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Tackling the Challenges of Assessing Collective Progress for an Effective Global Stocktake

Executive Summary

For our Environment

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Tackling the Challenges of Assessing Collective Progress for an Effective Global Stocktake

Executive Summary

By

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On behalf of the German Environment Agency

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executive summary of an underlying research project

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Contents

1 Introduction

The Paris Agreement provides an open-ended framework for global climate action. It combines top-down collective goals with individual countries' contributions (Nationally Determined Contributions (NDCs)). A key challenge of this hybrid approach is that there is no guarantee that the individual contributions add up to what is required to meet the collective goals.

To address this issue, the Paris Agreement established the Global Stocktake (GST). The GST will "assess collective progress" towards achieving the long-term goals of the agreement as of 2023 and every five years thereafter, on the basis of information reported through the Enhanced Transparency Framework. It thus provides feedback and connects the national-level implementation of NDCs with the overarching objectives of the Paris Agreement with a view to influencing and inspiring national agendas towards more ambitious subsequent NDCs. Corresponding to this role, this paper addresses three questions:

- **What should an effective Global Stocktake look like?**
- **What information and data are needed for an effective Global Stocktake?**
- **Is it possible to execute an effective Global Stocktake within the mandate of the Paris Agreement?**

To address these questions, a comprehensive two-year research project was financed by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and conducted by the German Environment Agency.[1] This executive summary provides a condensation of the underlying study and the comprehensive final report. Specifically, we first present background information and determine what "effective" means when it comes to the GST, focussing on the mitigation aspects (chapter 2). We then examine indicators and benchmarks that could be used in the GST to assess collective progress and evaluate whether the required information is at all available and of sufficient quality to conduct a meaningful analysis on mitigation progress (chapter 3). Subsequently, we develop and present opportunities and challenges in aggregating the information and describe an approach to present the information in a way that serves the purposes of the GST (chapter 4). We conclude with a review whether and to what extent the proposed approaches meet the conditions of a successful GST and formulate recommendations for the design of the GST process (chapter 5).

2 Background and Framework for Analysis

2.1 The Global Stocktake in Context

The GST is established by Article 14 of the Paris Agreement. Its mandate comprises three 'thematic areas'; mitigation, adaptation, and means of implementation and support, while loss and damage and response measures will also be considered in the process. In our study we solely focus on the area of mitigation. Negotiations at COP24 in Katowice confirmed that the GST will consist of three components – (1) information collection and preparation, (2) a technical assessment, and (3) consideration of outputs (for a detailed assessment of the Katowice Rulebook in view of the Global Stocktake see Jeffery, Hermwille and Siemons, forthcoming).

The outputs of the GST should "summarize opportunities and challenges for enhancing action and support in the light of equity and the best available science, as well as lessons learned and good practices". It is worth noting that the outputs of the GST shall "have no individual Party focus, and include non-policy prescriptive consideration of collective progress" (Decision 19/CMA.1 chapter I paragraph 14).

1 The project was funded under grant number FKZ 3717181030. The final report of the project is expected to be published in February 2020 at www.umweltbundesamt.de.

Information that is to serve as an input to the GST should be submitted at least 3 months before their consideration in the technical assessment and no later than six months before the consideration of outputs. It should include information on the state of greenhouse gas emissions and mitigation efforts undertaken by Parties, the overall effect of NDCs, the state of adaptation efforts, finance flows, barriers and challenges for developing countries, opportunities to enhance international cooperation and to increase support and fairness considerations.

Sources of input will comprise reports and communications by parties, reports of the IPCC, the subsidiary bodies (SBSTA and SBI), other relevant bodies under the UNFCCC or the Paris Agreement, the UNFCCC secretariat, UN agencies, regional groups and institutions as well as submissions from Parties and non-Party stakeholders. The Secretariat is asked to prepare four synthesis reports as part of the information collection and preparation stage that should cover (1) the state of GHG emissions and removals and mitigation efforts, (2) the state of adaptation efforts, experience, and priorities, (3) the overall effect of NDCs, and (4) financial flows (UNFCCC, 2018, para. 6c).

2.2 An Effective Global Stocktake: Functions of the Global Stocktake and Conditions to Fulfil Them

*We identify four functions that an effective Global Stocktake should fulfil; acting as a **pacemaker** of policy processes, **ensuring accountability** of countries actions, **driving enhanced ambition** in subsequent NDC cycles, and providing **guidance and signal** of a renewed commitment to the Paris Agreement goals.*

The GST is perceived as THE mechanism to increase the level of ambition over time. Still, a huge discrepancy exists between the high ambition expressed in the long-term temperature goal and the current level of ambition of NDCs (UNFCCC, 2016). It is therefore necessary that the level of ambition of NDCs is ramped up considerably in subsequent iterations of the NDC cycle. There are various theories of change that can help to explain how the GST could contribute to ramp up ambition over time. We have "translated" them into the following four governance functions for the GST that need to be fulfilled for the GST to be effective, i. e. to foster transformational change (also see Hermwille *et al.*, 2019). Specific process- and information-related conditions need to be fulfilled in order for the GST to meet those functions:

