NDC ASPECTS

# NDC ASPECTS – Lessons Learned for the Global Stocktake (Deliverable 6.4)

WP6 – Global Governance and International Cooperation

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# Preface

The NDC ASPECTS project will provide inputs to the Global Stocktake under the Paris Agreement (PA) and support the potential revision of existing Nationally Determined Contributions (NDCs) of the PA's parties, as well as development of new NDCs for the post 2030 period. The project will focus on four sectoral systems that are highly relevant in terms of the greenhouse gas emissions they produce yet have thus far made only limited progress in decarbonization. To advance these transformations will require to understand and leverage the Eigenlogic of those systems and take into account specific transformation challenges. These sectors are transport & mobility (land-based transport and international aviation & shipping), emission intensive industries, buildings, and agriculture, forestry & land-use, including their supply by and interaction with the energy conversion sector.

## 1. Changes with respect to the DoA

Among other sources of material to answer the research question - how to maximise the impact of the Global Stocktake (GST) for sectoral transformation - the DoA envisaged to undertake case studies of how previous UNFCCC processes and in particular the Talanoa Dialogue, the precursor to the GST, have impacted national policies in selected countries. However, initial scoping of the literature showed that the Talanoa Dialogue had only very little, if any, impact on national policies. The team therefore decided to instead survey literature and the views submitted by parties and non-party stakeholders during the GST process for recommendations on how the GST could foster sectoral transformation. In addition, this deliverable draws on the literature on socio-technical transition to develop a novel conceptual framework for how international processes such as the GST may foster transitions of sectoral systems. The recommendations derived from GST submissions and existing academic literature are categorised and discussed according to this conceptual framework.

## 2. Dissemination and uptake

As detailed in the DoW and the project's Communication, Dissemination and Exploitation Plan, the deliverable will be made available on the project website and advertised via the project's newsletter and social media channels. In addition, the resulting manuscript will be submitted, in somewhat further revised form, to a relevant academic journal.

The deliverable will be of use to different groups of stakeholders:

- Policymakers and societal stakeholders can draw on the analysis to identify options to follow-up on the GST and to adapt the second iteration of the GST in 2027/2028.
- The theoretical framework for how international processes such as the GST can foster system transitions is of wider relevance to the academic literature on global governance as well as for the literature on socio-technical transitions.

## 3. Short Summary of results

This deliverable assesses the GST's potential to promote transitions of sectoral systems and how its outcome fulfils this potential. It draws on research in socio-technical transitions and international institutions to develop an evaluation framework. Literature and stakeholder submissions highlight how an effective GST could support transitions. While the GST decision breaks ground by calling for transitioning away from fossil fuels and setting renewable energy and efficiency targets, it lacks strong legal language, clear follow-up mechanisms, and sufficient financial support for developing nations. Despite these limitations, the GST sets a new benchmark for climate governance and empowers those seeking bolder action within governments and businesses. And from a conceptual perspective, a system-focused approach has arguably proven its worth as a concept to effectively dissect the complex challenge of climate change.

## 4. Evidence of accomplishment

This report.

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# Executive Summary

The most recent assessment report by the Intergovernmental Panel on Climate Change highlighted the need for "[r]apid and far-reaching transitions across all sectors and systems" in order to achieve the objectives of the Paris Agreement. However, actual efforts by parties are still much weaker than necessary to actually achieve the Paris objectives. The first Global Stocktake (GST) under the Agreement was seen by many as a major opportunity for a "course correction". This deliverable therefore analyses what potential the GST actually had to promote transitions of sectors and systems and to what extent the actual GST outcome actually realised this potential. To this end, the deliverable first draws on concepts from literature on socio-technical transitions and from literature on international institutions to develop a conceptual framework for how an international process such as the GST may promote transitions of sectors and systems. The deliverable then applies this framework to synthesise suggestions from literature on the GST and from submissions by parties and non-party stakeholders to the GST process on how the first GST could potentially have promoted transitions of sectors and systems. On this basis, the deliverable discusses to what extent the actual GST outcome actually exploits this potential. A key aspect is that, based on socio-technical transitions literature, policy strategies should seek not only to promote the emergence of low-emission solutions but also need to explicitly put pressure on incumbent high-emission regimes in order to actually achieve substantial emission reductions. Against this background, it can be seen as a major success that the GST outcome became the first COP decision ever to call for transitioning away from fossil fuels. The GST outcome also introduced objectives for the expansion of renewable energy and improvement of energy efficiency, which if met, would go a long way towards bringing the world onto a Paris-compliant trajectory. However, the legal language is relatively weak and the GST failed to establish clear follow-up processes and to underpin these new global goals with provision of adequate financial support for countries with limited resources. Nonetheless, the GST decision establishes a new standard for responsible climate governance, empowering stakeholders who advocate for greater climate action within their governments or corporations. Moreover, from a conceptual perspective, adopting a focus on systems and sectors has arguably proven its worth as a concept to break the challenge of combating climate change down into more specific and actionable pieces. Subsequent GSTs will be able to further develop the focus on transitions of sectoral systems by taking stock of the extent to which the lines of action adopted in Dubai have actually been pursued, and to further flesh out the needed actions in more detail.

# Contents

# 1 Introduction

The Paris Agreement enshrined ambitious international objectives to mitigate global climate change, but national ambition and implementation have been sorely lacking. While there has been some progress – based on existing policies, global temperature increase is now projected 1°C lower than at the time of the Agreement's adoption, and if all pledges are actually implemented global temperature increase may actually be stabilised below 2°C – projections with existing policies indicate that global temperature increase will probably reach about 2.5°C within this century (International Energy Agency, 2022). 2023 was the warmest year on record, exceeding 1.5° above pre-industrial levels the entire year (Poynting, 2024). One of the key messages of the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report is therefore that "[r]apid and far-reaching transitions across all sectors and systems are necessary to achieve deep emissions reductions and secure a liveable and sustainable future for all" (IPCC, 2023, p. 68).

Since the weakness of parties' nationally determined contributions (NDCs) was apparent already when the PA was being negotiated, the PA established a 5-year "ambition cycle", requiring updates of NDCs every five years, with a "Global Stocktake" (GST) taking place every five years in between to assess the state of progress and inform development of subsequent NDCs and the enhancement of international cooperation.

The first GST concluded at the 28th Conference of the Parties (COP28) to the United Nations Framework Convention on Climate Change (UNFCCC) in Dubai with the adoption of the decision "Outcome of the first global stocktake" (UNFCCC, 2023a). In the runup to the conference, the first GST had been seen by many as a major opportunity for a "course correction" (European Union, 2023). The lead negotiator of the Alliance of Small Island States (AOSIS) had noted that the first GST was "the only GST that matters for ensuring that we can still limit global warming to 1.5C" (Fyson et al., 2023).

The GST covers all pillars of the Paris Agreement, i.e. including not only mitigation but also adaptation and means of implementation. While these are also crucial topics and progress in these areas has also been sorely lacking, this article concentrates on mitigation.

A key limitation of the GST is that it may only address collective progress, which poses significant challenges as to how it can generate outputs that are relevant to, and actionable in, specific country contexts. PA and GST modalities also say little about the period between the end of the GST and the submission of new NDCs. Moreover, global climate policy historically strongly focused on developing adequate targets for global and national GHG emissions and removals rather than directly addressing specific emission sources and sinks (Hermwille et al., 2019; Rajamani et al., 2023).

