutrality by 2050      |
|                                                                | Russia                                                                                                                                                                                                                                                                                                                                | 15%                               | 1990               | Israel                                       | 20%                                                                                                                                                               | Share of global CO2 emissions (in 2010): <1% |                                |
|                                                                | USA                                                                                                                                                                                                                                                                                                                                   | 17%                               | 2005               | Kyrgyzstan                                   | 20%                                                                                                                                                               |                                              |                                |
|                                                                | Share of global CO2 emissions (in 2010): 24%                                                                                                                                                                                                                                                                                          |                                   |                    | Mexico                                       | 30%                                                                                                                                                               |                                              |                                |
|                                                                | Type 2, NA1 countries:                                                                                                                                                                                                                                                                                                                |                                   |                    | Papua New Guinea                             | 50% by 2030                                                                                                                                                       |                                              |                                |
|                                                                | Antigua and                                                                                                                                                                                                                                                                                                                           | 25%                               | 1990               | Singapore                                    | 16%                                                                                                                                                               |                                              |                                |
|                                                                | Marshall Islands                                                                                                                                                                                                                                                                                                                      | 40%                               | 2009               | South Africa                                 | 34%                                                                                                                                                               |                                              |                                |
|                                                                | Moldova                                                                                                                                                                                                                                                                                                                               | 25%                               | 1990               | South Korea                                  | 30%                                                                                                                                                               |                                              |                                |
|                                                                | Montenegro                                                                                                                                                                                                                                                                                                                            | 20%                               | 1990               | Share of global CO2 emissions (in 2010): 11% |                                                                                                                                                                   |                                              |                                |
|                                                                | Share of global CO2 emissions (in 2010): <1%                                                                                                                                                                                                                                                                                          |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Intensity-based reduction                                                                                                                                                                                                                                                                                                             | Type 5:                           |                    |                                              | Countries could also in theory propose an intensity based reduction against a future, projected emissions level in a target year. No such pledges have been made. |                                              | No such pledges have been made |
| Country                                                        |                                                                                                                                                                                                                                                                                                                                       | intensity-based reduction in 2020 | Historic base year |                                              |                                                                                                                                                                   |                                              |                                |
| China                                                          |                                                                                                                                                                                                                                                                                                                                       | CO2/GDP by 40-45%                 | 2005               |                                              |                                                                                                                                                                   |                                              |                                |
| India                                                          |                                                                                                                                                                                                                                                                                                                                       | CO2/GDP by 20-25%                 | 2005               |                                              |                                                                                                                                                                   |                                              |                                |
| Share of global CO2 emissions (in 2010): 27%                   |                                                                                                                                                                                                                                                                                                                                       |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |
| Quantified: policy-, sectoral-, and project- level             | Type 6:                                                                                                                                                                                                                                                                                                                               |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Burkina Faso, Central African Republic, Colombia, Cook Islands, Ethiopia, Gabon, Morocco, Peru                                                                                                                                                                                                                                        |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Share of global CO2 emissions (in 2010): 1.9%                                                                                                                                                                                                                                                                                         |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |
| Non-quantified: Policy-, sectoral-, and project- level actions | Type 7:                                                                                                                                                                                                                                                                                                                               |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Afghanistan, Algeria, Argentina, Armenia, Benin, Bhutan, Botswana, Cambodia, Cameroon, Chad, Congo, Côte d'Ivoire, Dominica, Egypt, Eritrea, Gambia, Georgia, Ghana, Guinea, Jordan, Macedonia, Madagascar, Malawi, Mauritania, Mauritius, Mongolia, San Marino, Sierra Leone, Swaziland, Tajikistan, Togo, Tunisia                   |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Share of global CO2 emissions (in 2010): 6%                                                                                                                                                                                                                                                                                           |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |
| No pledge                                                      | Type 8:                                                                                                                                                                                                                                                                                                                               |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Bangladesh, Bolivia, Cuba, Ecuador, Iraq, Iran, Kenya, Kuwait, Lao, Libya, Malaysia, Mali, Myanmar, Nigeria, North Korea, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Serbia, Sudan, Syria, Thailand, Trinidad and Tobago, Turkey, Turkmenistan, Uganda, United Arab Emirates, Tanzania, Uzbekistan, Venezuela, Vietnam, Zambia |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |
|                                                                | Share of global CO2 emissions (in 2010): 14%                                                                                                                                                                                                                                                                                          |                                   |                    |                                              |                                                                                                                                                                   |                                              |                                |