- **Pacemaker function**: The Paris Agreement establishes a "pacemaker" that stimulates and synchronizes policy processes across governance levels. According to this perspective, the GST reinforces the periodic 5-yearly NDC cycle or rhythm of the Paris Agreement which resembles a prototypical policy cycle (agenda setting, policy formulation, decision-making, implementation, evaluation) (Jann *et al.*, 2007). The process itself can be seen to function as an agenda setting mechanism, designed to influence decision-making at the national level. In order to fulfil this function, meaningful information needs to be available in time. Furthermore, the outputs of the GST should be formulated in a way that resonates with the national discourse of as many countries as possible.
- **Ensuring accountability**: The initial phase of the GST process requires country-specific input (information from the Enhanced Transparency Framework as well as other "best available science"). Those information could contribute to hold countries accountable by "naming and shaming" countries with regard to the implementation of their NDCs. To do that, accurate and sufficiently granular data to track progress towards NDCs is necessary. Additionally, the GST could increase the level of public attention for progress made by publicly receiving, reviewing and appraising individual country reports, to complement the multilateral consideration of progress under the Enhanced Transparency Framework. This could be done if the corresponding reports of the process were officially endorsed by a high-level segment in the negotiations. However, the GST has a very narrow mandate as it is supposed to assess *collective* progress only. When one conceptualizes the GST as a process, it might be possible to receive and review the input during the initial phase of that process, possibly in public.

- **Driving NDC ambition:** It is necessary that the level of ambition of NDCs is ramped up considerably in subsequent iterations of the NDC cycle. To support the in-built "ambition mechanism" of the Paris Agreement that each NDC needs to represent a progression beyond the Party's previous NDC (Müller and Ngwadla, 2016; van Asselt, 2016), the GST could try to determine benchmarks that may help to determine what constitutes a progression as well as the highest level of ambition. It is not within the mandate of the GST to do this assessment, but it could provide the means for others including national policymakers and civil society organizations to carry out the work. The IPCC will play a prominent role in setting those benchmarks. Additionally, the GST could showcase particularly ambitious NDCs or aspects of NDCs. It could provide a peer-learning platform for 'how to do transformational change'" (Milkoreit and Haapala, 2017, p. 2). This could be done within the technical dialogues to be held during the GST process.
- **Guidance and signal:** The GST can be seen as an opportunity to reiterate and reinforce the signal already provided in Paris. The GST is an occasion to provide testament of whether or not Parties are still committed to the purposes of the Paris Agreement. More importantly, the GST could further develop and refine the existing signal. First, it needs to assess whether the long-term vision is still adequate and/or feasible in the light of available science. For mitigation, it would be particularly helpful if it collated and institutionalized sectoral visions that spell out more clearly sector-specific transformation challenges. Refining the signal provided from the Paris Agreement would not only help guide the next round of NDCs but could also serve as an updated reference point for all kinds of governance initiatives (incl. non-state and subnational actors). It would provide legitimation and orientation for transnational governance initiatives and thus help "orchestrate" the groundswell of climate action.

3 Taking Stock: Available Information for Assessing Progress

3.1 Indicators for an Effective GST

The GST should be based on a broad spectrum of information that can easily be related to policies and actions. Including consideration of detailed, sector specific information could facilitate a better understanding of emissions drivers and their barriers, and the development of a vision of a 1.5 °C compatible world.

To meet the functions described above, indicators and benchmarks will be necessary in the GST as a means to assess collective progress. Appropriate indicators for measuring progress against the Paris Agreement mitigation goal include not only emissions but also their drivers and the structural and institutional practices in place to facilitate the transition to a low carbon world. Indicators may be quantitative or qualitative in nature.

A good indicator is relevant, reliable, accurate, and tractable. **Under the GST, a relevant, or meaningful, indicator is clearly relatable to national and international climate policy frameworks, on a recent and near-future timescale and at a level of granularity that informs action.** If the GST is to inform enhanced ambition policies, the issues and indicators being tracked should be easily translatable into policies and not be too abstract. To be relevant, indicators also need to be formulated in a manner that is comparable between countries, such as per capita emissions or emissions intensity of economies.

To be reliable and accurate, an indicator must be robust in its formulation and based on good quality data that is trusted by all participants. Furthermore, averaging of data over multiple years is important to remove spurious data and account for fluctuations and events, such as those due to economic crises or year-to-year variations in temperature. Finally, a tractable indicator is one for which sufficient information is available, be that for a sufficient amount of countries, enough years, and updated regularly with the most up to date developments so that a good understanding of the situation is possible.

The GST needs to take multiple timeframes into account. We want to know the current state of emissions and their drivers, the direction in which changes are occurring, and where we expect emissions and their drivers to be in the future. To fulfil these purposes, all indicators would ideally be available based on data time series of continuous years extending both backward (until at least 1990) and forward (to the timeframe of current NDCs or long-term low emissions development strategies). Data and information for the latter require projections and are therefore particularly challenging. Thus, it may be that some indicators can only be used to measure progress to date, or to evaluate future directions only within a restricted timeframe (e.g. under NDCs but not long-term strategies).

The level of detail that the indicators should explore also needs to be taken into consideration, which we will refer to as granularity. This granularity could be in terms of sector, gas, region, fuel type, or technology. The more specific the indicator, the more specific information required to estimate the indicator. On the one hand, a more specific indicator is often easier to relate directly to policies (e.g. building renovation rates) and thus fulfilling the relevance requirement. On the other hand, it's less likely to be able to find comparable information for all countries and years.

To fulfil the relevance requirement of a good indicator outlined above, some level of sectoral detail is necessary. One challenge for the GST is that different institutions and information sources define sectors in a different way. Another requirement of the GST is that progress is assessed at the collective level but, to be relevant, some geographic resolution (either national or regional) could be more informative.