However, economies are composed of different country-specific sectoral systems, each supplying distinct goods and services such as energy, transport and mobility, agricultural products and food, residential and commercial buildings, or industrial products. Each sectoral system is distinct in its value chains, actor constellations, political economy, technologies, financing structures, industrial composition, and international interdependence, and therefore also needs distinct treatment. Mitigating climate change therefore requires not just one transition but many. Moreover, governments, who are the ones who need to implement climate policy, are largely organised along sectoral lines. Global climate governance and international cooperation should therefore take these differences into account to be most effective (Beuermann et al., 2021; Ghosh et al., 2022; Oberthür et al., 2021; Victor et al., 2019).

Some literature therefore suggested that the GST should adopt a focus on sectoral systems in order to be able to properly identify mitigation enablers, barriers and policy options, and to more directly engage relevant actors within and beyond governments (Hermwille et al., 2019; Höhne et al., 2019; Jeffery et al., 2021; Northrop et al., 2018; Obergassel et al., 2019; Srouji et al., 2023; van Asselt et al., 2023). A number of parties to the Paris Agreement similarly suggested to adopt a sectoral approach to "highlight the systemic transformations needed to reach the objectives of the Paris Agreement" (EIG, 2023a, p. 4), to agree on collective sectoral targets and actions to promote systems transformations (UK Government, 2023), to establish sectoral roadmaps (European Union, 2023), or to "pursue collective measures across relevant sectors to support systemic change" (AOSIS, 2023, p. 7).

The objective of this article is to analyse the extent to which the actual GST outcome may indeed provide a boost to transitions of sectoral systems. Answering this question first of all requires an understanding of what system transition entails and how it can be brought about. Over the last two decades, this question has been tackled by a rapidly growing literature analysing past and present socio-technical transitions (Köhler et al., 2019; Markard et al., 2012). However, this literature has so far mostly focused on national case studies and dealt little with questions of international relations and global governance (Caiafa et al., 2023; Hermwille, 2019; Newell, 2019; Power et al., 2016). Fuenfschilling & Binz (2018) and Newell et al. (2023) even accuse the scholarship on socio-technical transitions of "methodological nationalism".

To bridge this gap, this article proposes to employ concepts from the study of international institutions to analyse the potential impact of the GST. This literature has identified a number of functions which international institutions can activate to help address problems such as climate change. This article suggests that these functions can be employed similarly to how studies of national transitions have employed typologies of national policy instruments.

After this conceptual discussion, the article surveys suggestions from existing literature and GST submissions on how the GST could promote mitigation efforts and synthesises them according to the governance functions. in the final step, the article analyses to what extent these suggestions are reflected in the GST outcome.

The article finds that a key consideration in socio-technical transitions literature is that policy strategies must not be limited to fostering the emergence of low-emission solutions, but must also actively de-stabilise incumbent high-emission regimes in order to make transition to low-emission systems possible. The GST outcome addresses both dimensions to some extent. It arguably made history by being the first COP decision to explicitly call for a transition away from fossil fuels. Furthermore, it includes targets for expanding renewable energy and improving energy efficiency. If fully implemented, these outcomes have the potential to substantially align global efforts with the goals of the Paris Agreement. On the negative side, the outcome's non-binding language, caveats and lack of clear monitoring processes or sufficient financial support for developing countries are critical limitations. Nonetheless, the GST decision raised the bar on what is considered good government behaviour and thereby provides additional legitimation for actors that are engaged in political contestation on climate change at national or intra-company level.

# 2 Methods and Material

## 2.1 Conceptual Framework

### 2.1.1 Socio-Technical Transitions Research

The unit of analysis in socio-technical transitions literature are socio-technical systems, which are delineated according to the generic societal functions they fulfil, e.g., mobility, energy provision or food production. Socio-technical systems consist of multiple elements, such as technologies, markets, user practices, cultural meanings, infrastructures, policies, industry structures, and supply and distribution chains. Transitions, defined as "radical shifts to new kinds of socio-technical systems" (Köhler et al., 2019, p. 2), are therefore co-evolutionary processes, involving concurrent changes in a number of these elements and dimensions.

A prominent approach to conceptualise how transitions of sectoral systems occur is the multi-level perspective, which includes three analytical levels: landscape, socio-technical regime, and niches. While the "socio-technical regime" encompasses the currently dominant way of providing societal functions, by contrast, "niches" are alternative and currently marginalised approaches or solutions. The "landscape" denotes macro structures that can be influenced only in the long-term. Transitions unfold as the result of dynamic processes within and between these three levels. At the niche level, pioneers or entrepreneurs nurture the development of alternatives to the incumbent regime. These innovations may break through more widely if landscape developments, such as climate change, create pressure for change and thereby create tensions and windows of opportunity at the regime level. If niche innovations align with landscape pressures and address regime weaknesses, the incumbent regime may ultimately be substantially re-configured or even fully replaced. Policy may foster transitions, e.g. by creating protected spaces for niche innovations by subsidising demonstration projects, which is referred to as strategic niche management (Köhler et al., 2019).

However, incumbent regimes are dynamically stable. The economy, policy, technologies, practices, infrastructure systems, cultural meanings and scientific knowledge have co-evolved over decades and mutually support each other. Regimes reproduce and actively resist change, e.g. by working to retain subsidies, undermine competing technologies and discursive battles for legitimacy and public opinion (Geels, 2014; Trencher et al., 2020). High-emission systems are particularly prone to entrenchment (often referred to as "carbon lock-in") due to the high volumes of high-emission assets that are already in place (such as industrial and power plants, buildings and car-centred road networks), their longevity, and interrelationships between the socio-economic and technical systems involved. Strategies to promote the "[r]apid and far-reaching transitions" (IPCC, 2023, p. 68) that are needed to achieve the Paris objectives can therefore not be limited to promoting climate-friendly solutions. They also need to include measures to actively de-stabilise and dismantle high-emission regimes (Kivimaa & Kern, 2016; Seto et al., 2016; Unruh, 2000).

### 2.1.2 The Potential of Global Governance to Promote Transitions of Sectoral Systems

As noted in the introduction, the potential role of international institutions and global governance for promoting transitions of sectoral systems has so far been researched only to a limited extent within socio-technical transitions literature. Some limited literature from recent years suggests that international cooperation should focus on forming frontrunner alliances that are willing to tackle specific areas of action. By building institutions to enable experiments among willing actors, i.e. create

niches, draw lessons from these experiments, and coordinate diffusion activities to scale up niches for transition into larger market shares, such international coalitions may help to trigger self-reinforcing feedbacks or even positive tipping points that may rapidly overturn incumbent high-emission regimes pathways (Hale, 2020; Sharpe & Lenton, 2021; Victor et al., 2019).

To move this research agenda forward, we draw on the rich literature on global governance and international institutions. In general terms, global governance refers to the processes and mechanisms by which actors at the international, national, and sub-national levels coordinate their behaviour to address global challenges. As the world becomes increasingly interconnected and interdependent, traditional state-centric approaches to governance have become inadequate for dealing with issues that transcend national borders. Global governance seeks to fill this gap by fostering cooperation and coordination among a broader array of actors, including states, international organisations, non-governmental organisations, and multinational corporations (Florini & Sovacool, 2009; Oberthür et al., 2021).

