From science to policy: how can research community contribute to the reporting and verification needs under the Paris Agreement?

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Key issues

• The Paris Agreement has set a new transparency framework applicable to all

• The research community will play a key role in the post-2020 UNFCCC framework in support to developing countries

• GHG inventories must follow a rigid set of rules established by the UNFCCC and IPCC that countries need to follow

• Full understanding of the set of rules are key for the research community to effectively contribute to the process

• The research and reporting communities should facilitate estimates comparability
Pre-2020 UNFCCC reporting obligations

**All Parties:**
Common but differentiated responsibilities and respective capabilities

**Annex I Parties**
- **Commitments:** reduce their GHG emission, provide financial support and technology transfer to developing countries.
- **GHG Inventory (mandatory):** yearly emission from 1990 on the basis of 2006 IPCC Guidelines – Decision 24/CP.19 → every year

**Non-Annex I Parties**
- **Absence of commitments**
- **Biennial Update Report (BUR) – Decision 2/CP.17** → every 2 yrs
- **GHG inventory:** based on 1996 IPCC Guidelines (or a never versions) → every 4 yrs

**Least developed countries (LDCs) and Small Island Developing States (SIDS)**
- Can submit their GHG Inventory (GHGI) at their own discretion

**Independent annual reviews – Decision 2/CP.17 for UNFCCC and IPCC guidelines and guidance compliance**

Differentiated system between developed and developing countries
Paris Agreement transparency framework

**All Parties:**
Common objective

**Each party**

- Nationally Determined Contribution (NDC) – Paris Agreement Art. 3 and 4 → every 5 years from 2020
- Biennial Transparency Report (BTR) according the Modality, Procedures and Guidelines (MPGs) of the Decision 18/CMA.1 → every two years from 2024

**Review process of the BRT**
Decision 18/CMA.1 for controlling the consistency of the information reported in the national inventory report and the information necessary to track progress made in implementing and achieving NDC

**Least developed countries (LDCs) and Small Island Developing States (SIDS)**
Can submit their NDC and BTR on their own discretion

**Enhanced Transparency Framework (ETF)**

Common global reporting obligation with some flexibilities
GHG inventories approaches and principles

**IPCC Tier levels**

- **Tier 1**
  Default emission factors by IPCC
- **Tier 2**
  Country specific emission factors
- **Tier 3**
  Higher order methods (e.g. models and inventory measurement systems)

**IPCC reporting principles (TCCCA)**

- **Transparent**: fully documented
- **Complete**: i.e. estimates are reported for all relevant categories of sources and sinks, gases, and relevant geographic areas.
- **Consistent**: throughout time series
- **Comparable**: among national inventories
- **Accurate**: i.e., no over- nor under-estimates

**Scope**: anthropogenic emissions and removals
**GHG**: CO$_2$, N$_2$O, CH$_4$, PFCs, HCFs, SF$_6$, NF$_3$
**Scale**: Country level; annual basis

**Sectors**:
1. Energy;
2. Industrial Processes and Product Use (IPPU);
3. Agriculture;
4. Land-use, Land-use change and Forestry (LULUCF);
5. Waste/Wastewater

Emissions categories within sectors can be grouped while it is not possible to group between sectors.
Global Stocktake (GST) process

GST is the main tool for the assessment of the achievement of the global targets of the Paris Agreement

- **NDC**
  - Focus on Mitigation, Adaptation on voluntary basis (every 5 years)

- **GST**
  - Assess the collective progress against long term targets (every 5 years) – Mitigation, Adaptation and Means of Implementation

- **BTR**
  - GHG inventories - Track progress of NDC implementation (mitigation and financial support)

- **IPCC AR6**

- **IPCC AR7?**

- **2020**
- **2021**
- **2022**
- **2023**
- **2024**
- **2025**
- **2026**
- **2028**
- **2030**

- **Two main sources of data of GST:**
  - globally aggregated data from the NGHGI reports 13.7(a)) of the PA
  - best available science (art 14.1) such as IPCC.

- **This will require comparability between these two data sources!**
### Global Stocktake (GST) timeline and inputs