Data source: UNEP, 2012

FIGURE 1-A: EXISTING PLEDGES TYPES AND THEIR SHARE OF TOTAL GLOBAL CO<sub>2</sub> EMISSIONS IN 2010



Data source: UNEP, 2012

## References

- Busche, J., *et al.* (2008), “Changes and Implications of the 2006 Guidelines for National Greenhouse Gas Inventories”, European Topic Centre on Air and Climate Change (ETC/ACC)
- Canaveira, P. (2014), *Options and Elements for an Accounting Framework for the Land Sector in the Post-2020 Climate Regime*, Final Terraprima Report to the Swiss Federal Office for the Environment.
- Clapp, C., and A. Prag (2012), “Projecting Emissions Baselines for National Climate Policy: Options for Guidance to Improve Transparency”, OECD, Paris.
- Clapp, C., Karousakis, K., Buchner, B., and J. Chateau (2009), “National and Sectoral Mitigation Potential: A Comparison Across Models”, OECD/IEA, Paris.
- Cook, J. (2012), “Uncertainties in implementation of common metrics”, presentation made at the Workshop on common metrics to calculate the CO<sub>2</sub> equivalence of anthropogenic greenhouse gas emissions by sources and removals by sinks, 3 April 2012, Bonn.
- Danish Energy Agency (DEA), Organisation for Economic Co-operation and Development (OECD), and UNEP Risø Centre (URC) (2013), *National Greenhouse Gas Emissions Baseline Scenarios: Learning from Experiences in Developing Countries*, DEA, OECD and URC.
- IPCC and WMO (2009), “Meeting Report: IPCC Expert Meeting on the Science of Alternative Metrics”, Edited by Plattner, G-K., Stocker T., Midgley, P., and M. Tignor, 18-20 March 2009, Oslo.
- Lazarus, M., Kollmuss, A. and L. Schneider (2014), *Single-Year Mitigation Targets: Uncharted Territory for Emissions Trading and Unit Transfers*, Stockholm Environment Institute Working Paper, SEI US Centre
- Levin, K. *et al.* (2014), “Ex-Ante Clarification, Transparency, and Understanding of Intended Nationally Determined Mitigation Contributions”, Working Paper, World Resources Institute, Washington, DC.
- Prag, A., Hood, C., and P. Martins Barata (2013), *Made to Measure: Options for Emissions Accounting under the UNFCCC*, Climate Change Expert Paper No. 2013(1), OECD/IEA, Paris.
- Prag, A., and G. Briner (2012), “Crossing the Threshold: Ambitious Baselines for the UNFCCC New Market-Based Mechanism”, OECD, Paris.
- Schneider, L., Kollmuss, A. and M. Lazarus (2014), *Addressing Double Counting of Emission Reductions under UNFCCC*, Stockholm Environment Institute Working Paper, SEI US Centre
- Stanton, E., and F. Ackerman (2011), “Developing Baselines for Climate Policy Analysis”, additional guidance supporting UNEP’s MCA4climate initiative: *A practical framework for planning pro-development climate policies*, Stockholm Environment Institute and UNEP.
- UNEP (2012), *The Emissions Gap Report 2012*, United Nations Environmental Programme (UNEP), Nairobi.
- UNFCCC (2011a), Compilation of information on nationally appropriate mitigation actions to be implemented by Parties not included in Annex I to the Convention, FCCC/AWGLCA/2011/INF.1
- UNFCCC (2011b), Issues relating to the transformation of pledges for emission reductions into quantified emission limitation and reduction objectives: methodology and examples, Revised Technical Paper, FCCC/TP/2010/3/Rev.1, UNFCCC, Bonn.
- UNFCCC (2012a), *Decisions Adopted by the Conference of the Parties*, FCCC/CP/2011/9/Add.1 and FCCC/CP/2011/9/Add.1, UNFCCC, Bonn.

UNFCCC (2012b), Quantified economy-wide emission reduction targets by developed country Parties to the Convention: assumptions, conditions, commonalities and differences in approaches and comparison of the level of emission reduction efforts, FCCC/TP/2012/2, Technical Paper, UNFCCC, Bonn.

UNFCCC (2012c), Report of the workshop on common metrics to calculate the carbon dioxide equivalence of greenhouse gases, FCCC/SBSTA/2012/INF.2, Note by the Secretariat, UNFCCC, Bonn.

UNFCCC (2013), *Decisions adopted by the Conference of the Parties*, FCCC/CP/2012/8/Add.1 and Add.3, UNFCCC, Bonn.

WRI (2013a), *Greenhouse Gas Protocol: Mitigation Goals Accounting and Reporting Standard: Second Draft for Pilot Testing*, July 2013, World Resources Institute, Washington D.C.

WRI (2013b), *Greenhouse Gas Protocol: Policies and Actions Accounting and Reporting Standard: Second Draft for Pilot Testing*, July 2013, World Resources Institute, Washington D.C.