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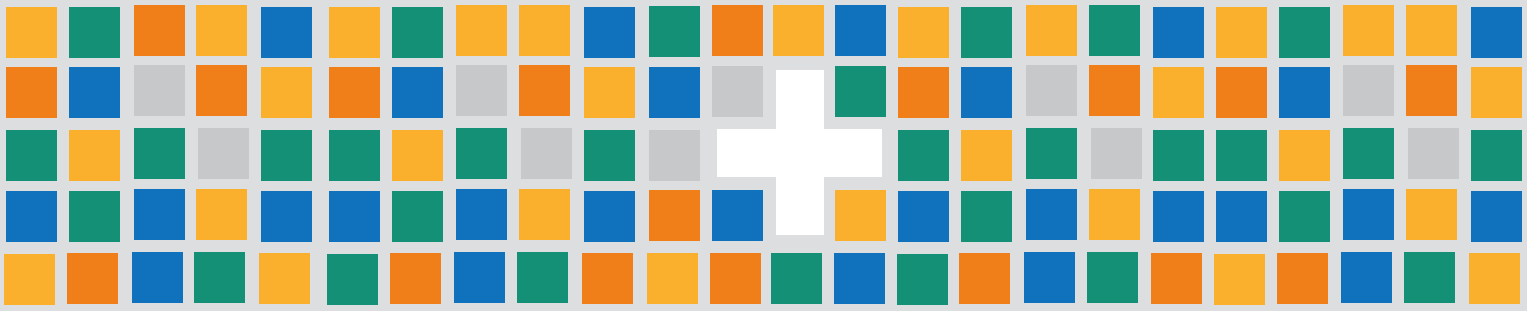
Mitigation Information and the Independent Global Stocktake

Leon Clarke and Nathan Hultman



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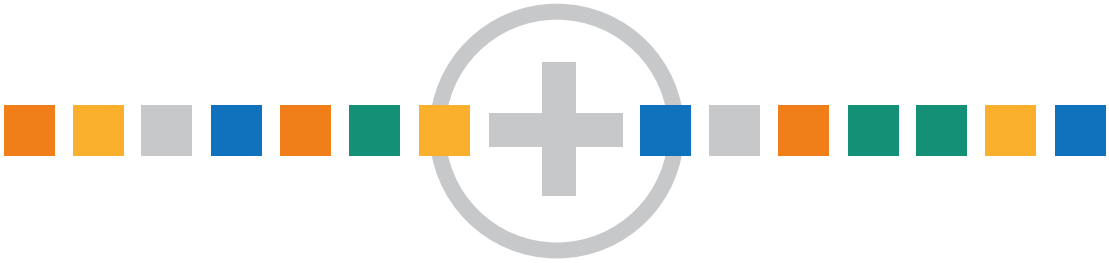

Leon Clarke and Nathan Hultman

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iGST
Independent Global Stocktake

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/independent-global-stocktake/

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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Disclaimer from the iGST on COVID-19

This paper was written September 2019 - February 2020, before COVID-19 had emerged as a pandemic. As of publication date (May 2020), COVID-19 has disrupted lives around the world, but its long-term impacts on the Global Stocktake and related processes remain unclear. We are cautiously hopeful that many aspects of the Global Stocktake will continue forward as planned, albeit against a backdrop of recovery and potentially heightened scepticism of global connectivity. Thus, while this paper does not account for COVID-19 related impacts, we believe that much of what was written here remains relevant.

Contents

+ Executive Summary

The Global Stocktake (GST) is a regular review activity included in the Paris Agreement. Its explicit purpose is to take stock of where we are as a global community with respect to meeting the goals of the Paris Agreement and to assist in increasing ambition. The process for the formal GST is still being worked out and will likely seek to incorporate diverse perspectives both from governments and from outside government. Given the broad institutional framework within which the GST will be conducted, however, the GST's ability to serve its catalytic function may be hindered in several ways, creating the need for a structured and organized response from outside the formal GST process.

The independent Global Stocktake (iGST) is a data and advocacy initiative that brings together climate modelers, analysts, campaigners and advocates and aims to increase the accuracy, transparency, accountability, and relevance of the GST through a combination of research, analysis, and dialogue. A central question for the iGST is how the independent, non-governmental community can best assist in meeting the goals of the GST, whether operating through the official GST process and/or operating outside of that process.