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Inputs</th>
<th>Outputs</th>
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<tbody>
<tr>
<td><strong>Nov 2021</strong></td>
<td>• GST preparation: Guiding questions by SBs Chairs</td>
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<td>• Secr. starts compiling information for technical assessment</td>
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<td><strong>June 2022</strong></td>
<td>• <strong>Info collection and preparation</strong> by SBs <em>(Phase 1)</em></td>
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<td>• Call for inputs</td>
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<td><strong>Sept 2022</strong></td>
<td>• <strong>Deadline for inputs to be provided</strong></td>
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<td><strong>Dec 2022</strong></td>
<td>• <strong>Technical assessment</strong> <em>(Phase 2) → Technical dialogue</em>**</td>
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<td><strong>June 2023</strong></td>
<td>• <strong>Cut off date for any further info collection</strong></td>
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<td><strong>Nov 2023</strong></td>
<td>• <strong>Consideration of Outputs by Parties</strong> <em>(Phase 3)</em></td>
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<td>• High level events</td>
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<td>• Identification of opportunities and challenges</td>
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<td>• Reports and communications from Parties <em>(e.g. BTR and GHG Inventories)</em></td>
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<td>• Latest reports of the IPCC</td>
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<td>• Reports of the subsidiary bodies and relevant constituted bodies and forums and other institutional arrangements under the Paris Agreement and the Convention;</td>
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<td>• Synthesis reports by the secretariat produced during the first steps of the GST process;</td>
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<td>• Relevant reports from United Nation agencies and other organizations supportive of the UNFCCC process <em>(e.g. UNEP gap report)</em>;</td>
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<td>• Voluntary submissions from Parties;</td>
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<td>• Relevant reports from regional groups and institutions;</td>
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<td>• Submissions from non-Party stakeholders and UNFCCC observer organizations <em>(thus potentially including research institutions)</em></td>
<td><strong>Synthesis Reports</strong> <em>(by the UNFCCC Secretariat (on mitigation, adaptation and finance))</em></td>
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<td>• Summary report of Phase 2</td>
<td><strong>Summary report and overarching factual synthesis</strong></td>
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<td><strong>Summary of key political messages</strong></td>
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*Source: UNFCCC Decision 19/CMA.1*
GST LOGICAL FRAMEWORK FOR MITIGATION

**Where are we?**
- **Scientific benchmark**
  - Models and measured data
- **Country data:** reports and communications from Parties (including Biennial Transparency Reports and GHG Inventories)

**Where are we going?**
- **Scientific benchmark (2° trajectory of anthropogenic emissions up to 2100)**
- Models, recent IPCC reports, UN related agencies Reports and other relevant inputs
  - **NDC scenario:** trend based on the NDC targets
  - **BAU scenario:** trend of emissions according to the BTR and the real achievement of the NDC (in case of general underachievement of the NDC targets)

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Source: Perugini et al 2020 Submitted

Needs of consistency between datasets

Historic emissions (GHGI)
- Scientific benchmark (2° trajectory of anthropogenic emissions up to 2100)
- BAU scenario
- NDC scenario
GHG inventories by countries vs IPCC AR

**GHGI**: Internationally agreed methods (reporting GLs and IPCC GLs) for the estimation of national anthropogenic GHG, with a consistent time-series data.

**IPCC Assessment Reports** focuses on assessing the state of the science on the global carbon budget using globally applied data, definitions and modelling methods.
Examples of Comparability issues

• **System Boundaries**

• Methodology
• differences

• Emission attribution

• Terminology

• **Spatial Scale**
  GHGI -> Country level (Bottom up approach)
  IPCC AR -> From Global (Top down approach) to local level

• **Temporal scale**
  GHGI -> Annual
  IPCC AR -> Variable (generally more refined)
Examples of Comparability issues

- System Boundaries
- Methodology differences
- Emission attribution
- Terminology

GHGI -> Wide use of Emission factors
IPCC AR -> [for inversion models] inversions of atmospheric GHG concentration gradients in combination with more process-based flux models
Examples of Comparability issues

• System Boundaries

• Methodology differences

• Emission
  • attribution

• Terminology

Source sector attribution is a key requisite in the GHG inventory.

Each sector comprises individual categories (e.g. Fuel combustion) and sub-categories (e.g. transport)

Emissions categories within sectors can be grouped while it is not possible to group between sectors.
Terminology

- System Boundaries
- Methodology differences
- Emission attribution

- Terminology

🔍 **Reporting** refers to the presentation of estimates in the tables or other standard formats used to transmit inventory information (Parties’ annual emissions)

🔍 **Accounting** refers to the way the reported information is used to assess the achievement of mitigation target/s set out in the NDC (e.g. reduced emissions against ’90 levels)
According to Gasser and Ciais (2013) and Pongratz et al. (2014), terminology is a key factor to understand differences in the estimates of net GHG emissions due to LULUCF under a global point of view.

**Terminology**

- System Boundaries
- Methodology differences
- Emission attribution

LULUCF sector the most affected:
- Complexity in GHG pathways
- Difficulties to differentiate anthropogenic sources/sinks
- Methodological complexity
Special focus on most uncertain sectors, gases, and subsectors in the GHGI

EU28 GHGI Uncertainties

- Total (excl LULUCF): 5.0%
- Total (incl LULUCF): 5.8%
- 5. Waste: 51.4%
- 4. LULUCF: 32.6%
- 3. Agriculture: 45.4%
- 2. Industrial processes: 11.8%
- 1B Fugitive emissions: 18.4%
- 1A Fuel combustion activities: 0.9%

Source: EU NIR 2019
How can science efficiently contribute?

• Improve the GHG inventories estimations and verification and inputs to GST

• Need of full understanding terms, rules, procedures and guidelines for relevant inputs

• Emerging challenges for developing countries

• The uncertainty level reduction is an important issue to be considered for future GHG inventories improvements

• Inventory data can offer a good source of data for modellers to develop tools and methods that can be then used in the GHG inventory.

• Close collaboration with inventory agencies would improve mutual understanding
Thanks

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