With regard to qualitative indicators, the GST should provide an overview about the domestic policies and measures that countries use. It will not be possible to assess the stringency, ambition or effectiveness of any individual policy. However, providing an overview of which countries have introduced comprehensive framework legislation, which sectors / areas of mitigation activity are covered and whether or not the expected mitigation impacts have been quantified could provide relevant information. A second type of qualitative information to be collated under an effective GST would relate to barriers and challenges regarding the transformation towards decarbonized economies and societies.

For the analysis underlying this paper, we examined a **comprehensive** set of possible indicators that could be used in the GST and assessed their relevance, data requirements, and the data availability for performing assessments. The selection includes **both key top-level parameters directly related to the Paris Agreement's objectives** as well as **highly-detailed aspects** of mitigation, incorporating sectoral level detail and policy relevance as described above. We further prioritised indicators that are fundamental to a transition to a low carbon economy, such as the share of renewable energy in final energy consumption, and key qualitative indicators of progress, such as the existence of a long-term low carbon development strategy.

Industry was selected as an exemplary sector to assess in greater detail because it is a substantial contributor to global emissions but less explored than the energy sector. Industry emissions are additionally interesting because their scope encompasses both energy emissions and process emissions and issues of sectoral definitions must be addressed. For the industry sector we selected indicators based on the IPCC's 5th Assessment Report, particularly WGIII Chapter 10 (IPCC, 2014). The drivers of emissions in industry are then considered in terms of energy efficiency, emissions efficiency of energy, emissions efficiency of processes (CO_2 and non-CO_2), materials efficiency and product demand.

3.2 Establishing Benchmarks for Evaluating Progress

We propose that the GST considers a series of indicators and here outline how those indicators can be evaluated using benchmarks. Benchmarks may be derived from macroeconomic modelling assessments, best practice examples, or consideration of technical potential. The application of benchmarks to individual or groups of countries should take national circumstances and equity considerations into account.

An indicator is only meaningful if a context and benchmark is given – what level should the indicator be at if a specific goal is to be met? In the case of the GST, the benchmarks derive from the context of the goals of the Paris Agreement: what is needed to be consistent with limiting warming to 1.5 °C, to peak emissions as soon as possible, and to achieve a balance of anthropogenic sources and sinks?

One of the challenges of setting benchmarks is that there are many different ways to achieve the overall temperature and emissions goals.

Benchmarks can be set in both qualitative and quantitative terms, and both can be useful. Particularly for top-level indicators, a clear descriptive benchmark can be more relatable than a numeric target. We propose that a mixture of descriptive and quantitative benchmarks is needed to robustly and effectively translate indicator assessment into effective policy action.

For the benchmarks explicitly included in the Paris Agreement (limiting global temperature increase, peaking emissions and balancing sources and sinks), the IPCC reports provide a pertinent source of information. We distinguish three different types of benchmarks for quantitative indicators that can be set; macroeconomic, best practice, and technical potential. Benchmarks may need to be updated in subsequent stocktakes to account for any missed targets in previous years or improved scientific understanding.

Finally, even more so than in defining indicators, defining and setting benchmarks is an aspect of equity. Should all countries be held to the same benchmark, or should countries be given different targets based on capacities and historical responsibility? Rather than formulating benchmarks for indicators based on equity, we propose that (1) the GST should include some specific indicators of equity such as per capita emissions, cumulative per capita emissions and capability, and (2) that equity can be operationalized through the manner in which indicators are used and assessed. For some indicators, particularly those derived on best practice or technical potential, equity could be operationalized with the expectation that developed countries are setting the best practice examples and are quicker in making improvements than less developed countries. Additionally, the level of support provided to developing countries will be crucial as will the overall adequacy of collective efforts (also see Winkler, 2019).

3.3 Quality and Availability of Information for the Global Stocktake

The Enhanced Transparency Framework should provide good quality and extensive information that the Global Stocktake can use. However, the framework will not be fully implemented until 2024 and, even then, will not include all information that would be ideal. Other sources of information that could provide additional details or indicators, before and after 2024, may lack legitimacy under the UNFCCC. These sources should be utilised as far as possible and the IPCC could play a role in synthesising and legitimising some information sources.

A rich variety of information sources is available which could, in principle, provide valuable input to the GST and provide data on selected indicators and benchmarks. However, the conditions for a fully effective GST will be difficult to fulfil and specific data gaps and challenges remain.

Information on progress towards mitigation targets and levels of GHG emissions will mostly be based on country reports submitted to the UNFCCC. However, these reports hitherto have included significant data gaps for a large number of countries. The aggregation of emissions would be possible on the basis of national reports combined with gap-filling approaches for countries with missing information,

Additionally, challenges still arise from the lack of transparency in the definition of countries' NDCs. Additional information requirements in order to track progress towards these NDCs, such as BAU targets, are not entirely covered by available data.

Some of the indicators considered, e.g. emissions per revenue tonne km, are currently not feasible for assessment under the GST as there are no individual data sources that provide this information for a sufficient number of countries. To perform such an assessment, information would need to be gathered from national or sub-national sources.

Data availability poses a strong restriction on the number of indicators that could be considered under the GST. In some cases, these restrictions may be reduced if the IPCC, or other bodies, are able to use data that is otherwise not publicly available and collate and include the information as part of the AR6 reports, giving the sources legitimacy under the UNFCCC. This would be particularly useful with energy data from the IEA and IRENA. Some of this data has been used by the IPCC in the past, but generally at a global or regional aggregate level.

