

## Research article

# The potential of international institutions to foster transitions. The example of the Global Stocktake under the Paris Agreement

Wolfgang Obergassel<sup>a,b,\*</sup>, Christiane Beuermann<sup>a</sup>, Carsten Elsner<sup>a</sup>, Heleen de Coninck<sup>b</sup>

<sup>a</sup> Wuppertal Institute for Climate, Environment and Energy, Döppersberg 19, Wuppertal 42103, Germany

<sup>b</sup> Eindhoven University of Technology, Department Industrial Engineering and Innovation Sciences, PO Box 513, Eindhoven 5600 MB, The Netherlands

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## ABSTRACT

Socio-technical transitions literature has so far engaged very little with the question of how international institutions could foster transitions. Conversely, international climate policy literature shows gaps in engaging with transformational change. To address these gaps, this article analyses the potential of the first Global Stocktake (GST) under the Paris Agreement to foster transitions. The article first develops a novel conceptual framework for how international institutions can promote transitions. On this basis, the article synthesises recommendations for the GST outcome from literature and the GST process and compares them with the actual outcome. The article finds that the GST sent important signals and fostered knowledge and learning on key aspects of low-emission transitions. However, it mostly focused on energy systems and failed to establish mechanisms and resources to promote actual implementation.

## 1. Introduction

The Paris Agreement enshrined ambitious international objectives to mitigate global climate change, but the nationally determined contributions (NDCs) of the Parties to the Agreement fall substantially short of the Agreement's ambition (IPCC, 2023; UNEP, 2024). Since this weakness was already apparent when the Agreement was being negotiated (UNFCCC, 2016, para. 15), it established a 5-year "ambition cycle", requiring new or updated NDCs every five years, with a "Global Stocktake" (GST) taking place every five years in between (Falkner, 2016; Rajamani & Bodansky, 2019). 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, it had been seen by many as a major opportunity for a "course correction" (e.g. European Union, 2023).

The mandate of the GST according to Art. 14 of the Paris Agreement is to inform the enhancement of actions and support by the Parties to the Agreement and to enhance international cooperation. The GST covers all pillars of the Paris Agreement, mitigation, adaptation and the so-called 'means of implementation': finance, technology transfer and capacity building. While all of these are crucial, for the sake of focus this article concentrates on mitigation and related means of implementation.

\* Corresponding author.

E-mail addresses: [wolfgang.obergassel@wupperinst.org](mailto:wolfgang.obergassel@wupperinst.org) (W. Obergassel), [christiane.beuermann@wupperinst.org](mailto:christiane.beuermann@wupperinst.org) (C. Beuermann), [carsten.elsner@wupperinst.org](mailto:carsten.elsner@wupperinst.org) (C. Elsner), [h.c.de.coninck@tue.nl](mailto:h.c.de.coninck@tue.nl) (H. de Coninck).

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Global climate policy historically strongly focused on developing adequate overall targets for global and national GHG emissions and natural sinks rather than directly addressing specific emission sources and sinks (Oberthür et al., 2021; Victor et al., 2019). However, one of the key messages of the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report was 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). 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 (Beuermann et al., 2021; Ghosh et al., 2022; Oberthür et al., 2021; Victor et al., 2019).

Literature as well as a number of Parties to the Paris Agreement therefore suggested that, in order to fulfil its mandate, the GST should adopt a focus on sectoral or systems transitions. In their view, adopting such a perspective would best enable the GST to inform Parties in the enhancement of their actions and support and in the enhancement of international cooperation. Given that opportunities and challenges strongly vary among sectoral system, adopting a focus on sectoral systems would allow the GST to properly identify mitigation enablers, barriers and policy options, and to more directly engage relevant actors within and beyond governments (AOSIS, 2023; EIG, 2023; European Union, 2023; Hermwille et al., 2019; Höhne et al., 2019; Jeffery et al., 2021; Northrop et al., 2018; Obergassel et al., 2019; Srouji et al., 2023; UK Government, 2023; van Asselt et al., 2023).

Although there is some sustainability transitions literature engaging with international dynamics (Binz & Truffer, 2017; Caiafa et al., 2023; Fuenfschilling & Binz, 2018; Miörner & Binz, 2021), the literature has so far mostly focused on national case studies and overall dealt little with questions of international cooperation and global governance (Caiafa et al., 2023; Hermwille, 2019; Newell, 2019; Power et al., 2016). Conversely, for most of its history, much of the international climate policy literature saw climate change as a collective action problem, i.e. a distributional conflict between states (Aklin & Mildenerberger, 2020; Patt et al., 2022). Only recently some literature has started complementing this perspective with a transformational change perspective (Ghosh et al., 2022; Hermwille, 2021; Sharpe & Lenton, 2021; Victor et al., 2019).

The objective of this article is hence to enhance understanding of how international institutions such as the GST can integrate sustainable sectoral and system transitions. The paper does so in two steps. First, a framework integrating insights from sustainability transitions and global governance literature is developed. Second, this framework is used to synthesise suggestions on how the GST outcome could foster system transitions to achieve the mitigation objectives of the Paris Agreement and to what extent the actual outcome of the first GST took up these suggestions.

## 2. Conceptual framework, methods and material

### 2.1. Conceptual framework

Analysing how international institutions may impact transitions requires two elements: an understanding of transitions, and an understanding of the potential impact of international institutions. While there is extensive literature on socio-technical transitions on the one hand and on international institutions on the other, there is only limited literature at their intersection, i.e. on how international institutions may facilitate transitions of sectoral systems. This section therefore first introduces key concepts from the two literature bodies. It then synthesises these concepts into the analytical framework that will be applied to the GST in section 3.

#### 2.1.1. Socio-technical transitions and the role of policy

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 have been conceptualised as consisting three distinct but interlinked dimensions of material factors, human actors and non-material factors (Fuenfschilling & Truffer, 2016; Geels, 2002, 2004; Trencher et al., 2020). Transitions, defined as “radical shifts to new kinds of socio-technical systems” (Köhler et al., 2019, p. 2), are co-evolutionary processes, involving concurrent changes in a number of these elements and dimensions.

In the multi-level perspective (MLP), the systems that need to transform to enable meeting the Paris Agreement goals are described as “socio-technical regimes”. The other two analytical levels in the MLP are landscape, which cannot be influenced but is changeable, and niches, in which technological innovations can mature in a protected environment. Transitions unfold as the result of dynamic processes within and between these three levels. Alternative approaches from the niche level may be phased in more widely if tensions in the socio-technical regime or landscape developments, such as a global push on climate action, create pressure for change and windows of opportunity (Geels, 2002).<sup>1</sup>

Emission-intensive systems are “locked in” to a high degree (Seto et al., 2016; G. Unruh, 2000). The economy, policy, technologies, practices, infrastructure systems, cultural meanings and scientific knowledge have co-evolved over decades and mutually support each other. A socio-technical regime reproduces itself, and can also actively resist change, e.g. by shaping legal, institutional and economic frameworks to their advantage, undermining or co-opting competing technologies, discursive battles for legitimacy and public

<sup>1</sup> Since this paper also draws on international relations literature, it bears noticing that the term “regime” is also used in this literature but with a different meaning. In international relations, international regimes are defined as “principles, norms, rules, and decisionmaking procedures around which actor expectations converge in a given issue-area” (Krasner, 1982). One example is the UN climate regime. However, since this paper does not analyse the UN climate regime as a whole but only one component, the GST, all use of the term “regime” herein is meant in the sense of the socio-technical transitions literature.

opinion, and even use of force to contain protests (Ford & Newell, 2021; Geels, 2014; Trencher et al., 2020).

Transition strategies therefore need to both promote the phase-in of climate-friendly solutions and to actively de-stabilise and phase out high-emission socio-technical regimes, e.g. by pricing GHG emissions, removing support such as fossil fuel subsidies, or banning certain technologies (Geels et al., 2017; Kivimaa & Kern, 2016; Seto et al., 2016; G. C. Unruh, 2002). This is represented by Loorbach et al. (2017) in Figure 1. The paper now turns to the question how international institutions may impact the dynamics of transitions described in this section.

2.1.2. The potential of international institutions to promote transitions

As noted in the introduction, the potential role of international institutions for promoting transitions of sectoral systems has so far been researched only to a limited extent within socio-technical transitions literature. This section therefore draws on the literature on global governance and international institutions to develop an analytical framework that will be applied in section 3 of this paper to assess how an international process like the GST may impact socio-technical transitions.

To develop this framework, we draw on several schools of thought which have strongly different theoretical assumptions, namely realism, liberalism, and constructivism. There are further schools such as the English school (e.g. Jones, 1981), Marxist (e.g. Wallerstein, 1979) and feminist (e.g. Enloe, 2014) schools. However, while our aim is to cover a broad spectrum of perspectives to allow us to identify a broad range of impacts international institutions may have on transition processes, our aim is not to give a full account of international relations theory.

Realism starts from the assumption that states are unitary utility maximisers following a logic of consequences. International relations are mainly driven by the power and interests of states and international institutions are mere epiphenomena (Mearsheimer, 1994; Morgenthau, 1978). By contrast, liberalism assumes that state behaviour is determined not by their capabilities but by state preferences, which are shaped by domestic and international interactions. Therefore, international institutions do not just reflect state interests but can also shape the perception of those interests and actual state practices by altering incentives and expectations of other states' behaviour (Hellmann & Wolf, 1993; Keohane & Victor, 2011; Moravcsik, 1997; Paterson, 1995). Finally, constructivism argues that material factors are less important than ideas, norms, and identities. In this perspective, states mostly follow a logic of appropriateness, reflecting identities, common beliefs and understandings of priorities (March & Olsen, 2011; Simmons & Martin, 2002).

While these schools traditionally focused on the role of states, over the last decades the role of non-state actors has increasingly come into focus. 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, such as climate change. 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). Any analysis of how international institutions such as the GST can impact transition processes therefore also need to account for how they can integrate or have an impact on these actors.

To analyse in detail how international institutions can help to address the problem of climate change, the following section outlines a typology of functions which these institutions can deploy. This typology on the one hand draws on the schools of thought introduced above. On the other hand, it draws on existing literature on global governance institutions, many of which include or are even composed solely of non-state actors (Andonova et al., 2009; Bulkeley et al., 2014; Hale, 2020; Kinley et al., 2021; Oberthür et al., 2021; Young, 1999), building in particular on Oberthür et al. (2021).

Similar to how different types of national policy instruments may be deployed to foster transitions nationally (Kivimaa & Kern, 2016; Reichardt et al., 2016; Rogge & Reichardt, 2016), these functions may be deployed to foster phase-in and phase-out processes

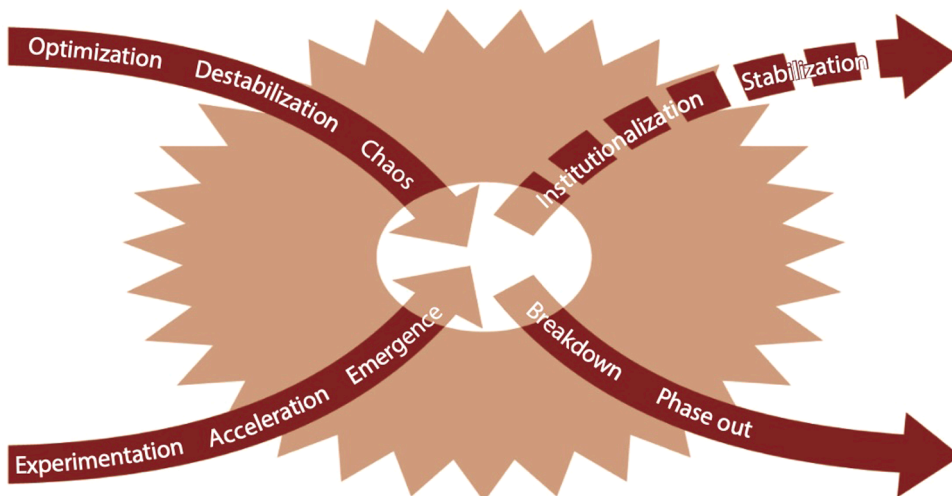


Fig. 1. Dynamics of societal transitions Source: Loorbach et al. (2017, p. 607).

internationally. The following section first introduces the typology and briefly sketches the potential of these functions to impact the dimensions of socio-technical systems introduced in section 2.1.1. - material, immaterial, and actors. [Figure 1](#) further below illustrates these potential impacts. Section 3 will draw on these functions to discuss the potential and actual impact of the GST.

### 2.1.3. Potential functions of international institutions

**2.1.3.1. Guidance and signal.** International institutions can enhance predictability of behaviour as emphasised by liberalism as well as promote the creation and spread of shared norms and values as emphasised by constructivism, i.e. immaterial system dimensions, by signalling the determination of members to pursue a particular course. These signals derive from the principles and goals that underpin international institutions and can affect not only members but also other actors directly by providing an indication of what policies the institutions' members are likely to pursue ([Kinley et al., 2021](#); [Oberthür et al., 2021](#)). In addition, international norms and values can impact the balance of power among system actors, emphasised by liberalism, by enhancing the legitimacy of actors demanding compliance with internationally agreed objectives ([Dai, 2010](#); [Hale, 2020](#); [Kinley et al., 2021](#)).

**2.1.3.2. Rules and standards.** In addition to providing broad direction, international institutions can also require their members to take specific actions to achieve mutually agreed-upon goals. In the case of intergovernmental institutions, the implementation of these rules by member states, i.e. adoption of national policies, is then expected to trigger respective behavioural change by actors under their jurisdiction ([Oberthür et al., 2021](#)). Transnational institutions may target non-state actors directly. Rules and standards may not only relate to actors' internal actions, but also to trade and international cooperation. For example, Article 4 of the Montreal Protocol on Substances that Deplete the Ozone layer restricts trade in ozone-depleting substances with non-Parties ([DeSombre, 2000](#)).

From the liberal perspective this function is key for enhancing states' ability to predict other states' behaviour ([Keohane, 1984](#); [Paterson, 1995](#); [Simmons & Martin, 2002](#)). Furthermore, in terms of politics, the impact of international rules may weaken polluting system actors and strengthen non-polluting actors. In addition, pro-compliance actors may draw on international rules to enhance their weight in political contestation or to engage in domestic litigation ([Dai, 2010](#); [Hale, 2020](#); [Preston, 2023](#); [Simmons & Martin, 2002](#); [Young & Levy, 1999](#)). Finally, from a constructivist perspective, international rules help solidify norms and values and may even define identities of states through the roles they ascribe to states ([Simmons & Martin, 2002](#); [Young & Levy, 1999](#)).

**2.1.3.3. 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. From the liberal perspective, this function is an indispensable complement to rules and standards to make sure that the members of an international institution actually comply with their commitments ([Keohane, 1984](#); [Paterson, 1995](#); [Simmons & Martin, 2002](#)). In addition, international transparency and accountability can help shift the political balance of power by providing pro-compliance constituents with information they might otherwise not have, by enhancing their legitimacy, by offering them an international platform to highlight shortfalls of their respective countries, and in some cases even by offering them access to international complaints mechanisms ([Dai, 2010](#); [Kuyper & Tørstad, 2023](#); [Young & Levy, 1999](#)).

**2.1.3.4. Means of implementation.** International institutions can address material system dimensions by organising capacity building, technology transfer, and funding among members. In particular developing countries frequently lack the resources needed to implement internationally agreed objectives, rules and standards ([IPCC, 2023](#)). Over the longer term, such support may also shift the balance of power among system actors as emphasised by liberalism by fostering the creation and growth of new constituencies ([Young & Levy, 1999](#)). While provision of support as such does not require international institutions, international coordination helps to reduce transaction costs ([Oberthür et al., 2021](#)).

**2.1.3.5. Knowledge and learning.** Finally, international institutions may create and disseminate scientific, economic, technical, and policy-related knowledge about understanding and/or possible solutions to the problem at hand. New knowledge and learning may relate to both new factual information, e.g. on material system dimensions, as emphasised by liberalism, as well as to the re-assessment of values as emphasised by constructivism ([Andonova et al., 2009](#); [Simmons & Martin, 2002](#); [Young & Levy, 1999](#)).

Building on [Figure 1](#) from [Loorbach et al. \(2017\)](#) above, [Figure 2](#) illustrates these potential mechanisms by which use of the functions of international institutions can influence transition processes.

Caption: International institutions may foster transitions by providing guidance and signal, rules and standards, transparency and accountability, means of implementation and knowledge and learning. In the first instance, all five functions can directly influence phase-in and phase-out processes within the institutions' member states or organisations. The actions by members, e.g. adoption of national policies by member states or action by frontrunner companies, in turn have impacts on non-members. In addition, in particular guidance and signal, means of implementation and knowledge and learning may also directly impact actors beyond the immediate circle of an institutions' members. In turn, non-members, e.g. national or intra-company constituencies, may use international norms and transparency mechanisms to influence the actions of members, e.g. demanding actual implementation of international phase-in and phase-out decisions.

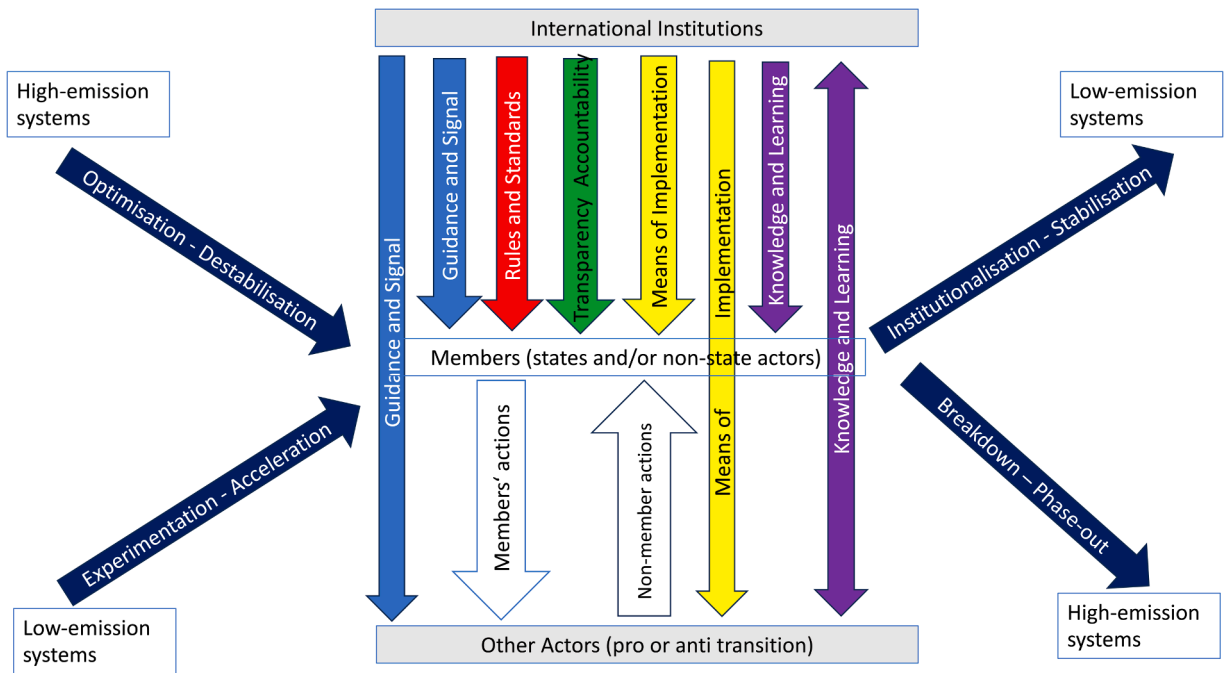


Fig. 2. Mechanisms by which international institutions can influence transitions.

2.2. Methods and material

The following sections employ this conceptual basis to analyse how the GST could in theory promote the transformational changes needed for climate neutrality and to what extent the first GST actually did so. To this end, the section first synthesises proposals made in literature and as part of the GST process on how the GST outcome could foster such transitions. In the second step, the paper compares these proposals to the actual GST outcome.

The article structures the discussion of both proposals and actual outcome according to the governance functions introduced in the previous section. Not all international institutions have all of these functions and based on the GST’s official mandate we initially assumed it could activate only the guidance and signal, transparency and accountability, and knowledge and learning functions. In our analysis, however, we found that some proposals and outcomes relate more to the other two functions. The article therefore uses all five functions to analyse the GST.

Relevant literature was identified using a combination of the Scopus database and the “Elicit” search engine (elicit.org). An initial Scopus query focused on how the GST could foster system transitions to achieve the mitigation objectives of the Paris Agreement<sup>2</sup> but yielded only ten matches. The authors therefore took all 120 articles identified by Scopus as starting point which contained “Paris Agreement” and “Global Stocktake” in the titles, abstracts or key words. The authors then narrowed the starting list down by manual review and complemented the Scopus search by a search in Elicit. Details are described in the annex.

To identify which proposals were made during the GST process itself, the authors analysed the submissions made by Parties to the Paris Agreement and non-Party stakeholders to the GST process. According to the GST modalities adopted at the 2018 climate conference in Katowice (UNFCCC, 2019), the GST process consists of three components:

- (a) information collection and preparation,
- (b) technical assessment of the implementation of the Paris Agreement to assess collective progress, and
- (c) consideration of outputs, discussing the findings of the technical assessment with a view to achieving the intended outcome of the GST, to inform Parties in updating and enhancing their actions and support, and enhancing international cooperation.

Parties and non-Party stakeholders were invited to submit their views i) under the information collection and preparation component of the GST for consideration in the technical assessment, and ii) in relation to the consideration of outputs component. The main element of the technical assessment is a “Technical Dialogue”, a two-year process involving both the Parties to the Paris Agreement as well as non-Party stakeholders (UNFCCC, 2023b).

Overall, about 400 submissions were made in response to these calls for inputs (UNFCCC, 2024). The authors manually reviewed all of these documents for references to “sector”, “system”, “transition” or “transformation” or “transition”. An additional search of the

<sup>2</sup> