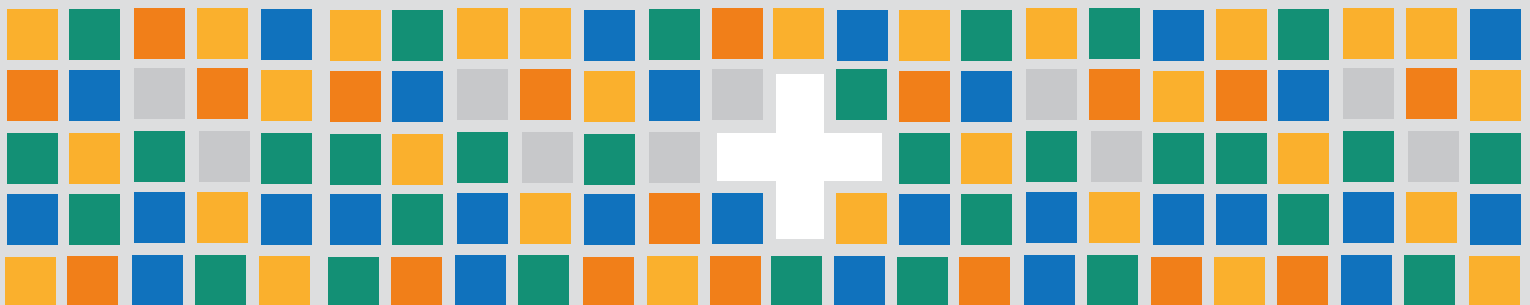




Guiding questions for the Global Stocktake under the Paris Agreement

What we know and what we don't

Niklas Höhne, Louise Jeffery, Anna Nilsson and Hanna Fekete



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About the iGST initiative and this report series

The **Independent Global Stocktake** (iGST) is an umbrella data and advocacy initiative that brings together climate modelers, analysts, campaigners and advocates to support the Paris Agreement. <https://www.climateworks.org/independentglobalstocktake/>

The **Designing a Robust Stocktake Discussion Series** envisions the contours of an ideal Global Stocktake and suggests ways in which the independent community can help to achieve that vision. These papers were produced by iGST partner organizations in consultation with the broader community, but the views expressed are the authors' own and don't necessarily reflect those of the iGST initiative or associated partner organizations.



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+ Summary



The Paris Agreement includes a cycle of ambition. Each five years, starting in 2023, a Global Stocktake (GST) analyses the global situation and provides information for countries to prepare updated Nationally Determined Contributions (NDCs). The Paris Agreement itself is very vague on what the GST should cover. It only notes that it should “take stock of the implementation of this Agreement to assess the collective progress towards achieving the purpose of this Agreement and its long-term goals. It shall do so in a comprehensive and facilitative manner, considering mitigation, adaptation and the means of implementation and support, and in the light of equity and the best available science.”

Given the crucial role of the GST in benchmarking and enhancing global climate action, the independent Global Stocktake (iGST) seeks to increase the accuracy, transparency, accountability, and relevance of the official benchmarking process by bringing together independent researchers and advocates. In this paper, we aim to build on previous work to identify knowledge gaps as well as potential areas of focus for a successful GST to take place.

The international climate negotiations that followed the adoption of the Paris Agreement led to asking the Subsidiary Body for Scientific and Technological Advice (SBSTA) to develop guiding questions for all components of the GST, including specific thematic and cross-cutting questions. This paper responds to that request.

We describe a systematic review of the status of knowledge on questions that are relevant for the success of the global stocktake under the Paris Agreement, drawing on the thematic scope for the GST that is provided in the Paris Agreement and the associated decision of Katowice in 2018.

We find that some questions are adequately covered by (existing) knowledge and synthesized results, for example current trends in emissions, implied temperature increase by 2100 and activities implemented by countries on mitigation, adaptation and finance.

But a majority of questions are left unanswered, creating uncertainties with regards to the successful undertaking of the global stocktake. Ill-defined points include, in particular:

- Mitigation: A common vision of a 1.5°C compatible world and recommendations on “how to get there” that are specific enough to be implemented by national governments.
- Adaptation: The definition of an “adequate adaptation response” and steps towards it.

- Finance: A common understanding of what constitutes Paris-consistent financial flows and steps towards it.
- Equity: What would be an equitable implementation of mitigation, adaptation and finance as a whole?

On the basis of this overview, we would recommend that an independent global stocktake would concentrate on the following points:

- **Synthesising:** A main focus of the iGST could be to synthesise already existing information, where it is available (as opposed to attempting to generate new information). It would support the goals of the global stocktake, if the open questions are clearly articulated and the status of the knowledge on the answers is clear. This could include the sharing of good practices and success stories.
- **Fostering common understanding:** Another focus of the iGST could be to support the building of a common understanding on several issues, where such understanding is missing but would be fundamental for the success of the global stocktake and the ambition mechanism as a whole. Examples include:
 - What does it mean for mitigation, adaptation and finance to be conducted in an equitable manner?
 - What would be a vision for a 1.5°C compatible world at country and sector level?
 - How could an “adequate” adaptation response be defined? What would be an according “adequate” consideration of loss and damage?
 - How could Paris-consistent financial flows be defined?
- **Forward looking:** the iGST could focus on options to raise ambition, the ultimate aim of the global stocktake (as opposed to looking at what happened in the past). Here it would be particularly important to collect and synthesise *country specific* recommendations on what could be done next in terms of mitigation, adaptation and finance, as such information will not be generated in the official UNFCCC process.



+ 1. Introduction



The Paris Agreement includes a cycle of ambition¹. Each five years, starting in 2023, a Global Stocktake (GST) analyses the global situation and provides information for countries to prepare updated Nationally Determined Contributions (NDCs).

A first test for the concept of a GST was the “Talanoa Dialogue”, which in 2018 brought together an international process on three main questions: “Where are we?”, “Where do we want to go?” and “How do we get there?”.

The Paris Agreement itself is very vague on what the GST should cover. It only notes that it should “take stock of the implementation of this Agreement to assess the collective progress towards achieving the purpose of this Agreement and its long-term goals. It shall do so in a comprehensive and facilitative manner, considering mitigation, adaptation and the means of implementation and support, and in the light of equity and the best available science.”

Only for adaptation is the Paris Agreement more specific, stating that the GST should:

- Recognize adaptation efforts of developing country Parties,
- Enhance the implementation of adaptation action taking into account the adaptation communication,
- Review the adequacy and effectiveness of adaptation and support provided for adaptation, and
- Review the overall progress made in achieving the global goal on adaptation.

The international climate negotiations that followed the adoption of the Paris Agreement on the GST have so far concentrated on the *process* and not so much on what it would actually address. For example, the decision taken in Katowice 2018 (Decision 19/CMA.1) defines in detail the process of how the GST is to be organised and which information sources it should consider.

On the actual *content*, the decision specified that the GST should:

- Include not only information on mitigation, adaptation, financial flows, and equity, but also on loss and damage and related response measures,
- Address barriers and challenges,
- Include good practices, experience and potential opportunities to enhance international cooperation,
- Address fairness considerations, including equity, in an overarching manner, and
- Only assess collective progress and not single out individual countries.

It also defines thematic areas such as mitigation, adaptation and support. It is, however, ambiguous if the assessment of the long-term goal of Article 2.1c (aligning financial flows with the temperature and adaptation goals of the Paris agreement) falls under “support” or is dealt with in the other thematic areas.

The decision asks the Subsidiary Body for Scientific and Technological Advice (SBSTA) to develop guiding questions for all components of the GST, including specific thematic and cross-cutting questions (Para. 7, Decision 19/CMA.1). This paper responds to that request.

The Independent Global Stocktake (iGST) is a data and advocacy initiative that brings together climate modelers, analysts, campaigners and advocates to support the Paris Agreement¹. Inspired by the critical role of the GST, in mid-2018 ClimateWorks Foundation, in collaboration with global partners, began to explore what independent researchers and advocates can bring to the table. This led to the creation of the iGST, which aims to increase the accuracy, transparency, accountability, and relevance of the official benchmarking process through a combination of research, analysis, and dialogue. The initiative is a multi-year effort tracking the timeline of the first GST, slated to occur 2023. The iGST can be helpful in two ways: 1) to ensure that the official GST has all the information it needs / can have to be as useful as possible, and 2) to perform additional tasks that are outside either the mandate or capacity of the official process, but that can enhance its effectiveness with a broader reach and more granular information^{2,3}.

The objective of this paper is to define a list of questions that could be asked during the stocktake process and to analyse the status of international research on the answers, i.e. “how well do we know the answer?”. This will enable us to identify areas that are well-covered and for which no additional work is necessary (e.g. where questions are well understood and research agrees on findings), as opposed to other areas where substantial additional work is necessary (e.g. where there are major disagreements or substantial knowledge gaps). This information will allow the iGST project to identify future areas of work, e.g. filling specific knowledge gaps.



+ 2. Methods



In order to understand the status of knowledge and possible contributions, we went through several steps that are described below. The objective is to assess the community's ability to answer the questions of the GST, not necessarily provide all the answers in this document. For all steps, we performed an initial analysis by reviewing existing literature, followed by consultations with experts, including the iGST working groups.

2.1. Questions that should be answered in the GST

First, we undertook a comprehensive review of which questions could be considered relevant for the GST, building on earlier work informed by the outcome of Katowice in 2018 ⁴. We started from the big picture questions to gain an overview and to limit the number of potential questions. We are anticipating that these questions would need to be answered in more detail, e.g. to incorporate sectoral, country, and policy information.

We based our list of questions on those that were used in the actual Talanoa Dialogue ⁵, as well as the list of questions that was part of the negotiations regarding the Global Stocktake but was never agreed upon ⁶.

In selecting the questions, we accommodate both an official and independent GST perspective. The process and the information limits within the UNFCCC may constrain the scope of the official GST ^{7,8} and the iGST will be needed to supplement the issues discussed. For example, the iGST is not bound to the 'collective progress' limitations. It can incorporate questions on different actors and additional sources of information to answer those.

The questions are categorized into four sections: mitigation, adaptation, finance, and additional questions (Table 2 to Table 5). The questions in each section follow the structure of the Talanoa Dialogue's overarching questions of "Where are we?", "Where do we want to go?" and "How are we going to get there?". We chose the Talanoa questions as they have been used before, which we take as a sign of general acceptance. We also used the questions that are already included in the Paris Agreement for adaptation and the new elements of the Katowice decision.

For all thematic areas, the questions are structured as follows:

- Where are we?
 - One question focuses on the status of implementation of action and reporting on it to facilitate the recognition of existing efforts,
 - One question addresses the overall progress made.
- Where do we need to be?
 - One question investigates whether there is an overall vision about where we need to be,
 - One question probes whether the existing efforts are adequate in relation to the long-term goal, usually termed as the "gap".



- How do we get there?
 - One question addresses the barriers and challenges,
 - One question includes good practices, experience and potential opportunities to enhance international cooperation and implementation.

The question regarding the overall vision is the only question that is not directly mentioned in the Paris Agreement or the GST decision text. We included it however, as it is important and sometimes the heart of the matter, as we will see further below.

2.2. Sources of information

In a second step, we scanned possible information sources that would be available to answer these questions. We specifically looked for original work and reports that synthesise various sources.

We also made an assessment of how likely we think it is that the available information will be acceptable for consideration under the UNFCCC. Our assessment is based on the sources identified by the Katowice outcomes (Para. 37, Decision 19/CMA.1) and does not intend to pre-judge the final selection of information sources. Rather, it serves to guide the iGST about where the UNFCCC process may be limited with regard to information inputs. “Yes” and “No” options here are reserved for clear cases, with “maybe” to highlight sources where it is not clear from the descriptions available.

2.3. Status of that information

We then categorised the status of international research on the answers – “(how well) do we know the answer?”

By doing this, we aim to reach a better understanding of where answers to the questions are well understood and research agrees, and where there are major disagreements or substantial knowledge gaps. This information should inform the future work of the iGST in terms of priority areas and filling those gaps.

We then evaluated each question according to its relevance to the GST and the status of information available. Categories for status of information are as follows:

Table 1. Categories for the status of the information

Answers available from various sources, consistent and synthesised
Answers available from various sources, consistent but not synthesised
Answers available from various sources, but diverse or contradictory
Limited analysis available
Lack of methods to analyse the question

2.4. Need for further work by 2023 to better answer these questions

Finally, we provide an indication if the answer to the question is fundamental for the success of the GST and, if it is not adequately answered to date, if it should be a focus of the iGST or other research efforts. For example, if the knowledge is good, synthesised and acceptable, there is no need for the iGST to do additional work.



+ 3. Status of knowledge: Mitigation



The overview of the analysis (Table 2) shows that for mitigation, our ability to answer the ‘where are we?’ questions is considerably advanced. We have elaborate processes within the UNFCCC reporting framework and independent, scientifically robust analysis to collect information on reporting, on mitigation actions by national governments and whether they are on track for meeting their NDCs with national policies. We also have a good understanding of the aggregated projected GHG emissions and the projected increase in global average temperatures above pre-industrial levels based on current progress. All this information is analysed in various ways, well synthesised and consistent, with possibly the exception of details on forestry and emissions accounting of some NDCs. Under the Katowice outcomes, the UNFCCC Secretariat is tasked to provide a synthesis report for the GST on greenhouse gas emissions, mitigation efforts, overall effect and implementation of NDCs. A GST could directly build on the information available.

Areas where there is less information include current trends of drivers of emissions at the country and the sectoral level, and the aggregated impact of subnational and non-state actions on global GHG emissions. Here, more analysis could be beneficial for the success of a GST.

A particular gap exists in the question of whether the NDCs are in line with equity and CBDR-RC and if they reflect “highest possible ambition”. Some analysis is available but is highly controversial. It is not synthesised and currently usually available on a country level, which will make it difficult to be acceptable in the GST (which, according to the Katowice decision, should not single out individual countries). However, a common understanding is that equity is fundamental to the success of the GST, if not the Paris Agreement as a whole, and that it is most useful at the country level. Hence, there is scope for the iGST to fill this gap and to generate a common understanding of the issues. Equity will also be relevant for other issues (see below).

The question “Where do we need to be?” is also relatively well covered with regular processes to develop emission scenarios by, for example, the IPCC and regular checking of the gap, e.g. the UNEP emissions gap report⁹. What is still lacking is a common vision on what a 1.5°C world would look like. Scenarios alone are still very abstract and difficult to understand at the individual country or sector level, let alone at the personal level. Future work could concentrate on developing a common and understandable vision of how a 1.5°C world could look like, that is appealing and worth acting for.

Answers on “How to get there?” are least well covered. Yet it is probably the most important question of all, if we want to close the gap and solve the issue of climate change. The barriers are understood in general, but barriers are so country- and sector-specific that only limited information is available on a more general level. Various pieces of work have started to distil good practices in national policies and other climate actions, and to evaluate the positive and negative impact of such actions. As every country is different, country-specific guidance or recommendations are needed; however, current literature only provides them for a limited set



of countries. Such recommendations will also not become available through the transparency framework of the UNFCCC process, as the decisions of Katowice explicitly ruled this option out. Therefore, there is a huge opportunity for future work, including by the iGST, to provide country-specific recommendations on “how to get there”, which would take into account both positive and negative impacts of these actions.



Table 2. Status of knowledge relevant for the global stocktake on mitigation

Question	Possible sources of input to the GST		Acceptability of input for official GST	Status of information	Fundamental for success	Possible focus of iGST
	Original Work	Synthesized work				
Where are we?						
M1. Are all Parties preparing , communicating, accounting for and maintaining successive nationally determined contributions, long-term strategies and respective domestic mitigation measures?	-	UNFCCC Secretariat	Yes	Answers available from various sources, consistent and synthesized	Yes	-
M2: Are the NDCs in line with equity and CBDR-RC and do they reflect “highest possible ambition” given potential, costs and benefits?	Various scientific papers and grey literature ¹⁰⁻¹²	None	No	Answers available from various sources, but diverse or contradictory	Yes	Yes
M3: Are countries implementing domestic policies to meet their NDCs and can they be considered a major deviation from past activities?	Various individual studies ¹³	UNEP Emissions gap report ⁹ UNFCCC synthesis report ¹⁴	Yes	Answers available from various sources, consistent and synthesized	Yes	-
M4. What actions are undertaken by subnational and non-state actors?	Individual actors and initiatives ¹⁵	Aggregated database NAZCA	Yes	Answers available from various sources, consistent and synthesized	Yes	-
M5. What is the aggregated impact of subnational and non-state actions on global GHG emissions?	Individual reports by initiatives and research	UNFCCC Yearbook of Global Climate Action ¹⁶ , “Global climate action by cities, regions and business” ¹⁷	Maybe	Answers available from various sources, but diverse or contradictory	Maybe	Maybe
M6. What are the aggregated projected GHG emissions that result from all actions and when will emissions peak?	Scientific and grey literature	UNFCCC synthesis report ¹⁴ , UNEP Emissions gap report ⁹	Yes	Answers available from various sources, consistent and synthesized	Yes	-
M7. What is the current trend of drivers of emissions at the country and the sectoral level?	Scattered in various places, e.g. IEA, IRENA, and scientific literature	None	Maybe	Answers available from various sources, consistent but not synthesized	Maybe	Yes
M8. What is the projected increase in global average temperatures above pre-industrial levels based on current progress?	Scientific ¹⁸ and grey literature ¹⁹	UNFCCC synthesis report ¹⁴ , UNEP emissions gap report ⁹	Maybe	Answers available from various sources, consistent and synthesized	Yes	-
Where do we need to be?						
M9. What global emission pathways are consistent with the long-term temperature goal, when will global emissions have to peak and reach net zero to achieve the long-term temperature goal and what are the associated assumptions?	Various modelling comparison exercises ²⁰ and individual studies	IPCC ²¹ , UNFCCC synthesis report ¹⁴ , UNEP Emissions gap report ⁹	Yes	Answers available from various sources, consistent and synthesized	Yes	-
M10. What does it mean for mitigation to be conducted in an equitable manner?	Individual studies ¹⁰⁻¹²	Not available	No	Answers available from various sources, but diverse or contradictory	Yes	Yes

Question	Possible sources of input to the GST		Acceptability of input for official GST	Status of information	Fundamental for success	Possible focus of iGST
	Original Work	Synthesized work				
M11. What does a 1.5°C world look like on a country and sector level? What would such a shared vision be?	Individual studies ²²	None	Maybe	Limited analysis available	Yes	Yes
M12. What is the gap (in global GHG emissions, technology, action, investments) between current progress and scenarios consistent with the long-term temperature goal?	-	IPCC ²³ , UNFCCC synthesis report ¹⁴ , UNEP emissions gap ⁹	Yes	Answers available from various sources, consistent and synthesized	Yes	-
How do we get there?						
M13. What are the barriers for implementation of further actions that would be in line with what is needed, and how can they be overcome?	Individual studies	Partly IPCC ²³ but not country level	Maybe	Limited analysis available	Yes	Yes
M14. What policies are available at the country and sector level to close the gap between where we are and where we need to be? Which of these have been proven successful in the past?	Individual studies	Partly IPCC ²³ but not country level	Maybe	Answers available from various sources, but diverse or contradictory	Yes	Yes
M15. What are the costs (e.g. mitigation costs, implications for human rights, equity implications) and benefits (e.g. development, air quality, health, energy security, innovation) of achieving additional reductions at a country and sector level?	Individual studies	Partly IPCC ²³ but not country level	Maybe	Answers available from various sources, but diverse or contradictory	Yes	Yes



+ 4. Status of knowledge: Adaptation



Compared to mitigation, the status of knowledge (Table 3) is far less advanced for adaptation. The only question that is well researched and synthesised is whether countries report adaptation efforts. The three main sources of information are the UNEP Adaptation Gap Report⁹, the UNFCCC Secretariat and the IPCC 1.5°C Special Report²³. The UNFCCC Secretariat tracks which countries are reporting their adaptation efforts. A UNFCCC Synthesis Report¹⁴ (mandated by the Katowice decision) will collect adaptation “efforts, support, experience and priorities”. It is unclear if this will also include information as to what extent enhancement of such actions and support has been achieved relative to what is needed, let alone how to enhance efforts further.

The most glaring question is the lack of common understanding on what an “adequate adaptation response” is in practice. To answer this, issues related to methodologies, metrics and data collection must first be addressed. The tracking, monitoring and evaluation of adaptation is restricted by the lack of a common set of adaptation metrics/indicators. This also makes it difficult to distinguish between adaptation and any co-benefits that come with it. Such a set of common metrics/indicators is a prerequisite to track and verify progress and activities. A common understanding will have to be generated before studies can determine the gap towards an adequate adaptation response.

More clarity on the adequate adaptation response would also give more clarity on what constitutes “loss and damage”, an issue over which there was significant disagreement about whether it should be covered in the global stocktake at all (see section 6).

Given the context specific nature of adaptation, taking geographical, sectoral, or socio-economical perspectives into account further complicates the efforts of defining successful adaptation. Available literature linked to the first question of ‘Where are we?’ mainly informs us on past and current efforts but does not tell us much about its adequacy, nor effectiveness.

Based on this, the focus of the iGST with reference to adaptation could be (i) methodological, linked to the understanding of an ‘adequate’ adaptation response; but also (ii) activity focused, assessing how adaptation implementation can be enhanced.

Table 3. Status of knowledge on adaptation

Question	Possible sources of input to the GST		Acceptability of input for official GST	Status of information	Fundamental for success	Possible focus of iGST
	Original Work	Synthesized work				
Where are we?						
A1. Are all parties preparing and reporting successive adaptation communications?	-	UNFCCC synthesis report ¹⁴	Yes	Answers available from various sources, consistent and synthesized	Yes	-
A2. Are efforts to adapt to climate change being conducted in an equitable manner ?	Individual studies ²⁴	Not available	No	Answers available from various sources, but diverse or contradictory	Yes	Yes
A3. Are parties planning and implementing domestic policies and governance structures in support of their adaptation communications and do these enhance adaptive capacity, strengthen resilience and reduce vulnerability?	Individual studies ^{25,26}	UNFCCC synthesis report ¹⁴	Yes	Answers available from various sources, but diverse or contradictory	Maybe	-
A4. To what extent has adaptive capacity been enhanced, resilience strengthened, and vulnerability reduced with view to contributing to sustainable development?	Individual studies ^{27,28}	UNFCCC synthesis report ¹⁴ , IPCC ²³ , GCA ²⁹	Yes	Limited analysis available	Maybe	Yes
A5. To what extent have Parties enhanced understanding, action, and support with respect to loss and damage associated with the adverse effects of climate change?	-	Warsaw International Mechanism on loss and damage (WIM) ³⁰	Yes	Answers available from various sources, but diverse or contradictory	Maybe	-
Where do we need to be?						
A6. What are the current and projected climate change needs, risks and impacts ?	Individual studies, national reporting ³¹⁻³³	Adaptation Gap Report ³⁴ , IPCC ²³ , GCA ²⁹	Yes	Answers available from various sources, but diverse or contradictory	Maybe	-
A7. What does it mean for adaptation to be conducted in an equitable manner ?	Individual studies ³⁵⁻³⁷	Not available	No	Answers available from various sources, but diverse or contradictory	Yes	Yes
A8. What would be an “adequate” adaptation response in a 3-4°C and 1.5°/2 world considering climate risk and residual damages?	Individual/national studies ³⁸⁻⁴¹	Partly Adaptation Gap Report ³⁴ , GCA ²⁹	Yes	Lack of methods to analyse the question	Yes	Yes
A9. What would be the adaptation gap , i.e. are current adaptation plans, policies and support (financial and technical) provided ‘adequate’ and ‘effective’ to respond to needs?	Individual, national and subnational/local studies ³⁸⁻⁴¹	Partly Adaptation Gap Report ³⁴	Yes	Lack of methods to analyse the question	Yes	Yes
A10. What is required for Parties to avert, minimize and address loss and damage associated with the adverse effects of climate change?	Individual studies ^{42,43}	Warsaw International Mechanism on loss and damage (WIM) ⁴⁴	Yes	Limited analysis available	Maybe	-
How do we get there?						
A11. What are the common technological, social and financial barriers to adaptation to the extent needed?	Individual studies ^{25,45,46}	IPCC ²³ , GCA ²⁹	Yes	Answers available from various sources, but diverse or contradictory	Maybe	-
A12. What policies and institutions at the country and sector level are available to achieve the adaptation actions that are needed? Which of these have been proven successful in the past?	Individual studies ⁴⁷⁻⁴⁹	Partly IPCC ²³ , UNFCCC synthesis report ¹⁴	Yes	Limited analysis available	Yes	Yes
A13. What policies and institutions are available to reduce the risk of loss and damage ?	-	Warsaw International Mechanism on loss and	Yes	Limited analysis available	Maybe	-
A14. What are the associated costs and benefits (resilience, avoided damages, other positive effects) of these approaches at country and sector level?	Individual studies ^{50,51,46,48}	Partly Adaptation Gap Report ³⁴ , GCA ²⁹	Yes	Limited analysis available	Yes	-



+ 5. Status of knowledge: Finance flows, support and means of implementation



The knowledge on finance flows, support and means of implementation is very scattered (Table 4). The main source of aggregated information is the Standing Committee on Finance (SCF) that prepares the “Biennial Assessment and Overview of Climate Finance Flows”⁵². However, it focusses heavily on the support for mitigation and adaptation, and the mobilisation of resources, the 100bn USD. Only recently did the standing committee embark on covering the question of whether overall financial flows are aligned with the goals of the Paris Agreement (Article 2.1c), but it still does not cover the question of “how to get there”. In addition, the UNFCCC is mandated to provide a synthesis report for the GST on both issues, finance flows and means of implementation and support, drawing on the biennial assessments.

On finance, there are particular definitional challenges. If the definitions of the goals are not clear, it is also difficult to assess progress towards them. One issue is the definition of mobilisation of resources of at least 100bn USD and what should count towards it. Another unclear issue is what would constitute financial flows consistent with the Paris Agreement. For both issues, we find only limited analysis on where we are today, where we need to be, or how to get there, precisely because of the lack of definition of the goal. However, these issues seem fundamental to the success of the GST.

The opportunity for work by the iGST is therefore significant:

- The iGST could support the already ongoing synthesis of information on mobilising the 100bn USD.
- The iGST could support the development, testing and consensus building among stakeholders around the issue of what constitutes Paris-compatible financial flows. It could review and synthesise the various methods that are currently being developed and highlight further gaps.
- The iGST could explicitly support an understanding of how the ambition in NDCs could be increased via aligning financial flows with the Paris Agreements goals and through other support. It could support the development of recommendations on policies that countries could implement to align finance flows and, with that, increase their domestic emissions reduction ambition. It could also cover how they could increase their international support.



Table 4. Status of knowledge on finance flows, support and means of implementation

Question	Possible sources of input to the GST		Acceptability of input for official GST	Status of information	Fundamental for success	Possible focus of iGST
	Original Work	Synthesised work				
Where are we?						
F1. What is the status of financial support (contributions) in implementing the Paris Agreement and reporting on it?	-	Standing Committee on Finance (SCF) ⁵²	Yes	Answers available from various sources, but diverse or contradictory	Yes	-
F3. To what extent are finance flows consistent with the Paris Agreement goals, e.g. towards low or high emission development, towards climate resilience, towards meeting the collective finance goal?	Individual reports ⁵³⁻⁵⁵	Not available	-	Answers available from various sources, but diverse or contradictory	Yes	Yes
F4. What policies and institutions are being used to make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development?	Individual report ⁵⁴⁻⁵⁶	Not available	-	Answers available from various sources, but diverse or contradictory	Maybe	-
F5. To what extent are countries and other actors mobilizing financial resources , technology transfer and capacity building in line with the Paris Agreement goals and in an equitable manner?	Individual reports ^{54,57-59}	Standing Committee on Finance (SCF) ⁵²	Yes	Answers available from various sources, but diverse or contradictory	Yes	Yes
Where do we need to be?						
F6. What are the priorities and needs for support of developing countries?	Individual and country reports ^{60,61}	Paris Committee on Capacity Building (PCCB), Technology executive committee (TEC), SCF, UNFCCC	Yes	Answers available from various sources, but diverse or contradictory	Yes	-
F7. What would be the financial flows that are consistent with the goals of the Paris Agreement?	Initial work, e.g. development banks and finance sector ^{56,62-64}	SCF	-	Answers available from various sources, but diverse or contradictory	Yes	Yes
F8. What is the estimated gap between climate finance mobilized, the collective mobilization goal and pathways that are consistent with the long-term goal?	-	Standing Committee on Finance (SCF) ⁵²	Yes	Limited analysis available	Yes	Yes
F9. With whom and to what extent lies the responsibility of provision of finance ?	Individual reports ⁶⁵	Not available	-	Answers available from various sources, but diverse or contradictory	Maybe	-
How do we get there?						
F10. What are the barriers that prevent financial flows to be consistent with the goals of the Paris Agreement?	Individual reports ⁵⁶	Not available	-	Answers available from various sources, consistent but not synthesized	Maybe	-
F11. What policies and institutions could be used to make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development be scaled up / made more effective? (e.g. financial market reform)	Individual reports ⁶⁶⁻⁶⁸	Not available	-	Answers available from various sources, but diverse or contradictory	Yes	Yes
F12. What policies and institutions are required to scale up the mobilization of finance , achieve a balance between adaptation and mitigation financial resources, and ensure efficient access to finance?	Individual reports ^{64,67,68}	Not available	-	Answers available from various sources, but diverse or contradictory	Yes	Yes



+ 6. Status of knowledge: Other questions



In addition to the three key elements discussed above, we identified three other issues that the GST could consider: Education, training, and public awareness; Reporting and Review requirements; and Equity (Table 5).

On education, training and public awareness, the Paris Committee on Capacity Building (PCCB) and the Technology Executive Committee (TEC) are active and prepare synthesised reports. A main question will be if these are only backward looking or also forward looking in suggesting what is needed to fulfil the goals of the Paris Agreement and how to get there.

The UNFCCC Secretariat collects information on how countries are complying with the reporting and review requirements. Again, forward looking information may be missing.

The mandate of the GST is clear that equity should be an important overarching consideration². In addition to the thematic equity questions above, we identify additional overarching equity questions. For the answers to these equity related questions, only disparate information is available. The discussion is so controversial that individual reports on equity are unlikely to be accepted as input to the official GST. In particular, a common understanding of what constitutes an equitable implementation of the Paris Agreement, combining the elements of mitigation, adaptation, loss and damage and financial support, is lacking. Therefore, the iGST could support the formation of such a common understanding.