In other cases, the data simply does not exist at sufficient temporal resolution for enough countries to be usable under a GST that truly includes all countries. This issue is particularly relevant for those indicators that are more detailed in terms of sub-sectors, such as the material intensity of industrial subsectors. This is where efforts to ensure that the GST addresses policy relevant indicators run into limitations, although there is a level of detail at which both data is available and the indicator can directly inform policy, such as the share of renewables in the energy sector.

One option for the GST to consider for increasing the number of indicators that could be used, is to establish a cut-off number of countries for which data is available and an assessment could still be performed. This could be particularly relevant for activities that are dominated by more developed countries and where the countries for which data is available represent a major share of the global total for that indicator.

Additionally, there may be data sources available which hold data that could prove useful for a GST but which are compiled by entities which make them available on a commercial basis (e.g. the Platts database on world electrical power plants (S&P Global Platts, 2018), Bloomberg New Energy Finance (Bloomberg New Energy Finance, 2018)). However, the stocktake should ideally be based on data sources which are publicly available. If data sources such as IEA World Energy Outlook, SE4ALL, Enerdata or Bloomberg New Energy Finance were made available to the GST, the number of indicators, particularly in the energy sector, could be significantly increased. It may prove useful to consider whether there are (non-financial) incentives that could motivate such data-owners to contribute to the cause of a GST in the design of this process. The GST could provide a global platform for making their products publicly known and advertising their usefulness to an important international process. Otherwise, some of the features of an effective GST will need to be performed by independent organisations and activities.

For **qualitative indicators**, there are several different sources of information. First and foremost are official UNFCCC documents prepared and submitted by the Parties themselves. To review the quality and availability of pertinent information from these sources, we prepared country dossiers for five selected countries (the EU, India, Mexico, Vietnam and Ethiopia) with the dual purpose of assessing the data availability as well as providing input for attempts to aggregate qualitative information.

In terms of domestic policies, data availability with existing official UNFCCC documents was generally sufficient, however, not in all cases very recent. With the revised reporting obligations under the Enhanced Transparency Framework, this will supposedly improve. While a list of relevant policies could be compiled from these sources, a categorisation/classification of those policies was not as straight forward and required significant additional research and deliberation. Meanwhile, information on the NDCs differs strongly.

Information on transformation challenges and barriers, however, was largely unavailable from official UNFCCC documents. The guidelines for the preparation of Biennial Update Reports for developing countries foresee a section where Parties are supposed to "provide updated information on constraints and gaps, and related financial, technical and capacity-building needs" (UNFCCC, 2012, p. 41), however only in the context of international support. For developed countries there is no such requirement. Hence a systematic assessment of experienced and anticipated transformation barriers and challenges is not possible with existing official documentation.

The **information for setting benchmarks** is more readily available than that for the indicators themselves and will primarily come through the IPCC, either in the form of multi-model assessments or literature review. The IPCC provides the most legitimate and comprehensive source of information for the GST. Integrated assessment models provide both an extensive breadth and depth of information that will undoubtedly be used in both the upcoming IPCC AR6 reports and the GST. However, there are limits to the information they can provide in terms of detail and in terms of the flexibility of assumptions used to set up the model. Not all options for mitigation are included in IAMs, or are resolved in enough detail, and some mitigation paths may be taken that are not possible in the models. In particular, including detailed energy data that is currently behind a paywall and clearly defining technical potential and best practice examples from industry would substantially boost the scope of the GST. Moreover, defining benchmarks for more detailed/granular indicators is really difficult, particularly in having confidence about what is Paris compatible. A key challenges here is that the more granular an indicator is, the more interlinkages with other processes/indicators exist e.g. across the value chain. Defining benchmarks therefore necessarily implies assumptions based on other interdependent indicators. Overall, some testing and development of how to integrate different types of benchmarks and particularly how to operationalize equity in the definition of benchmarks is still needed.

In addition, analyses prepared by research institutes (e.g. the Climate Action Tracker or data by Climate Watch) could provide additional value to the GST process or be used by civil society to interpret the results of the GST independently of the official process.

4 Assessing Collective Progress: Approaches and New Tools

We assessed the challenges of addressing the GST's mandate to assess collective progress and the ability of the analytical community to address those challenges. Key challenges include the quantification and aggregation of emissions under the NDCs due to lack of clarity in the NDCs, only partial coverage of emissions within a country, contribution of the land-use sector, and the impact of market mechanisms.

4.1 Challenges in Aggregating National Information

The GST will necessarily need to assess progress on global emissions. However, such an aggregation implies a number of challenges.

Given that Art. 4.4 of the Paris Agreement stipulates that all countries should move towards economy-wide absolute emission reduction targets over time, the GST should assess whether or not progress is being made in that regard. The analysis should be expressed as the share of countries that have committed to economy-wide absolute emission reduction targets as well as the share of global emissions that is subjected to those kinds of targets. However, **quantifying NDCs is challenging, where limited or contradictory information is provided under the UNFCCC in NDCs and other documents.** Due to a lack of commonly accepted standards and information requirements, the (i)NDCs prepared by Parties in the run-up to Paris and in many cases confirmed thereafter display a huge variety in terms of types of commitments as well as sectors and gases covered. Additionally, a number of specific pieces of information are often missing in order to precisely assess the mitigation impact of NDCs and to track current progress with the implementation and achievement of NDCs (such as metrics or IPCC guidelines used for the calculation of emissions/removals; methodologies for establishing and accounting BAU targets or the contribution of the land-use sector or market mechanisms).