Existing literature has identified several specific functions which international institutions can deploy to help address problems such as climate change (Kinley, 2017; Oberthür et al., 2021). An analogy can be drawn between policy options at national level and the levers global governance has at its disposal. National policy may draw on a broad portfolio of policy instruments to promote transitions of sectoral systems, such as direct regulation, financial support schemes, pricing instruments, funding research and development, and information instruments (Kivimaa & Kern, 2016; Reichardt et al., 2016; Rogge & Reichardt, 2016). In particular Kivimaa and Kern (2016) highlight that policy needs to develop strategies of “creative destruction”, i.e. to combine instruments to foster sustainable solutions, such as financial support for research and development, demonstration and deployment, with instruments to actively de-stabilise unsustainable socio-technical regimes, e.g. pricing GHG emissions, removing support such as fossil fuel subsidies or banning certain technologies.

The functions of international institutions may similarly be deployed to foster “creative destruction”. For example, the Montreal Protocol forced technological change by requiring the phase-out of ozone-depleting substances (ODS) and restrictions of trade with non-parties, but also promoted innovation and deployment by the establishment of technical committees involving industry experts to support the development and uptake of ozone-friendly alternatives, and by the provision of financial and technological support for developing countries to replace ODS by alternatives (DeSombre, 2000; Victor et al., 2019).

The following lays out a typology of potential functions of international institutions developed by Oberthür et al. (2021), with examples from literature on how they may be deployed to foster low-emission transitions of sectoral systems. Taking up the concept of “creative destruction, the governance functions may be deployed to put pressure on high-emission regimes and/or to foster the emergence and breakthrough of low-emission solutions:

- *Guidance and signal*: International institutions can signal the determination of members to pursue a particular course, such as promoting GHG reductions. These signals derive from the principles and goals that underpin international institutions and can provide direction beyond the institution in question by giving businesses, investors, and other actors an indication of what policy paths countries are likely to take. They may also serve to enhance the political leverage of actors that seek to promote low-emission transitions in domestic politics or intra-firm deliberations (Dai, 2010; Hale, 2020; Kinley, 2017). The Paris Agreement has already served to increase pressure on high-emission regimes by providing signals to pursue 'climate neutral' development (Falkner, 2016; Kinley, 2017) and by driving the emergence of a view that a large share of available fossil fuel reserves should not be exploited (Athanasiou, 2022; Rayner et al., 2021). Going forward, for example, the fossil-based electricity system could be further destabilised by further expansion of the Powering Past Coal Alliance, which has the objective to phase out coal use. Further strengthening of this alliance may negatively impact investor expectations to such an extent that, together with measures to reduce capital costs of renewables, the cost of capital for new renewable generation capacity may fall below that of coal in each country (Sharpe & Lenton, 2021).
- *Rules and standards*: International institutions cannot only provide desired direction, but also require their members to take specific actions to achieve mutually agreed-upon goals. For example, fossil-based electricity systems could be destabilised by an agreement among the three chief international funders for new coal power plants, China, Japan and South Korea, to stop this funding. Such an agreement could significantly raise the cost of capital for coal globally (Sharpe & Lenton, 2021). In terms of supporting the breakthrough of low-emission systems, for example, the uptake of electric light duty vehicles could be fostered by alignment of the regulatory trajectories of the three largest auto markets, China, the EU and California. Such an alignment would shift investments throughout the global auto industry and accelerate achievement of cost parity on initial purchasing costs of electric and conventional vehicles. In addition, the attendant technology improvements would also bring down costs of larger electric vehicles as well as costs for battery storage in the electricity sector, and might also prompt a re-orientation of the global oil industry by depriving them of their largest market (Sharpe & Lenton, 2021; Victor et al., 2019).
- *Transparency and accountability*: International institutions can increase the transparency of actions taken by their members by collecting and analysing relevant data and identifying and addressing problems in the implementation of agreed rules/standards. In theory, reporting, and expert and peer review can support countries in doing more to promote system transitions by helping them to identify opportunities for further action. They can also allow other governments as well as non-party stakeholders to demand higher ambition and better implementation from governments (Chan et al., 2016; Stevenson, 2021; Weikmans et al., 2020).
- *Means of implementation*: International institutions can organise capacity building, technology transfer, and funding among members to support the emergence and break-through of low emission systems. For example, donor countries already provide considerable support for transitioning to renewable energy. To enhance impact, donors could improve their coordination and support large-scale transformational programmes instead of large numbers of small projects (Sharpe & Lenton, 2021; Victor et al., 2019).

- *Knowledge and learning*: International institutions can create knowledge and platforms for individual and social learning. The goal is to create and disseminate scientific, economic, technical, and policy-related knowledge about understanding and/or possible solutions to the problem at hand. Such knowledge may promote transitions if it creates demonstration and learning effects which enhance the capacity and willingness of actors to undertake mitigation actions (Hale, 2020).

### 2.1.3 The Potential of the GST to Promote Transitions of Sectoral Systems

The following section employs this conceptual basis to analyse the following: First, how the GST could in theory have promoted low-emission transitions of sectoral systems. To this end, the section synthesises proposals made in literature and as part of the GST process on how the GST could foster such transitions. Relevant literature was identified using the "Elicit" search engine and following up on references cited in the literature identified with Elicit. Elicit uses language models to extract data from and summarise research papers. Upon entering an initial search query, the engine first identifies the eight most relevant publications that semantically match the query but can also generate larger lists of matches.

In addition, Parties and observer states, UN agencies and other intergovernmental organizations (IGOs), as well as non-party stakeholders and observer organizations were invited to submit their views under i) the information collection and preparation component of the GST for consideration in the three sessions of the Technical Dialogue of the first Global Stocktake, and ii) the consideration of outputs component of the first Global Stocktake. In total, about 400 submissions were thus contributed to the GST process. The authors searched all of these submissions for references to sector or system transformation or transition, or to a sectoral approach. A search of the database "Global Stocktake Explorer" (Global Stocktake Explorer, n.d.) cross-checked results for completeness. As this Explorer is a pilot release with some limitations, this search was supplementary only. The following synthesises the suggestions made in literature and GST submissions according to the five governance functions.

Moreover, in a second step, the following section also compares the actual GST outcome to the GST's theoretical potential as synthesised in the first step. The GST outcome comprises two elements: the GST decision adopted at the Dubai conference (UNFCCC, 2023a) and the synthesis report by the co-facilitators of the Technical Dialogue (UNFCCC, 2023e). In addition, various coalitions of countries and other actors pledged various kinds of actions in relation to the GST at the Dubai conference. However, these pledges are not a distinctive feature of the Dubai conference. Over the last decade, the making of such pledges has become a standing feature of every session of the COP (Aykut et al., 2021). This article therefore focuses on the outcomes of the formal negotiation process.

# 3 Guidance and Signal

## 3.1 The Potential of the GST to Provide Guidance and Signal

As noted above, the PA has already provided signals to pursue 'climate neutral' development. Based on the objectives of the PA, increasing numbers of countries have adopted mid-century net-zero GHG or $CO_2$ targets (Patt et al., 2022). However, the PA and subsequent UNFCCC conferences have so far mostly focused on global emissions, pointing to the global 'emissions gap' and exhorting a sense of urgency only in general terms (Obergassel et al., 2022). There is therefore not really a shared understanding among parties on what "success" of the PA would mean (Milkoreit & Haapala, 2017, 2018). At the sector level, for many sectors it is still unclear what 1.5° means, in particular which sectors will be required to reduce emissions to zero (or below zero) and which sectors may be allowed to continue having a certain amount of emissions (Dagnet et al., 2020; Hermwille et al., 2019).