Table 5. Status on knowledge on additional questions arising from implementation of the Agreement not captured above

Question	Possible sources of input to the GST		Acceptability of input for official GST	Status of information	Fundamental for success	Possible focus of iGST
	Original Work	Synthesised work				
<i>Where are we?</i>						
O1. To what extent have Parties cooperated to enhance climate change education, training, public awareness, public participation and public access to information , recognizing the importance of these steps with respect to enhancing actions under this Agreement?	-	UNFCCC secretariat	Yes	Answers available from various sources, consistent and synthesized	Maybe	-
O3. To what extent have Parties implemented reporting and review requirements ?	-	UNFCCC secretariat	Yes	Answers available from various sources, consistent and synthesized	Maybe	-
O4. Are efforts on mitigation, adaptation and support being conducted in an equitable manner ?	Individual studies	Not available	No	Answers available from various sources, but diverse or contradictory	Yes	Yes
<i>Where do we need to be?</i>						
O3. What is required for enhanced cooperation on education, training, public awareness, public participation and public access to information?	Individual studies ^{69,70}	Paris Committee on Capacity Building (PCCB) ⁷¹ , Technology executive committee (TEC)	Yes	Answers available from various sources, but diverse or contradictory	Maybe	-
O7. What would be the reporting and review requirements that would be compatible with the long-term goals of the Agreement?	-	Not available	-	Answers available from various sources, but diverse or contradictory	Maybe	-
O8. What does it mean to implement mitigation, adaptation and support in an equitable manner ?	Individual studies	Not available	No	Answers available from various sources, but diverse or contradictory	Yes	Yes
<i>How do we get there?</i>						
O5. What policies, and institutions are available to enhance education, training, public awareness, public participation and public access to information on climate change?	Individual studies ⁷⁰	Paris Committee on Capacity Building (PCCB) ⁷¹ , Technology executive committee (TEC)	Yes	Answers available from various sources, but diverse or contradictory	Maybe	-
O11. How could the barriers for reporting and review requirements that would be compatible with the long-term goals of the Agreement be overcome?	-	Not available	-	Answers available from various sources, but diverse or contradictory	Maybe	-
O12. How can mitigation, adaptation and support efforts be conducted in a more equitable manner ?	Individual studies	Not available	No	Answers available from various sources, but diverse or contradictory	Yes	Yes



+ 7. Conclusions



In this paper we describe a systematic review of the status of knowledge on questions that are relevant for the success of the GST under the Paris Agreement, drawing on the thematic scope for the GST that is provided in the Paris Agreement and the associated decision of Katowice in 2018.

We find that some questions are adequately covered by (existing) knowledge and synthesised results, for example current trends in emissions, implied temperature increase by 2100 and activities implemented by countries on mitigation, adaptation and finance.

But a majority of questions are left unanswered, creating uncertainties with regards to the successful undertaking of the global stocktake. Ill-defined points include, in particular:

- **Mitigation:** A common vision of a 1.5°C compatible world and recommendations on “how to get there” that are specific enough to be implemented by national governments.
- **Adaptation:** The definition of an “adequate adaptation response” and steps towards it.
- **Finance:** A common understanding of what constitutes Paris-consistent financial flows and steps towards it.
- **Equity:** What would be an equitable implementation of mitigation, adaptation and finance as a whole?

On the basis of this overview, we would recommend that an independent GST would concentrate on the following:

- **Synthesising:** A main focus of the iGST could be to synthesise already existing information, where it is available (as opposed to attempting to generate new information). It would support the goals of the GST, if the open questions are clearly articulated and the status of the knowledge on the answers is clear. This could include the sharing of good practices and success stories.
- **Fostering common understanding:** Another focus of the iGST could be to support the building of a common understanding on several issues, where such understanding is missing but would be fundamental for the success of the GST and the ambition mechanism as a whole. Examples include:
 - What does it mean for mitigation, adaptation and finance to be conducted in an equitable manner?
 - What would be a vision for a 1.5°C compatible world at country and sector level?
 - How could an “adequate” adaptation response be defined? What would be an according “adequate” consideration of loss and damage?



- How could Paris-consistent financial flows be defined?
- **Forward looking:** the iGST could focus on options to raise ambition, the ultimate aim of the GST (as opposed to looking at what happened in the past). Here it would be particularly important to collect and synthesise *country specific* recommendations on what could be done next in terms of mitigation, adaptation and finance, as such information will not be generated in the official UNFCCC process.



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