The GST could contribute to assessing the likelihood of overall implementation of the NDCs by incorporating existing work and summarising it. The summary could be performed at the global level – e.g. "current policies are set to exceed the NDC targets by X%" – or could summarise national efforts with statements such as "X of Y countries are on track to meet their NDC targets".

However, some uncertainties will not be resolved by or under the UNFCCC, and some of the information that will eventually be provided under the transparency framework will not be available for the first GST because the first reporting is not due until 2024. Either the Secretariat or independent analysts will therefore need to fill this informational and analytical gap.

Fortunately, the analytical community is well-poised to do so, having performed similar NDC aggregation efforts in 2015. Some of those methods and data will need to be updated for the GST and, preferably, in time for incorporation in the IPCC's AR6 which could give both robust review and legitimacy to individual assessments.

Secondly, to **evaluate collective progress toward the Paris Agreement goals, it is important to track global progress in the total emissions levels that are leading to that temperature change**. Unfortunately, the translation between global emissions and expected future temperature increase is non-trivial.

To estimate future temperatures, we first need to estimate future global emissions. If we assume that the NDC mitigation targets will be met, we have some constraint on emissions until 2030 but long-term temperatures will also strongly depend on post-2030 emissions. Globally aggregated emissions in 2030 can therefore only give an indication of whether global efforts are on track to meet the goals (Jeffery *et al.*, 2018). However, total emissions in 2030 can be used as a barometer to measure the level of effort and a number of methods have been developed for doing so. The methods vary in the extent to which they interpret the emissions level and the assumptions made about what will happen after 2030. Some approaches rely primarily on emissions totals whereas more model-based approaches also take more structural changes in energy systems into account.

Thirdly**, regarding qualitative information, it may also be informative to assess overarching policy frameworks, laws or indicative planning documents of countries as well as the sectoral coverage of policies in terms of dedicated sectoral policies**. Building on existing UNFCCC documents such as national communications and biennial reports / biennial update reports, it should be possible to establish a meaningful survey of the coverage of policies – even more so, when the new reporting requirements of the Enhanced Transparency Framework take effect. A main challenge, though, is a lack of structure and a meaningful classification of policies. Including a framework that classifies policies and measures in different types of instruments in the reporting templates of the transparency framework would make the assessment in the GST much more straight-forward.

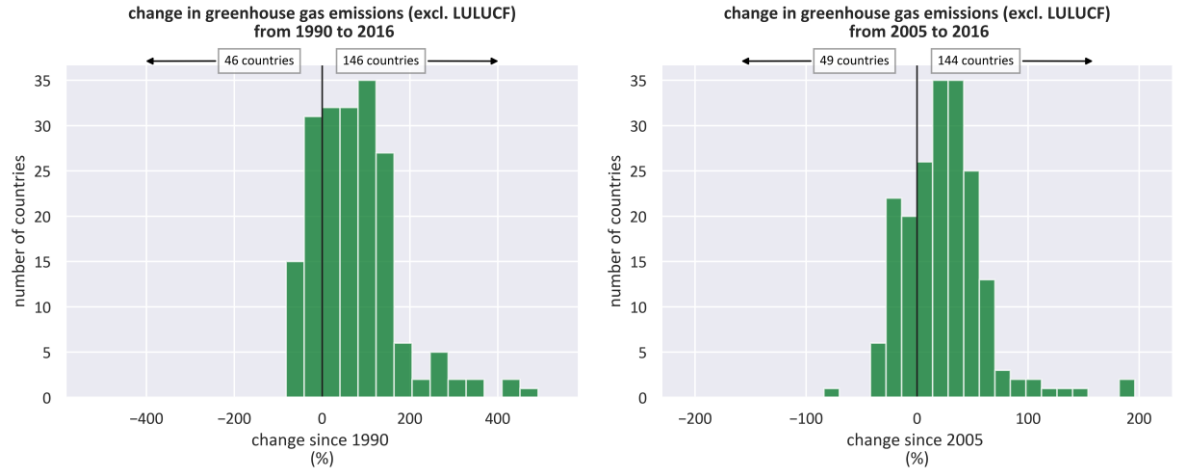
4.2 New Tools and Methods for Assessing Collective Progress

To meet both the mandate of assessing collective progress under the GST and the need for the GST to consider policy relevant, detailed information, we proposed and developed a new suite of tools to perform collective assessments of a range of indicators.

To meet the combined challenges of assessing collective progress and providing relevant information, we propose that the GST use a 'performance distribution' approach. In this approach, information from individual countries is used, but in an anonymised manner. Individual country information is displayed in histograms so that no individual country is highlighted but it is nevertheless possible to see if some countries are either leading or lagging behind others. The plots also contain information about global averages and either the averages or the distribution can be compared with global (or regional) benchmarks to evaluate progress.

Under this project, a toolset has been developed to test this performance distribution approach and evaluate its usefulness and suitability for the GST.[2] An example of change in emissions compared to 1990 and 2005 is shown in Figure 1.

Figure 1 Change in emissions compared to 1990 and 2005



Source: Own illustration based on PRIMAP-hist v2.0 data (Gütschow *et al.*, 2016; Gütschow, Jeffery and Gieseke, 2019). Note the change in scale between the two plots. Three outliers are not shown in the left-hand side plot and two in the right-hand side plot.