This discussion paper focuses on information availability and needs for the iGST in support of the mitigation mission of the GST and the Paris Agreement more generally. Other iGST activities address climate finance and adaptation. The assessment here is based on discussions with a range of stakeholders, literature review, and the outcome of an iGST webinar on the topic.

The construction of this discussion paper is based on several assumptions. First, it assumes that the iGST will be an independent source of information that might be used within the GST process or to support activities and understanding outside of the formal GST process. Second, it assumes that while the iGST will have limited resources, it can help align a broader constellation of independent activities towards shared goals. Third, this document implicitly assumes the importance of country-level information for assessing progress and identifying ways to increase ambition. Given that the official GST will provide only "collective" information as per its mandate, there will be a need to engage country-level information in the iGST process.

Building on these assumptions, this concept note explores the state of information on mitigation and the potential role of the iGST in supporting a robust global stocktake, whether within or outside of the official GST process. It seeks to identify potential gaps in available information. Based on our review, we put forward several conclusions.

Standard techno-economic information is largely available at both the collective and country level, but some gaps remain. A number of sources are available to conduct a first-order analysis of global and national progress to date ("where are we?") in the context of standard techno-economic indicators such as emissions, energy use, energy supply, land use, and so forth. Research and analysis of "how do we get there" is active and ongoing through both official (e.g., official mid-century strategies) and unofficial processes. While there is only limited strategic information on the details of future carbon-neutral energy and resource systems ("where do we want to go?"), this is to some degree inevitable given uncertainty about how the future might evolve. At the same time, while a range of underlying data is available to be included in the official GST, some potential gaps remain. Interpretation of potential implications of this information, most notably in the context of ways to increase ambition, may

be missing from the GST process. Furthermore, as noted throughout this document, the official GST process will focus on collective information, leaving a potential gap in country-level information. Finally, while development of information on "how do we get there" is a particularly active area of research, and largely consistent with the goals of the iGST, it is not clear how well this research is being directed in a way that will specifically support the GST or iGST nor how this information might be brought effectively into the GST or iGST.

There is a potential lack of digestible information on the societal dimensions of mitigation, including barriers, institutions and institutional changes, societal change, and polices. While much of the techno-economic information to support the iGST is available or being developed, this information does not address many of the societal issues that surround mitigation. Clarity on the societal barriers that have held back and will continue to hold back mitigation is essential if we hope to identify pathways to overcome these barriers. Examples of means to overcome these barriers and best practices will be necessary to guide action, as will an understanding of necessary institutional changes and potential institutional or societal lock ins. To date, research on the societal dimensions of climate change is generally under-supported in comparison to "physical science" or techno-economic research, and where information on societal barriers does exist, it is not clear that it is in the form needed to support increased ambition in the context of a global stocktake process. An assessment and the development of a strategy to better incorporate information on the societal aspects of mitigation is needed.

The relatively limited information on the societal aspects of mitigation may deemphasize questions of how to increase ambition. An important question for stocktaking is the relative focus on "where are we" vis-à-vis questions associated with moving forward, "where do we want to go" and "how do we get there". If stocktaking focuses most heavily on the techno-economic aspects of "where we are" (e.g., emissions, energy investments, energy system changes), this could tend to draw attention to naming and shaming or demonstrating yet again that the world is not on track toward ambitious climate goals. While the lack of progress is important to highlight, this conclusion is already well understood and has not, as of yet, been sufficient to spur greater ambition. In contrast, societal aspects of mitigation relating to some of the most important barriers to mitigation and to the strategies for overcoming these barriers may offer an alternative path forward.

+ 1. A framework for evaluating existing and potential information

There is an enormous amount of mitigation-relevant information that is available or could be made available for stocktaking. A framework is needed to categorize this information and assess strengths and potential gaps. Here we propose a two-part framework.

One dimension of this framework addresses the questions that the iGST might choose to inform. Here we apply the questions that emerged from the Talanoa dialogue. The "Talanoa questions" are: (1) where we are; (2) where we want to go; and (3) how do we get there? Outside of international climate discussions, these are simply standard questions for strategic planning.

The other dimension of the framework addresses the character of the information that might support these questions. For the purpose of this paper, we distinguish between two types of information. One type of information we describe as "techno-economic," and includes quantitative indicators that might be included as part of a statistical yearbook on emissions, energy, the economy, and land use. This information typically focuses on physical or economic outcomes. Examples would be overall greenhouse gas emissions by gas, emissions by sectors, deployment of low-carbon supply technologies, energy use by sectors, or broader activity indicates (e.g., miles traveled per person).