One contribution of the GST cycle could be to facilitate the development of a shared understanding of the meaning, measurement and status of progress toward the goals and the overall purpose of the PA (Milkoreit & Haapala, 2017, 2018). Through periodic goal setting and benchmarking every five years, the GST could contribute to normalisation of ambitious climate action and shift expectations of stakeholders across all governance levels (Hale, 2020; Hermwille et al., 2019; Jeffery et al., 2021).

COP26 started a process of putting the climate mitigation challenge into terms that are more specific than global emission figures by calling on parties to phase down unabated coal and phase out inefficient fossil fuel subsidies - the first time ever a COP decision directly addressed fossil fuels (Van Asselt & Green, 2023). The conference in Sharm el-Sheikh struggled but ultimately failed to go beyond Glasgow by calling for the phase-down of all fossil fuels (Green & Asselt, 2022).

The first GST could have built on these discussions and could have endeavoured to break the global goals down to the level of the individual sectors, spelling out what each sector would need to look like to be compatible with the Paris temperature limit (Jeffery et al., 2021; Rayner et al., 2021). Similarly, several Parties (AILAC, 2023a; AOSIS, 2023; EIG, 2023b, 2023a; Government of Norway, 2023), stressed the need for systems transformations across all sectors and contexts, a sectoral approach or applying a sectoral lens in their submissions. Non-party stakeholders support such approaches (Climate Analytics, 2023; IDDRI, 2023; iGST, 2023; We Mean Business Coalition, 2023; Wuppertal Institut, 2022). Specifically, submissions to the GST process included proposals to directly target the phase-out of fossil fuels as well as very specific targets to scale up climate-friendly alternatives. Suggestions to put pressure on fossil systems included to call for (submitting Parties/Groups in brackets):

- a (full) phase-out of all fossil fuels (AILAC, 2023a; AOSIS, 2023; Australian Government, 2023; Canada, 2023; EIG, 2023a; European Union, 2023; Government of Japan, 2023; Government of New Zealand, 2023; LDC, 2023; UK Government, 2023; USA, 2023);
- a phase-out of (unabated) coal power generation, in particular by 2040 (Canada, 2023; EIG, 2023a; UK Government, 2023; USA, 2023), with a 2030 target in the Canadian submission and a 2050 target in the US submission;
- a phase-out of "inefficient" fossil fuel subsidies by 2025 (AILAC, 2023a; EIG, 2023a; European Union, 2023; Government of Norway, 2023; UK Government, 2023).

Regarding the upscaling of climate-friendly solutions to achieve the Paris Agreement objectives, suggestions included

- on electricity, to increase the share of renewables in global electricity generation from 30 percent in 2022 to 55–90 percent by 2030 and 98-100 percent by 2050 (AILAC, 2023a; Australian Government, 2023; Government of New Zealand, 2023; Government of Norway, 2023; LDC, 2023; USA, 2023). The submission by AILAC is with exact wording on the 2030 target, the US submission is more generally on scaling up the share of renewables or on tripling by 2030;
- on buildings, to increase the rate of building retrofits to 3.5% by 2040 (AILAC, 2023b; EIG, 2023a) and reduce global average energy consumed per square meter in buildings by 45% by 2030 from 2021 levels (Canada, 2023; USA, 2023);
- on transport, to double the share of fossil fuel–free transport to at least two-thirds of all passenger kilometres travelled by 2030, including by increasing in the share of electric vehicle sales to 75–95 percent of global car sales and 30 percent of zero-carbon truck sales by 2030 (EIG, 2023a; Srouji et al., 2023) with the EIG submission generally on modal shift), and to further achieve 100% zero emission on new light duty vehicle sales by 2035 in leading markets and 2040 globally and at least 30% of new medium and heavy-duty vehicle sales being zero emission by 2030 and 100% by 2040;
- on industry, to reduce carbon intensity of industries such as cement and steel, by 10-fold (AILAC, 2023b);
- on agriculture, forestry and other land use, to transform food systems, eliminate and reversing deforestation and degradation, reduce agricultural emissions by a quarter and cutting loss of food production and food waste in half by 2030 (AILAC, 2023b; EIG, 2023a; Government of New Zealand, 2023; Srouji et al., 2023).

In the political process, attention in particular focused on a suite of targets championed by the International Energy Agency (IEA), to be achieved by 2030: To triple global renewable power capacity from 3629 (GW) in 2022 to over 11,008 GW, to double the global rate of energy efficiency improvements from 1.96% in 2022 to over 4% annually, to cut methane emissions from fossil fuel operations by 75%, to establish large-scale financing mechanisms to triple clean energy investment in emerging and developing economies, and to commit to measures for an orderly decline in the use of fossil fuels, including an end to new approvals of unabated coal-fired power plants. According to the IEA, these measures would deliver 80% of the emission reductions needed by 2030 to get onto a 1.5°C trajectory (IEA, 2023).

## 3.2 Actual GST Outcome

One of the key findings in the synthesis report by the co-facilitators of the Technical Dialogue of the first GST is that “governments need to support systems transformations that mainstream climate resilience and low GHG emissions development.” (UNFCCC, 2023e, p. 3) Specifically, it finds that expanding renewable energy and phasing out all unabated fossil fuels are “indispensable elements of just energy transitions” (UNFCCC, 2023e, p. 19), that halting and reversing deforestation and improving agricultural practices are “critical” (UNFCCC, 2023e, p. 21), and also notes the need for transformations in industry, transport, and buildings (UNFCCC, 2023e, p. 20). The report suggests quantified benchmarks for forestry and energy sources. On the former, it notes that halting and reversing deforestation by 2030 and restoring and protecting natural ecosystems will yield large-scale CO2 absorption. On the latter, it notes that 1.5°C-compatible scenarios in AR6 envisage a reduction of

unabated coal power by 67–82 per cent by 2030 from the 2019 level and hardly any use of coal for electricity generation by 2050, while low- and zero-carbon sources account for between 97–99 per cent of global electricity by 2050 (UNFCCC, 2023e, pp. 118–120). On other sectors, the report describes measures to implement system transformations in qualitative terms (see section on knowledge and learning).

In the political process, agreeing to promote shifts to climate-friendly systems proved to be substantially easier than agreeing to put pressure on fossil systems. Tripling renewables and doubling energy efficiency improvement rates was agreed on by the G20 countries already at their summit in September 2023, which made it virtually certain that these targets would also be adopted by the COP (G20, 2023). By contrast, the G20 failed to agree on a position on fossil fuel phase-out and e.g. China noted in the COP run-up that it was opposed to a "not realistic" global fossil fuel phase-out (Lo, 2023a). Accordingly, China proposed draft text encouraging Parties to achieve effective and secure transition by establishing the new before abolishing the old. A transition into a clean, low-carbon, secure and efficient energy system should be encouraged while in the meantime recognizing the significant role of fossil fuels in ensuring energy supply security while facilitating the transition, and using fossil fuels in a clean, low-carbon and efficient manner (China, 2023, p.9). During the COP, OPEC's Secretary-General specifically instructed OPEC member countries to resist any phase-out language (Carrington, 2023). The COP negotiations experienced significant shifts, starting with a draft text proposing various fossil fuel phase-out options (UNFCCC, 2023f, p. 36). However, a subsequent draft did not contain any phase-out language and presented options related to mitigation as a menu that parties could choose from (UNFCCC, 2023g, p. 39).