Many NDCs are framed as a reduction below a base year but with different base years. This type of calculation and figure allows the current status, or potentially also NDC targets, to be framed according to multiple different base years. In assessing the current status, or historic changes, the GST would really be taking stock and highlighting the progress made to date.

The first GST could present a figure similar to this one to examine the change in emissions since the Paris Agreement was adopted. If that figure were similar to those shown above for the historic trend, it would serve as a clear indication that the Paris Agreement has not yet translated into action. Alternately, if the distribution has shifted clearly to the left, it would show that the majority of countries were making progress and any outliers are either frontrunners (to the left) or laggards (to the right).

On the basis of information presented in this way, independent actors, including civil society and policymakers, would be able to locate their country within the distribution and know if their performance were rather as a leader or a laggard. That way, the GST would enable peer pressure among Parties, but also public scrutiny at the national level that could contribute to the enhancing ambition function of the GST.

The approach also allows for a collective assessment of whether all countries are moving together or whether there are clear leaders that have made substantial progress. The approach thereby circumnavigates on the one hand a naming-and-shaming while not letting individual countries hide within a global number and on the other hand a pride-and-fame illustration of high ambitious groups.

Furthermore, the approach is designed in such a way that it can be applied consistently for many indicators and so should be more accessible to a wide community. Once one figure is explained and understood it's easy to translate that understanding to other indicators and figures.

2 The Python based toolset used to make these figures is available for download from https://github.com/mljeffery/performance-distribution-tools.

5 Conclusions and Recommendations

Considering the availability of information and procedural constraints we assess the potential and limits for the GST to deliver on fulfilling the four functions of an effective global stocktake outlined above. The UNFCCC GST process could maximise its effectiveness by (1) including an explicit public appraisal of the inputs, (2) applying the performance distributions approach developed in this project, (3) including detailed discussion of key sectoral systems in the structured expert dialogues, and (4) calling upon the IPCC to assess the available research specifically with a view to identifying benchmarks. The official GST should be complemented and supported by independent activities from civil society and the academic community.

5.1 Will the Necessary Conditions Be Met to Fulfil the Four Functions of an Effective Global Stocktake?

To answer this question, we relate the findings of our analysis back to the functions of an effective GST as outlined in chapter 2.2. For the **pacemaker function**, the first GST will face severe shortcomings with respect to the information available, particularly with respect to self-reported and hence official UNFCCC approved information. However, from 2024 it is obligatory for all countries to submit transparency reports every two years following common reporting guidelines. It can be expected that efforts and support to submit information in time will be significantly enhanced from 2024 onwards. We have identified a plethora of alternative data sources outside of the UNFCCC, but the majority of these is likely not to be acceptable in the UNFCCC process if institutions are not part of the UN system, or data stems from private initiatives etc. (e.g. IEA world energy outlook or Bloomberg New Energy Finance). Moreover, many of these data sources are not comprehensive in terms of countries covered and/or time series being available. Finally, some of the most comprehensive and potentially useful datasets are only commercially available. Arguably, this should not pose an impediment to the GST as such but could hamper transparency of the process and the further exploitation of the analysis e.g. by civil society actors on the national level.

Regarding public attention during the political phase of the GST, it will be up to Parties to decide whether the outcomes of the GST should be recorded e.g. in the form of a non-binding political declaration, or a COP decision with some prescriptive formulations for how a country shall take the findings of the GST into consideration in the preparation of their subsequent NDCs. Whether the GST will be able to function as a pacemaker will thus depend on the decision by Parties on the outcomes of the GST and on the extent to which countries thoroughly implement the Enhanced Transparency Framework

Admittedly, the GST was not designed to **ensure accountability** at the level of individual countries, this is the role of the Enhanced Transparency Framework. The GST could, in theory, support this function, yet the ability of the GST to effectively do so is severely limited. Firstly, as outlined above, the availability of information is limited, at least for the first iteration of the GST. As of 2024, this can be expected to improve, but it remains to be seen, to what extent Parties will take advantage of the flexibilities implied in the reporting guidelines of the Enhanced Transparency Framework (particularly with regard to the submission of projections and the quantification of policies and measures). This might lead to important gaps in reported information. Moreover, in practice, a lack of capacities, resources or expertise may continue to pose obstacles to comprehensive reporting. It takes a significant amount of time to establish robust reporting systems and where such systems are not in place yet, enhanced reporting requirements alone will not suffice. The Capacity Building Initiative for Transparency, among others, will be an important instrument to address such lack of capacities.

Secondly, it is questionable whether the GST can create sufficient public attention to put policy makers into the spotlight, particularly those who have failed to implement their NDCs. As discussed above, singling out individual countries will not be possible under the GST. The modalities of the GST adopted in Katowice only provide a mandate for the UNFCCC Secretariat to prepare a synthesis report. It is not

clear how far the Secretariat can go in highlighting failure of countries to implement NDCs. To be most effective regarding the accountability function an anonymised 'transcript of grades' could be included in the report. This could include statements like 'X countries representing Y per cent of global emissions show significant implementation deficits and are unlikely to meet their targets unless implementation is improved.' While it is unlikely, that the Secretariat will develop its own judgements on the progress of implementation, it may well collate the self-assessment provided by parties in this way. The report could be the basis of discussions and serve as a means to hold countries accountable. It would be accessible to various stakeholders and could be used to create political pressure on the national level. How these reports will be considered in the technical assessment is currently not specified in the modalities for the GST though.