The other type of information is what we call "societal" information. This information provides insight into societal readiness to undertake mitigation consistent with the Paris goals and the societal, political, institutional changes that could and would be needed to make it happen. Importantly, some aspects of interest may not easily be captured simply by quantitative indicators and may therefore include qualitative or narrative dimensions. These might include, for example, interrelated information on key barriers to mitigation such as public opinion or key power dynamics, challenges in climate finance, best practices for making progress on mitigation, capacity to undertake change, or institutional structures. These societal dimensions are important; it is increasingly clear that the barriers to climate mitigation should be viewed as societal in character and not just technological, although these two are clearly interlinked.

The boundary between techno-economic and societal indicators is not distinct. For example, numerical counts of different types of policies or public opinion polls are statistical in nature but are focused more on societal changes. Alternatively, the linkages between mitigation and the other societal priorities that are typically of greater national importance than mitigation – air pollution, jobs, competitiveness, energy access, or energy security – may be focused largely on broader societal concerns but frequently have an easily quantified, techno-economic character. Despite challenges in categorizing some types of indicators, the simple paradigm of "techno-economic" vs. "societal" indicators can be useful for organizing thinking about gaps and the iGTS's strategies for supporting a stocktake.

Based on these two dimensions, it is possible to construct a matrix representing the status of information in support of the iGST. From our assessment, a broad conclusion is that techno-economic information is both more readily available in digestible form and more likely to be included in the official GST than societal information. This suggests a potentially important role for the iGST in identifying how to fill the gap on societal information. As discussed in the Executive Summary, the lack of information on societal dimensions of change, if left unaddressed, may limit the GST's ability to answer essential global questions about how to increase ambition. It is also important to note that although techno-economic data may be

included in the official GST, interpretation and implications of this information may not. This suggests a role for the iGST in supporting the development and sharing of those messages.

	Where are we?	**Where do we want to go?**	**How do we get there?**
Techno-economic Indicators	Substantial information available	Information available, but some limits on understanding of very-low emissions futures	Substantial information available, but some limits on understanding
Societal Indicators	Some information is available, but it is diffuse and difficult to synthesize	Limited information	Limited information

In the following sections, we discuss the character of available and needed techno-economic and societal information along each of the three Talanoa questions that informs the table above.

+ 2. Techno-economic information and the Talanoa questions

A broad range of national and international sources collect and synthesize techno-economic information that can be used to answer the question, "**where are we?**" This includes national statistical agencies as well as international organizations and private sector actors.[1] This is supplemented by groups providing information specifically aimed at assessing where we are in the context of mitigation.[2] While there are certainly limits to the quality of the underlying data in many cases, particularly in the context of developing countries, it is straightforward to develop techno-economic characterizations of where we are relative to the other areas of discussed here.

The question of "**where do we want to go**" is less well characterized. Some basic elements of where we want to go are well-understood. For example, it is well understood that CO_2 emissions need to go to zero around 2050 for 1.5C pathways and around 2070 for 2.0C pathways. Some general characteristics of very-low-carbon economies are also well understood. For example, carbon-neutral energy systems will include only limited and/or targeted use of fossil fuels, zero or negative CO_2 emissions from electricity, electrification of end uses, alternative fuels in hard to decarbonize sectors, more efficient use of energy, greater reliance on integrated system approaches, and potentially at least some limited use of CO_2 removal technologies. Information like this will be assessed in IPCC reports and potentially other publications.

At the same time, many of the details are missing and are a matter of continued discussion. There are many different futures that could align with emissions goals at both global and country levels, particularly in the context of emerging technologies and evolving social and political systems. Some uncertainty in this regard is inevitable. Furthermore, pathways could vary substantially from country to country based on country-specific factors such as indigenous resources, postures on international integration, existing infrastructure, public opinions, and linkages to other priorities. Finally, understanding varies from sector to sector and technology-by-technology, with substantial uncertainties surrounding, among others, batteries, bioenergy, hydrogen, electricity systems with high renewables penetration, long-haul freight, industrial mitigation, the ability to constrain energy demand growth, and nature-based solutions.