The final decision "calls on Parties to contribute to" a list of goals, "in a nationally determined manner" (UNFCCC, 2023a, p. 28), including "transitioning away from fossil fuels in energy systems, in a just, orderly and equitable manner, accelerating action in this critical decade, so as to achieve net zero by 2050 in keeping with the science" (UNFCCC, 2023a, p. 28(d)). The COP thereby for the first time ever recognised that a transition away from fossil fuels is necessary. The reference to "this critical decade" and the target date 2050 are also important, a decision with stronger phase-out language but without a timetable would have been meaningless. On the other hand, the legal language has a very low degree of legal bindingness, only "calling on" Parties "to contribute to" this goal "in a nationally determined manner". In addition, the term "energy system" may be interpreted to refer only to energy supply, not to energy use or to use of fossil fuels as industry feedstock. Moreover, there is no clear roadmap and the decision also calls for accelerating carbon capture and utilisation and storage technologies (UNFCCC, 2023a, p. 28(e)), which would allow for continued use of fossil fuels, and recognises that "transitional fuels" may play a role (UNFCCC, 2023a, p. 29), which is commonly understood to refer to fossil gas (Lo, 2023b).

The decision also calls for "substantially reducing" methane emissions (UNFCCC, 2023a, p. 28(f)), but without setting a specific target, contrary to what had been proposed by the IEA. On coal, the decision repeats the language from COP26 on phasing down unabated coal power, but still does not define what "unabated" means (UNFCCC, 2023a, p. 28(b)). Such a definition is critically needed since low capture rates with high residual and fugitive emissions would not be consistent with achieving the objectives of the Paris Agreement (Khourdajie et al., 2023).

In terms of scaling up low-emission systems, the decision calls on parties to triple global renewable energy capacity and double the global rate of annual energy efficiency improvements by 2030 (UNFCCC, 2023a, p. 28(a)). Together with the provisions on fossil fuels and methane emissions, the decision thereby to some extent ticks four of the five boxes the IEA had laid out as key for keeping the

1.5°C limit within reach. However, the final text omitted the 2022 base year and absolute targets contained in a previous draft text, namely 11,000 GW new renewable energy capacity and an annual decrease of energy intensity by 4.1% by 2030 (UNFCCC, 2023f, p. 36). Moreover, so far no international assessment of achievement of these targets is envisaged. This opens these targets to potential for gaming, e.g. countries could choose other years than 2022 as baselines to make target achievement easier.

The decision also touches on transport, forests and food systems, though these provisions were not so much in the public spotlight. On transport, the decision calls for "accelerating the reduction of emissions from road transport (…), including through development of infrastructure and rapid deployment of zero- and low-emission vehicles" (UNFCCC, 2023a, p. 28(g)). The decision also emphasises the need for "enhanced efforts towards halting and reversing deforestation and forest degradation by 2030" (UNFCCC, 2023a, p. 33). While there had been a number of forest-related pledges over the years, e.g. the Glasgow Leaders' Declaration on Forests and Land Use, this marked the first time that such a target was included in a UNFCCC decision. Similarly, the GST decision became the first-ever UNFCCC decision to address food systems, which are responsible for nearly one-third of global GHG emissions (Chandrasekhar, Dunne, Dwyer, Quiroz, et al., 2023).

Overall, the GST therefore did manage to define benchmarks for transition in relation to renewable energy, energy efficiency and deforestation and forest degradation. On other sectors and systems, submissions had similarly suggested quantified benchmarks but these were not taken up in the GST outcome, neither in the technical dialogue report, nor in the GST decision.

# 4 Rules and Standards

## 4.1 The Potential of the GST to Provide Rules and Standards

As noted, the UNFCCC process has so far strongly focused on economy-wide emissions. However, in addition to being insufficient overall, parties' efforts in reducing emissions have so far strongly varied among sectoral systems. It could therefore be useful if international rules and standards compelled Parties to demonstrate progress across all sectoral systems (Obergassel et al., 2022). In addition, a sectoral breakdown of NDCs could help to connect the NDCs to national policymakers and implementers in specific sectors, and to identify sector-specific areas for international cooperation (Waisman et al., 2021). Many NDCs contain sectoral information such as sectoral targets or policies, but there is no requirement for Parties to include such information (van Asselt et al., 2023).

Literature therefore suggested that the GST outcome could have requested Parties to include such information in their NDCs and in their mid-century long-term climate strategies (C2ES, 2023c; van Asselt et al., 2023). Specifically, the GST outcome could have requested parties to take up the outcomes of COP26 and report on progress in energy transition as part of their NDCs, in particular efforts to phase down unabated coal and phase out inefficient fossil fuel subsidies (UNFCCC, 2023c). The GST outcome could also have requested parties to indicate in their NDCs how they will contribute to any global targets set at COP28, such as for scaling up renewable energy globally, as discussed under guidance and signal (C2ES, 2023c; Climate Action Network, 2023).

## 4.2 Actual GST Outcome

The GST outcome contains only weak follow-up requirements, the synthesis report by the co-facilitators of the technical dialogue and the GST decision contain none of the suggestions outlined above. The technical dialogue report (UNFCCC, 2023e) only summarises next steps already agreed in previous COP decisions. The GST decision merely reiterates language from the Paris Agreement according to which parties shall provide information on how the preparation of their NDCs has been informed by the outcomes of the GST (UNFCCC, 2023a, p. 169). Adopting more detailed guidance was not possible due to pushback that this would violate the nationally determined nature of NDCs.

Nonetheless, the requirement to take the GST outcome into account in the development of the next round of NDCs does provide a basis for domestic constituents to demand implementation of the new global goals. It may also serve to strengthen the case of litigants that want to challenge new fossil fuel infrastructure or projects in court (van Asselt, 2023).

# 5 Transparency and Accountability

## 5.1 The Potential of the GST to Provide Transparency and Accountability

As noted in section 2.1.2, transparency and accountability provisions may support countries in doing more to promote system transitions by helping them to identify opportunities for further action, and by allowing other governments as well as non-party stakeholders to demand higher ambition and better implementation. However, since the GST may assess collective progress only, there is no scope for one of the traditional means of enhancing accountability, naming and shaming (Milkoreit & Haapala, 2017). Still, literature suggested that with a focus on system transitions, the GST could have disaggregated the global picture at least to some extent. The GST could have taken stock not only of current and projected emission levels at global level, but it could also have assessed the collective progress and gaps of mitigation efforts at the level of sectoral systems (Obergassel et al., 2019; Rajamani et al., 2022). Such an assessment could for example have found that the transport sector has been performing especially poorly and therefore requires particular attention (Obergassel et al., 2021).

Moreover, while the potential of the GST itself is limited, it could have highlighted the need for increased transparency and accountability under the PA and beyond. Existing work has identified significant deficiencies in the PA's transparency and accountability mechanisms. First, they do not have the mandate to assess the adequacy of individual parties' NDCs, nor the mandate to assess the adequacy of policies and actions to actually achieve NDCs. Second, the strong variety of NDCs complicates assessment. Third, non-party stakeholders have only limited opportunities to participate in the proceedings of the transparency mechanisms. Fourth, it is unclear whether parties and the UNFCCC Secretariat have sufficient resources to adequately operate these mechanisms (Obergassel et al., 2022; Pauw et al., 2018; Raiser et al., 2022; Weikmans et al., 2020). Finally, parties are not required to report on the implementation and achievement of NDCs in individual sectors (van Asselt et al., 2023).

The first review and potential update of the modalities, procedures, and guidelines for the Enhanced Transparency Framework (ETF) of the Paris Agreement is due only in 2028. Given the urgency of tackling climate change, the GST outcome could have called for an earlier revision, or alternatively for intensified efforts to provide guidance to and build capacities of Parties to strengthen transparency on the contribution of sectoral systems (van Asselt et al., 2023).

Finally, the actual uptake of the GST outcome could also profit from specific monitoring. As past experience has shown, parties can agree on decisions but fail to actually implement them (Jeudy-Hugo & Charles, 2022, 2023; Northrop et al., 2018). The group of least-developed countries therefore demanded a "process to ensure accountability and transparency of action and announcement with a clear follow up immediately after 2023 as an agenda item for SB60 and lead up the next round of NDCs for monitoring progress on raising ambition in line with 1.5°C, mobilization of scaled-up finance, implementation of GGA and addressing loss and damage" (LDC, 2023, p. 9). The GST outcome could therefore have included requirements to monitor implementation, such as requesting the UNFCCC Secretariat to report on progress with implementation of GST recommendations as part of their annual NDC Synthesis Report, a special event in the second quarter of 2025 by the UN Secretary-General to specifically recognise parties that have updated their NDCs in line with GST recommendations, consideration by technical expert reviews of biennial transparency reports if Parties have provided information on how GST recommendations have been considered in their updated NDCs, or workshops

including consideration of information on how Parties' NDCs were informed by GST recommendations under the Facilitative, multilateral consideration of progress (FMCP) (Jeudy-Hugo & Charles, 2022, 2023). The GST outcome could also have mandated specific follow-up on commitments made in COP decisions, such as on the phasedown of unabated coal power as agreed in Glasgow, or the new global goals agreed in Dubai. For example, the UNFCCC Secretariat could have been mandated to assess whether parties have credibly taken steps to achieve these commitments (Rajamani et al., 2023). In particular the already existing mitigation and adaptation work programmes could be vehicles to monitor and promote implementation of GST outcomes (Jeudy-Hugo & Charles, 2022, 2023).

In addition to action by parties, the GST could also have been used to enhance transparency and accountability of actions by other international organisations that are relevant for combating climate change. Many international organisations are relevant for specific sectors, such as the International Civil Aviation Organisation or the International Maritime Organisation. There is an agenda item under the UNFCCC's Subsidiary Body for Scientific and Technological Advice on cooperation with other international organisations, but there has been little substantive debate under this item so far. To create more engagement, the GST outcome could have called for establishing a dedicated process under the auspices of the UNFCCC Secretariat, the COP Presidencies, and the UNSG, requesting international organisations and international financial institutions to provide specific information on how their goals and actions align with the Paris Agreement's goals and to offer detailed information on progress made. This process could also include a regular review, for instance by UNEP as part of its annual Emissions Gap Reports (Rajamani et al., 2023).

The GST outcome could also have called for enhanced transparency and accountability of voluntary international cooperative initiatives (ICIs), both regarding their commitments and regarding implementation. The GST could specifically have called for developing minimum standards for ICIs concerning quantifiable targets/goals, the additionality of initiatives to national commitments, financing for actions under the initiatives and reporting (Rajamani et al., 2023; UNFCCC, 2023c). Parties could also have invited the UNFCCC secretariat (together with the UN High-Level Climate Champions) to prepare an annual report on progress under ICIs (Jeudy-Hugo & Charles, 2023). The GST outcome could also have called on parties to include all ICIs wherein they participate in their NDCs and thereby submit them to the Paris Agreement's transparency mechanisms (van Asselt et al., 2023).

## 5.2 Actual GST Outcome

The GST outcome takes up only a few of these suggestions. The GST outcome does not take stock of the situation at the level of sectoral systems. Both the technical dialogue report and the GST decision remain at the global level, with the GST decision noting "with significant concern that, despite progress, global greenhouse gas emissions trajectories are not yet in line with the temperature goal of the Paris Agreement" (UNFCCC, 2023a, p. 24).

In terms of next steps, as noted under rules and standards, the technical dialogue report only summarises next steps as already agreed previously. The GST decision establishes that, to monitor and promote the integration of the GST outcome in NDCs, future subsidiary body meetings will feature an "annual global stocktake dialogue" "to facilitate the sharing of knowledge and good practices" on how GST outcomes are informing NDC preparation. The Secretariat is mandated to prepare a report for the subsequent subsidiary body session (UNFCCC, 2023a, p. 187). Parties are also invited to present their NDCs "at a special event to be held under the auspices of the United Nations Secretary-General" (UNFCCC, 2023a, p. 190).

The GST outcome also does not call for accelerating the review of ETF modalities, nor does it call for enhancing transparency of actions by other international organisations and ICIs, nor does it mandate specific follow-up on specific commitments, such as the new global goals on fossil fuels, renewable energy and energy efficiency. On the last point, parties did discuss whether the mitigation work programme (MWP) should take up and carry forward GST outcomes. However, in particular the like-minded developing countries sought to block all references to the GST in the MWP negotiations (International Institute for Sustainable Development, n.d.). The final decision on the MWP (UNFCCC, 2023b) does not include a mandate to take up the GST outcome, while the GST outcome itself only generally invites relevant work programmes and constituted bodies "to integrate relevant outcomes of the first global stocktake in planning their future work" (UNFCCC, 2023a, p. 186).

# 6 Means of Implementation

## 6.1 The Potential of the GST to Provide Means of Implementation

As noted in section 2.1.2, international institutions can support the emergence and break-through of low emission systems by organising capacity building, technology transfer, and funding among members. These issues have in fact been central items in the UNFCCC negotiations from their very beginning (Kinley et al., 2021; Oberthür et al., 2021). In addition to such targeted provision of support, the PA in Article 2.1(c) also enshrined the objective to generally make all global financial flows compatible with its objectives.

Regarding the provision of support, the GST could have analysed and highlighted the level of achievement of collective finance commitments. The GST could also have taken stock of support needs of developing countries to achieve the Paris Agreement, compared this to the support that is actually provided, and on this basis quantified and highlighted support gaps (Watson & Roberts, 2019). Such a needs assessment could have benefited from a focus on systemic transformations to help identify and act upon global enablers such as access to quality finance. Access to finance may e.g. be impeded if transformations rely on diffuse and small actors such as individual farms, if they require massive investments, or if they rely on immature technologies or markets (IDDRI, 2023). The GST could also have explored the potential of innovative instruments to mobilise resources such as special drawing rights or debt-for-climate swaps (Watson et al., 2021).

In terms of shifting financial flows, while an objective of the PA, there so far is no shared understanding of what this should mean. The GST could have contributed to the development of such a shared understanding, for example by building on sectoral roadmaps and actions as discussed above. On this basis, the GST could have highlighted to what extent flows are not yet aligned (Obergassel et al., 2019; Watson & Roberts, 2019). For example, the GST could have highlighted the scale of fossil fuel finance that is still being provided by parties, taken stock of the state of existing commitments to phase out fossil finance, and developed realistic phase-out pathways (Gençsü & Watson, 2021)

On the basis of such an assessment, the GST outcome could have urged parties, MDBs and non-party stakeholders to review and adjust their investment plans and portfolios, phase out fossil fuel subsidies and divest from polluting industries, tied to just transition plans and support for developing countries (C2ES, 2023b; Jeudy-Hugo & Charles, 2023). The GST could also have called on financial institutions and investors to adopt near-term science-based climate targets and corresponding low-emissions, climate-resilient transition plans with annual disclosure of progress (iGST FWG, 2023).

## 6.2 Actual GST Outcome

At the Dubai conference, many developing countries drew a strong connection between the energy transition and the provision of finance, calling for a strong increase of grant-based finance to support the acceleration of renewable energy and just transitions. However, negotiations were complicated by the fact that parties are scheduled to agree on a new collective quantified goal (NCQG) for climate finance at COP29 in 2024. Against this background, it was always unlikely that substantial new commitments would be agreed at COP28. While developing countries pressed for new finance commitments, developed countries argued against prejudging the adoption of the NCQG (Chandrasekhar, Dunne, Dwyer, Evans, et al., 2023; International Institute for Sustainable Development, n.d.).

The GST outcome nonetheless takes up the above suggestions to some extent. In terms of existing commitments, the synthesis report by the co-facilitators of the technical dialogue (UNFCCC, 2023e) finds that provision of financial support to developing countries needs to be rapidly scaled up. While developed countries increased their provision of climate finance to developing countries since the adoption of the Paris Agreement, their goal of jointly mobilising USD 100 billion per year from 2020 was not fully met; they instead mobilised only 83.3 billion in 2020. The GST decision therefore "notes with deep regret" that developed country Parties have so far not achieved their goal to mobilise jointly USD 100 billion per year by 2020 (UNFCCC, 2023a, p. 80) and urges them "to fully deliver, with urgency" (UNFCCC, 2023a, p. 85).

On financing needs, the technical dialogue report refers to analysis by the UNFCCC Standing Committee on Finance (SCF), which identified 4,274 needs in developing country NDCs. Out of these, 1,782 needs across 78 NDCs were costed, with cumulative costs amounting to USD 5.8–5.9 trillion. Out of these, the SCF identified USD 502 billion as requiring international finance. The GST takes up this estimate, "highlighting that such needs are currently estimated at USD 5.8–5.9 trillion for the pre-2030 period" (UNFCCC, 2023a, p. 66)

On overall financial flows, the technical dialogue report finds that trillions of dollars need to be unlocked and redeployed to meet global investment needs – while currently many investments still lock in high future emissions. For example, in 2019-20, USD 892 billion was invested in fossil fuels annually on average, and an additional USD 450 billion was provided as fossil fuel subsidies. The report therefore notes that removal of fossil subsidies is "a key strategy" (UNFCCC, 2023e, p. 121).

In the political process, discussions on shifting overall finance flows according to Article 2.1(c) mainly took place under the Standing Committee on Finance, not under the GST. However, discussions largely stalled because developing countries fear developed countries intend to use this item to divert attention from their obligation to provide traditional public climate finance (Argueta et al., 2023; Chandrasekhar, Dunne, Dwyer, Evans, et al., 2023). The GST decision "recognizes the need for further understanding of Article 2, paragraph 1(c), of the Paris Agreement (…) and notes the limited progress towards making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development" (UNFCCC, 2023a, p. 91). However, the decision does not further specify what the limitations are, it merely decides to continue the ongoing "Sharm el-Sheikh dialogue between Parties, relevant organisations and stakeholders to exchange views on and enhance understanding of the scope of Article 2, paragraph 1(c)" (UNFCCC, 2023a, p. 92).

On fossil fuel subsidies, the decision does provide some more detail than the COP26 decision by calling for the phase-out of "inefficient" subsidies, which still is not defined, "that do not address energy poverty or just transitions, as soon as possible" (UNFCCC, 2023a, p. 28(h)). The latter part is new compared to COP26, conveys a sense of urgency and clarifies that fossil fuel subsidies should only be provided to address energy poverty or just transition. However, without a definition of "inefficient", this provision can still hardly be operationalised.

Overall, therefore, the fifth pillar laid out by the IEA, to substantially enhance financial support for emerging and developing countries, is therefore largely absent from the GST outcome. While the outcome does take stock of the actual delivery of finance commitments and provides an estimate of financial needs, it does not offer measures to close the financing gap (Argueta et al., 2023). Moreover, the estimation of needs is given only in aggregate amounts, not specified in terms of needs in individual sectoral systems. The outcome therefore provides only very limited guidance for where specifically to enhance the provision of support.

# 7 Knowledge and Learning

## 7.1 The Potential of the GST to Provide Knowledge and Learning

Milkoreit and Haapala (2017, 2018) suggested to "use the GST as a peer-learning platform for 'how to do transformations'", a forum where parties and non-party stakeholders share experiences, best practices, implementation barriers, peer learning and practical guidance (Milkoreit & Haapala, 2017, 2018). Sectoral mitigation pathways could have provided a key basis for such an exercise. The GST could have provided specific information addressing sectoral challenges and providing information targeted to specific actors (Dagnet et al., 2020; Hermwille et al., 2019; Obergassel et al., 2019). On this basis, the GST outcome could have contained actionable "toolkits" for individual thematic areas, e.g. as technical annexes of a CMA decision (C2ES, 2023b, 2023a; Rajamani et al., 2022, 2023). Such outputs could have included a synthesis report with key findings on collective progress, main challenges and opportunities as well as breakdowns of potential pathways and transformations within and across key sectors and systems. Jeudy-Hugo and Charles (2023) noted that previous processes under the UNFCCC had already produced lengthy lists of good practices - but with limited impact. They therefore suggested that a comprehensive, searchable online database could be more effective in reaching relevant actors.

## 7.2 Actual GST Outcome

As noted under guidance and signal, the synthesis report by the co-facilitators of the technical dialogue (UNFCCC, 2023e) provides some quantitative benchmarks for energy systems and forestry, and for other sectors it qualitatively describes elements of system transformations that are needed to achieve the mitigation objectives of the Paris Agreement. For example, it notes that reducing industrial emissions will require demand management, enhancing energy efficiency, electrification, greater circularity and attention to supply chains. The report similarly describes transformation strategies for urban systems, buildings, transport, agriculture and forestry. It thereby lays out broad outlines for transformation strategies that should be pursued by governments at all levels as well as by non-party stakeholders.

The GST decision "encourages Parties to take into account the good practices and opportunities identified during the technical dialogue (...) in enhancing their actions and support" (UNFCCC, 2023a, p. 177). However, the material is hardly presented in a form that makes this possible. The synthesis report by the co-facilitators of the technical dialogue stays at a very general level. For example, in terms of process improvements, it recommends establishing climate policy frameworks within countries, enhancing capacity for preparing and implementing Nationally Determined Contributions (NDCs), and collaborating with regional and international organisations for NDC development, among other suggestions (UNFCCC, 2023e).

The reports from the three individual technical dialogue sessions go into somewhat more detail, but still remain at a fairly general level. For example, the report from the third round notes that enablers for achieving renewable energy goals include streamlining permitting schemes, implementing sustainability and technology standards, investing in clean energy solutions for grids, and designing electricity markets to incentivize flexibility and clean power procurement (UNFCCC, 2023d).

Parties discussed to make the good practices more easily accessible through a technical annex or a searchable interface, but did ultimately not resolve to take such a step. Instead, an independent organisation established an online "Global Stocktake Explorer", GST1.org (Climate Policy Radar, 2024).

The Explorer gives access to the entirety of inputs that were fed into the GST process, comprising over 1,600 documents and 170,000 pages. This is supposed to serve "as a dynamic resource to access information related to good practices, lessons learned, and proposed climate action solutions in the thematic areas of the GST/TD" (UNFCCC, 2023d, p. 11). The content is curated to some extent, for example, including filters for "mitigation", "mitigation technologies", or "renewables". However, as one example, using the "renewables" filter leads to more than 10,000 results, starting with a mention of renewables in Guyana's first NDC. There is also the option for an individual search combining individual search terms with other categories such as selecting Party/Non-Party submissions, authors and submission types. But depending on the specificity of the search term this can again result in a large number and wide range of meta-level results. For example, searching for "best practice" leads to 439 results. Combining this search with submission type "submissions to the GST" leads to 59 results, many of which are appellative calls to share best practices. A search for very specific key words such as for example "building code" in combination with "submission to the GST" still leads to 40 submissions where the term is included. Given this massive amount of material and limited curation, it seems doubtful whether this resource will indeed meet the purpose of making good practices and lessons learned available to countries that may want to make use of them.

# 8 Conclusions

As noted by the IPCC, fundamental transitions across all sectors and systems are necessary to achieve the objectives of the Paris Agreement. The first iteration of the GST under the Agreement was seen by many as a key opportunity to promote and accelerate such transitions. This article has sought to analyse the potential and actual contribution of the GST to transitions of sectoral systems in terms of sending guidance and signal, creating rules and standards, providing transparency and accountability, promoting the provision of means of implementation, and fostering the creation and dissemination of knowledge and learning. We have argued that this typology of governance functions can be used similarly to how typologies of national policy instruments are used in literature to analyse the effectiveness of national policy. A key consideration is that policy strategies should seek not only to promote the emergence of low-emission solutions but also need to explicitly put pressure on high-emission regimes in order to actually achieve low-emission transitions.

Reactions to the GST outcome have ranged from “historic” to “woefully inadequate”. It is arguably both, depending on what measure for success is used. Adopting the analytical lens of how use of the governance functions can help to destabilise high-emission regimes and promote alternative low-emission solutions has allowed us to develop a more fine-grained analysis of the achievements and limitations of the first GST.

Fundamentally, the general approach of adopting a focus on systems and sectors has arguably proven its worth as a concept to break the challenge of combating climate change down into more specific and manageable pieces. After spending three decades discussing mitigation mainly in abstract terms of emissions accounting, the UNFCCC process is now finally focusing on which systems need to change and how. After COP26 had marked the first time a COP decision directly addressed fossil fuels by calling for the “phase-down” of coal power, COP28 now called for a “transition away” from all fossil fuels.

A similar progression of norms can be seen in the promotion of low-emission systems. After COP26 had called for enhancing energy efficiency and scaling up renewable energy in general terms, COP28 now set specific targets for renewable energy and energy efficiency. Overall, the GST outcome thereby to some extent ticked four of five pillars suggested by the IEA to bring the world onto a 1.5-aligned trajectory. The GST decision also highlights the need for sector-specific action in a range of other sectors such as transport, forests and food systems. It specifically highlights the need to end and reverse deforestation and forest degradation by 2030 and qualitatively describes transitions that need to be undertaken in all other sectoral systems.

To be able to achieve agreement, the language of the energy transition package is non-binding and includes many caveats. The narrative battle on the strength of the signal is on. While UNFCCC Executive Secretary Stiell called the agreement “the beginning of the end” for fossil fuels, Saudi Arabia’s energy minister called the energy transition paragraph an “a la carte menu” (Lo, 2024). Grubb (2023) notes that markets hardly reacted to the COP decision, and fossil investments continue apace.

Nonetheless, given the resistance by fossil-based countries and the need to achieve consensus, it arguably is a major achievement that the conference was able to agree on any language calling for an end to the use of fossil fuels. The decision therefore arguably marks a key advance in terms of anti-fossil norm development and can as such be used by actors in political contestations at domestic and intra-firm levels to put pressure on high-emission regimes.

Such use by pro-climate actors will indeed be necessary since the new global goals are not underpinned by binding rules and standards, nor by transparency and accountability provisions, nor by means of

implementation. The decision does not require parties to explicitly refer to the new global goals in their NDCs, it only repeats previous language calling on parties to explain how the GST outcome has informed the development of their NDCs. Grubb (2023) argues that a key obstacle in this regard is the firm opposition by the US to anything that may imply differentiation among countries. As a result, everything to be agreed by the COP needs to be agreeable to all parties, there is no possibility to develop differentiated norms for what different types of countries can be expected to contribute.

The GST outcome also does not establish a system to provide transparency and accountability for progress towards the achievement of the new global goals, nor does it scale up the provision of means of implementation. The IEA's fifth central pillar was to massively increase clean energy investments in emerging and developing countries and these countries themselves also constantly reiterated their need for financial support at the conference. However, developed countries blocked all calls for underpinning the fossil phase-out call with adequate support. In terms of negotiation dynamics, this was to be expected, since the New Collective Quantified Goal on climate finance is set to be adopted in 2024. Still, the result is that COP28 did not deliver on this central pillar.

In terms of knowledge and learning, a large amount of best practice examples and lessons learned were highlighted in submissions and showcased at the technical dialogue sessions. However, instead of curating a selection of this material, it was made accessible in its entirety in an online data interface. Comprising over 1,600 documents and 170,000 pages, it seems doubtful whether this kind of presentation will indeed be useful for countries that are looking for inspiration or concrete guidance to strengthen their NDCs, policies and measures.

Overall, the GST outcome therefore did manage to further enhance the guidance and signal from the Paris Agreement, but it failed to make progress on the other governance functions. The new guidance and signal are not underpinned by new rules and standards, nor by enhanced transparency and accountability, nor by enhanced means of implementation. And while the Technical Dialogue compiled a vast amount of knowledge and learning, it seems doubtful whether the online presentation of this material is indeed accessible to those actors that may make use of it.

It also bears noticing that the enhanced guidance and signal relates only to the energy and forestry sectors. Submissions to the GST had included suggestions for progress benchmarks for all sectors, but these suggestions were taken up neither in the synthesis report by the co-facilitators of the technical dialogue, nor in the GST decision.

Going forward, the impact of the agreement will depend on what actors at all levels make of it. Saudi Arabia's energy minister rightly wondered why some of the countries that strongly supported fossil phase-out language don't tackle their own fossil fuel production. Countries like the US, Canada, Australia, Norway and the UK so far have no plans to phase out their fossil fuel production, Canada and the US instead are even planning to increase it (Lo, 2024). However, with the public positioning of these countries and the COP outcome, pro-climate constituents now have new levers to put pressure on them. A positive example for what the impact of the GST could look like was provided by the decision by the US Biden administration in January 2024 to re-evaluate liquefied natural gas expansion plans, which explicitly referenced the COP28 decision on transitioning away from fossil fuels as one reason (Axios, 2024).

In terms of international processes, the UNFCCC is not the only forum where follow-up to the GST may be pursued, and maybe also not the best one. Suggestions to take up the GST outcome in the mitigation work programme was blocked by the group of like-minded developing countries since they are concerned that this process may be used to impose new commitments on them. However, over the

last decade, a plethora of “minilateral” inter- and transnational governance initiatives has emerged to complement the UNFCCC climate regime as part of a "polycentric" global climate governance (Jordan et al., 2018). Many of these initiatives have a focus on specific sectoral systems (Rayner et al., 2021) and may therefore be useful avenues to take up the system-specific GST outcomes.

In terms of lessons for the subsequent iterations of the GST, the second and subsequent GSTs will now be able to further develop the focus on transitions of sectoral systems. They will be able to take stock of the extent to which the lines of action adopted in Dubai have actually been pursued, and to further flesh out the needed actions in more detail. Literature and submissions to the GST process had made even more specific proposals for how individual sectors and systems could be addressed. As research and public discussions on transitions of sectoral systems continue to develop, the second and subsequent GSTs may be even more able to break the global challenge down into details and give action-oriented guidance to parties and non-party stakeholders.

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