Measures to maximize public attention are indeed key for an effective GST. Only then can civil society and the global scientific community support the official process and create complementary assessments that are explicitly naming countries and highlighting both failures as well as means to improve the implementation.

In order for the GST to **drive NDC ambition**, it should be feasible with available information and within the mandate of the GST to define credible overarching benchmarks despite significant challenges. However, with increasing levels of granularity it becomes more and more difficult to establish commonly acceptable benchmarks. Ideally, the GST would also set sectoral benchmarks e.g. for energy, industrial processes and product use (IPPU), agriculture, forestry and other land use (AFOLU), or waste. Such benchmarks would allow policy makers on the national level to develop a more holistic perspective on their own mitigation activities.

The IPCC would have to play a major role in setting global and more specific benchmarks as it is the most authoritative scientific body to do so. Following the example of the recent 1.5 °C Special Report which was also "invited" by Parties through a corresponding COP decision (1/CP.21 §21), Parties could send a call to the IPCC to determine those benchmarks to feed into the GST. To maximize the effectiveness, the benchmarks formulated and proposed by the IPCC would then have to be officially endorsed also as part of the political consideration of outputs.

The integration of equity considerations, however, remains an unsolved question. Should all countries be measured against the same benchmarks? How and who is going to decide which benchmarks apply for which group of countries? etc. (also see Winkler, 2019).

Finally, we propose that the performance distribution tool as presented in chapter 4.2 has the potential to further facilitate the effect of credible benchmarks. Including global benchmarks in the visualization of the assessment of collective progress enables observers and parties themselves to evaluate their own performance against the benchmarks. While making such an evaluation explicit would exceed its mandate, providing the tools to perform such an evaluation is in our view an essential task for the GST.

With regard to facilitation of peer learning and sharing of experiences that might trigger enhancement of ambition in other countries, relevant information on policies and measures and their mitigation effects is already included by many countries in their national reports. However, there is no information being collected (systematically) on the obstacles or the main transformation challenges that countries face across all relevant sectors. Overall, providing information on successful mitigation policies to the negotiations to fulfil this function will be more a question of how to design the process of the GST than to generate new types of information input. A main task for the design of the political phase of the GST will be to identify ways of how to most effectively share best practice examples of mitigation options. In designing such a process, the GST would particularly benefit from a more structured classification of different types of policies, sectors addressed, and main mitigation options being addressed by those policies.

The modalities of the GST provide for technical dialogues to be held by means of "in-session round tables, workshops or other activities" (UNFCCC, 2018, para. 6). This creates ample leeway for the Chairs of the subsidiary bodies and the assigned co-facilitators of that contact group to provide a meaningful structure for the technical assessment. Ideally, this would take the form of structured dialogues of experts, which should focus on relatively concrete (sectoral) transformation challenges in order to fully exploit their potential. Input from non-state and subnational initiatives could be particularly valuable here and the modalities of the GST enable this stakeholder engagement. Voluntary national reviews under the Agenda 2030 for Sustainable Development and the Sustainable Development Goals, the Structured Expert Dialogue (SED) conducted under the first periodic review (2013-2015) as well as the existing Technical Examination Processes (TEPs) held under the joint auspices of the UNFCCC's Subsidiary Bodies or the Technical and Economic Assessment Panel (TEAP) under the Montreal Protocol on Substances that Deplete the Ozone Layer can provide useful lessons learnt to that end.

Lastly, whether the GST will be able to meet the **guidance and signal function** to a large extent depends on the process design and less on the information available. This is particularly true with respect to the reinforcement of the collective goals provided in the Paris Agreement. To what extent the COP will be able to send the signal of renewed demonstration of commitment will depend on the COP Presidency as well as on the facilitators of the political consideration of outputs and the way in which they chose to adopt the conclusions of the GST. To further develop and refine the existing signal, the GST crucially depends on external inputs, particularly from the IPCC and other sources of "best available science". In the meantime, as long as such roadmaps do not exist, the GST could try to gather such information through establishing corresponding in-session expert dialogues that may be able to establish a consensus on which to base further political conclusions in a discursive manner. Again, the modalities of the GST leave it at the discretion of the chairs of the GST to organize the expert dialogue in a way corresponding to this function, or not.

Thus, even with existing information, it will be possible to answer the question **"where are we?"** The official UNFCCC reported GHG emission data is still riddled with information gaps but the availability of information is bound to improve significantly when the reporting requirements of the Enhanced Transparency Framework take effect as of 2024. Also, additionally available information from third parties is reliable and detailed enough to fill those gaps and to enable the development of an accurate picture of GHG emissions on the aggregate level.

Where do we want (need) to go? Our discussion of benchmarking has shown that building on existing research and information, it seems possible to determine global benchmarks at least for the most overarching metrics such as aggregate emissions, stabilization/peaking of emissions, net zero balance between GHG sources and sinks. However, for this the GST will crucially depend on the IPCC as the most authoritative source of "best available science".