The integrated assessment (IA) literature has historically been a primary source for much of the information about low- or zero-carbon energy systems, but this literature identifies a wide variety of different possible futures.[3] The other primary source of information is a growing body of national mid-century strategies (MCSs),[4] along with other long-term strategies that might

[1] This includes, for example, the International Energy Agency (IEA), Bloomberg New Energy Finance, and British Petroleum.

[2] See, for example, the UNEP Emissions Gap Report and Climate Action Tracker (https://climateactiontracker.org/).

[3] See, for example, the IPCC's Assessment Report and the 1.5C report for illustrations of the many different scenarios passing through zero net emissions.

[4] In accordance with Article 4, paragraph 19, of the Paris Agreement, all Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies, mindful of Article 2 taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances. The COP, by its decision 1/CP 21, paragraph 35, invited Parties to communicate, by 2020, to the secretariat mid-century, long-term low greenhouse gas emission development strategies in

have occurred under different planning processes in countries or in research communities. These documents provide potential snapshots of future low-carbon economies but do not focus explicitly on the characteristics of such economies. To the extent that all countries have produced official MCSs at the time of GST, this could be a useful source of information on where we want to go. At the same time, some MCSs may not be constructed to be on track towards a zero-carbon economy consistent with the Paris goals; that is, some may focus on less ambitious action, particularly given that MCSs could be used as leverage in international negotiations. In addition, many MCSs, as well as the scenarios from the IA literature, are relatively aggregate and may not be transparent or detailed. There is, in fact, little detailed research specifically on the character of zero-carbon energy systems. The quite limited research that is available or the aggregate accounting information in IA models is general and indicative in character only. This may, however, be sufficient to provide some guiding principles for near-term planning.

The treatment of **"how do we get there"** is mixed. Some general classes of measures are obvious and require little formal modeling; for example, installing more zero-carbon electricity, electrifying, increasing efficiency, retiring coal-fired power plants, and halting new construction of gas-fired power plants. However, the near-term targets for any of these, and particularly at a country level, are often less clear. In addition, some questions of near-term action may have long-lasting consequences and need to be judged carefully. For example, approaches to infrastructure may put countries on track toward particular types of futures and limit options for other options (e.g., a "hydrogen economy").

The information sources for this question will include the same sources as with the question of "where do we want to go". This includes IA modeling scenarios, official MCSs, and unofficial long-term strategies. Other sources may also be available focused explicitly on shorter-term scenarios. A range of sectoral studies are now available, independent from official processes and typically of greater detail than overall energy sector or economy-wide scenarios. Official MCSs, in particular, are specifically intended to be the source for information on how to get there at a country level. An important question will be whether these strategies go beyond generic information about scenarios and move into more specific policy recommendations. A number of processes are now taking place to support both near-term and long-term strategy development. This work is taking place at NGOs, universities and think tanks and is supported and enabled by governments, development banks, foundations, and other organizations.[5] This should provide a robust techno-economic information base for assessing how to get there, with country-level information for a large number of countries.

accordance with Article 4, paragraph 19, of the Agreement. (https://unfccc.int/process/the-paris-agreement/long-term-strategies)

[5] See, for example, the 2050 Pathways Platform (https://www.2050pathways.org/), the Deep Decarbonization Pathways Project (http://deepdecarbonization.org/), the Low-Emissions Development Strategies Global Partnership (https://ledsgp.org/?loclang=en_gb), or a number of European Commission funded projects (e.g., COMMIT, at https://themasites.pbl.nl/commit/).

+ 3. Societal Information and the Talanoa Questions

Whereas techno-economic information is relatively well characterized and lends itself naturally to quantitative metrics, societal information is less easy to synthesize or quantify. There is, indeed, a substantial base of social science research and analysis that is relevant to the iGST, but it is unclear how to bring such information into a stocktaking process. More broadly, it is increasingly recognized that social science research in climate change lags physical system research.[6,7]

With regards to the question of **"where are we"**, societal information is generally diverse and not consistently synthesized into a form that can be used to support increased ambition. One class of supported information is quantitative information on policies. A range of different actors are now collecting information on policies by type across the world and at a country level.[8] This information, while indicative, has some limitations. In particular, the specific details of these policies are of great importance and not just counts. Furthermore, limits to policy enforcement often mean that policy goals and actual implementation can diverge. Some policies may simply be more successful than others. Other types of information amenable to quantitative synthesis are also potentially available, for example, public attitudes toward climate change relative to other societal priorities.

The more challenging, but potentially more important and interlinked questions about barriers to change, capacity to undertake mitigation, institutional structures and so forth are naturally less amenable to synthesis. Understanding why mitigation has not moved as quickly as hoped over the past decades will be important for identifying strategies for increasing ambition. A number of studies have explored these barriers at a generic level. For example, studies on barriers to energy efficiency have been going on since at least the 1990s. More targeted, country-level information is often found in case studies. It is not clear from the assessment supporting this discussion paper whether such information is ready to be used in support of a global stocktaking with a focus on enabling increased ambition; nor is it clear how such information would be used.

A review of the societal dimensions of **"where do we want to go"** indicates a substantial void. There is no clear synthesis of the societal and institutional changes that would be associated with carbon-neutral economies or economies with substantially lower emissions than today; nor is it clear what form synthetic information might look like. A range of different changes have been posited, many of them associated with communities caring substantially more than they do today about climate change and making the associated changes to lifestyles (e.g., eating less meat or living in smaller homes). Others have explored in general terms the sorts of institutional structures that might be need to, for example, integrate large amounts of renewables into the electricity grid. In general, however, there is very limited information on the societal characteristics of economies with carbon-neutral economies or economies with

[6] See, for example, Overland, I. and Sovacool, B.K., 2020. The misallocation of climate research funding. Energy Research & Social Science, 62, p.101349 and http://www.lse.ac.uk/GranthamInstitute/news/why-we-need-more-social-science-research-on-climate-change/

[7] An important next step for the iGST would be to more specifically review the state of support regarding barriers and societal needs and approaches to increase ambition. Assessment of this material in support of this discussion paper was limited. This is noted in the recommendations section below.

[8] See, for example, Climate Change Laws of the World at the Grantham Institute (https://climate-laws.org/) or the Climate Policy Database (http://climatepolicydatabase.org/), along with a range of associated reports.

much lower emissions than today. Given the challenges in predicting and understanding future societal changes, it is not surprising that this information is limited, not is it clear that this gap will be filled any time soon.

The question of **"how do we get there"**, while better supported, is diffuse and subject to differences of opinion. Information about societal changes may be found more in sources not recognized within the Official Global Stocktake process, such as peer-reviewed journal articles or reports by NGOs and think tanks.[9] Official MCSs could be an official source of this information, as could unofficial long-term strategies in published reports or peer-reviewed journal articles. A key question regarding official MCSs, however, will be whether these strategies go beyond largely techno-economic information about scenarios and move into more specific information about barriers, societal needs, policies, and institutional changes. The official, governmental character of these strategies may put limits on the ability to be targeted regarding barriers, policies, or institutional changes that are linked to political concerns. Unofficial NDC or long-term strategy studies from the research and NGO community may fill this gap, but they, too, have generally focused more heavily on quantitative, techno-economic information.

In overview, questions on social change – barriers, policies, institutions, and broader societal changes – are less supported than those associated with the more accessible techno-economic information. An important question for the iGST would be its role in stimulating new information or processes or in synthesizing any relevant information. A further review beyond that associated with this short discussion paper would be useful to better understand the available information and potential opportunities for the iGST to engage on matters of policies, institutions, and societal change.

[9] For example, the New Climate Economy, from the Global Commission on the Economy and Climate, produces a range of reports aimed at providing "independent and authoritative evidence on the relationship between actions which can strengthen economic performance and those which reduce the risk of dangerous climate change" (http://newclimateeconomy.net/).

+ 4. Crosscutting Issues

The discussion above has focused on the specific question of the status of information along dimensions of the Talanoa questions and techno-economic vis-à-vis societal information. This section raises three cross-cutting issues in the context of the mitigation information and the role of the iGST.