How do we get there? The overarching benchmarks mentioned above can only provide a general sense of direction – like a compass. They do not provide – like a satellite navigation system – the potential routes and specific destinations for the required transformation. For that, more detailed sectoral pathways and roadmaps translated into specific benchmarks would be required. The IPCC with its Sixth Assessment Report may contribute such roadmaps authoritatively. Major challenges persist with regard to the lack of structure and classification of policies/sectors/mitigation actions under the current reporting framework. While this situation might improve with the Enhanced Transparency Framework after 2024, another major shortcoming is that the obstacles and transformation challenges that lie in the way are not being systematically reported nor reflected upon by Parties. And finally, the mandate of the GST does not allow it to make country-specific recommendations and call out those who are moving in the wrong direction.

5.2 Specific Recommendations for the Official Global Stocktake and Complementary Activities

Based on our assessment of the informational and procedural needs for the GST to be effective, and an assessment of the information available to the official process, we establish the following set of recommendations for the GST to maximise its effectiveness.

- The GST should include an explicit **public appraisal of the inputs**, especially the transparency reports and technical reviews thereof. This would help to increase public attention for the whole process as well as to generate interest in specific sources of input to the GST which also includes country-level data. Particularly the GST should take into account the proceedings of the facilitative multilateral considerations of progress under the transparency framework. To summarize the progress regarding implementation of NDCs we propose that the UNFCCC Secretariat could create an **anonymised "transcript of grades"** of the form "X countries representing Y per cent of global emissions show significant implementation deficits and are unlikely to meet their targets unless implementation is improved."
- For a graphic representation of collective progress and relating it to a global benchmark of where progress should be, we propose that the UNFCCC Secretariat may apply the **performance distributions approach** developed in this project. We suggest that within the narrow mandate of the GST the performance distribution presents the most differentiated analysis of "collective progress", providing information that is relevant at the national level while maintaining anonymity of individual countries.
- To exchange information on sectoral transformation challenges and barriers, the expert dialogues mandated in the modalities of the GST for the technical assessment should include structured expert dialogues on key sectoral systems including energy, emission intensive industry, transport, agriculture, forestry and other land use as well as waste. These expert dialogues should focus on actual positive learning. They must not result in an endless repetition of previously stated commitments nor must it become a forum for greenwashing lack of ambition, demonstrating effective shirking of responsibility, or pretence of ambition. In particular the dialogues should focus on:

    1. identifying key sectoral transformation challenges and barriers commonly shared by many developed and developing countries taking into account economic, political and institutional, technological barriers as well as lack of awareness, information and capacity constraints;
    2. collating good practice policies and measures to overcome those challenges and barriers;
    3. agreeing on milestones for sectoral decarbonization pathways/roadmaps that may serve as benchmarks for subsequent NDCs.

- The IPCC will be a key source of information for the GST particularly with respect to the determination of benchmarks. Hence, we propose that **the COP should call upon the IPCC to assess the available research specifically with a view to identifying benchmarks** (including for key sectors) for what is required to meet the objectives of the Paris Agreement. Those benchmarks can then be used to inform and assess subsequent NDCs, not only overall but also their respective sectoral targets and policies.
- The political consideration of outputs of the GST should

    1. **convincingly reinforce Parties' continued commitment to the goals of the Paris Agreement;**

2. **develop and refine existing signals through more specific messages at sector level** by highlighting sector-specific challenges and benchmarks so that they receive public attention and appropriate consequences can be taken;
3. **politically endorse the benchmarks** identified in the technical assessment of the GST
4. and **call upon Parties to align their subsequent NDCs with those benchmarks** by means of a COP/CMA decision.

Given the relatively narrow mandate for the GST provided in the Paris Agreement as well as the limitations of the political realities of UNFCCC negotiations, we argue that whether or not the GST is effective, whether it can catalyze "the highest possible level of ambition" in subsequent NDCs, not only depends on the design and execution of the official process, but also how it is received, communicated and utilized by Parties, Observers and the wider public.

In the spirit of the Paris Agreement which explicitly acknowledges the role of all kinds of stakeholders, we therefore argue that the catalytic effect of the official GST could be supported by accompanying activities from civil society and the global research community.

To support the **Pacemaker Function** it is necessary to first of all amplify the messages from the GST and contextualize them in respective national discourses. This requires the research community to translate global aggregates into nationally specific requirements and recommendations and break down global benchmarks to the national level. Following up on these research activities, civil society should seek to coordinate their storylines and orchestrated media strategy to maximize the agenda setting effect of the GST.

With respect to the **Ensuring Accountability** function we have concluded that the official GST can only have an enabling role. It can only enable comparability of ambition and progress of implementation; it cannot do the actual comparison. This is, of course, the natural next step for actors outside the official UNFCCC process. Referring to the results of the GST, the research community should come up with assessments of progress at the national level, disaggregate the aggregate findings, indicating where each country should be, and comparing country performance, thus enabling stakeholders to hold their respective national governments accountable.

For **Driving NDC Ambition** the global research community should break down international benchmarks to the national level, discuss sector specific transformation challenges/barriers and highlight good practices to overcome them. Again, given that the official GST must not develop country-specific recommendations, there is ample scope for researchers and civil society organizations to develop and communicate science-based country-specific recommendations that are consistent with official GST benchmarks.

Finally, to amplify the **Guidance and Signal** provided by the GST, a complementary strategy for civil society actors would be to get policy makers on the record that they are still on board and buy in to the implications of the objectives of the Paris Agreement. This could be organized for instance as a "pledge of allegiance" to the objectives of the Paris Agreement. Furthermore, civil society organizations with support from the research community could use the GST to build and communicate a commonly shared vision of what each country should look like in 2050 in a 1.5 °C world.

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