First, as noted in the introduction, this short discussion document is predicated on the notion that country-level information, and not just collective information, is important for the goals of the GST. Much or all of this information will not make its way into the official GST. This raises questions about how the iGST will engage with country-level information. Whereas collective techno-economic information has a natural home – the official GST – country-level information does not. The iGST will need to assess if and how it intends to bring country-level information to bear in an organized way on the goals of the GST. At present, a broad range of country-level information is being generated through a wide range of sources, including country-level and international statistical assessments, official MCSs and unofficial long-term strategy documents, and shorter-term studies looking and NDC or other short-term implementation.[10]

Second, the discussion above has largely focused on countries as the core actors in climate mitigation. In reality, the nature of climate mitigation is shifting, with substantial action now being overtaken by subnational or even international actors such as cities, states, and businesses. Some assessments are currently in place to assess the level of action by cities, states, and businesses, but the level of information and the synthesis of this information lags behind that at a national level, particularly when moving beyond near-term statistical information and focusing on specific country actions.[11]

Third, implicit in the discussion above is the fact that mitigation is rarely the most important consideration in the way that national decisions relevant to climate change are made. A wide set of other national priorities, such as energy security, air pollution, energy access, jobs, and economic competitiveness will generally have greater import for decision making than climate change. These broader concerns are frequently subsumed within the Sustainable Development Goals (SDGs) and can serve both as barriers to mitigation and enablers of mitigation. Regardless, successfully raising ambition will require explicit acknowledgement of the links between mitigation between these other societal priorities. It is not clear how the iGST might sharpen the focus on these linkages within the context of a stocktaking process.

[10] See Footnote 5, also the NDC Partnership (https://ndcpartnership.org/),

[11] See, for example, the Camda for Credible Climate Action (https://www.climateworks.org/camdaforcredibleclimateaction/), America's Pledge (https://www.americaspledgeonclimate.com/), C40 (https://www.c40.org/), the We Mean Business Coalition (https://www.wemeanbusinesscoalition.org/), NewClimate Institute, Data-Driven Lab, PBL, German Development Institute/Deutsches Institut für Entwicklungspolitik (DIE), Blavatnik School of Government, University of Oxford. *Global climate action from cities, regions and businesses: Impact of individual actors and cooperative initiatives on global and national emissions*. 2019 edition.

+ 5. Recommendations

The following recommendations focus on enhancing the mitigation information base for the iGST. An assumption in these recommendations is that iGST does not itself have the resources to create a substantially more robust information base for stocktaking. These recommendations therefore focus largely on engaging existing research and analysis communities to direct their activities toward the goals of the iGST. Engagement is also important in the sense that in many cases, information is best communicated through knowledge exchange and peer-learning, particularly in the case of information that is not immediately amenable to quantification.

Develop strategies to incorporate societal dimensions into stocktaking. As noted above, there is a potentially important lack of synthetic and digestible information on the societal dimensions of mitigation that could support the iGST. Also as noted above, understanding of the societal dimensions of mitigation is critical for increasing ambition. The iGST could more thoroughly explore the status of societal information, ongoing efforts that could fill those gaps, and, equally importantly, how the iGST might provide an avenue for such information to be better incorporated into stocktaking.

Engage university and other country-level research facilities and networks to prepare for the iGST. A broad range of independent research communities around the world are engaging in country-level research that might support the iGST. Universities, for example, have special standing within countries as trusted, legitimate intellectual centers. Other country-level research institutions such as research laboratories or NGOs may be similarly engaged. A range of cross-country processes are already in place to support country-level activities[12]. Engagement from these actors and processes would provide important, trusted, in-country thought leaders and analysts focused on the goals of the iGST.

Engage with mitigation scenario development processes. Model-based scenarios will be essential to identify “how do we get there” as well as “where do we want to go”. As noted above, there is a great deal of modeling and analysis activity currently underway to plot physical system pathways toward long-term climate goals. While this activity is robust, the modeling community is only beginning to look ahead specifically toward the GST and to identify how these activities can support stocktaking. The iGST could engage with these processes as a means to understand how they can best support stocktaking and implement strategies to do so.

Explore methods to integrate subnational actors into the iGST. While the GST is focused on national governments, climate mitigation is increasingly being driven by subnational actors such as states, provinces, regions, and cities as well as businesses, which may cross country boundaries. Research has only begun to consider how these actors can engage in a broad stocktaking process. Furthermore, an effective GST will need to quantify the implications of current actions as well the potential for enhanced ambition from these actors. The iGST could engage with the various processes that are currently organizing and coordinating subnational actors.[13]

Explore the role of information on other societal priorities in the iGST. As noted above, mitigation is enabled or limited by linkages to other societal priorities from energy security to air pollution. Understanding the links between mitigation and these other societal priorities will

[12] See, for example, footnote 5.

[13] See, for example, footnote 11.

therefore be critical for raising ambition. This discussion paper has merely identified this concern; it has not articulated strategies to bring this information into stocktaking. This bears continued exploration.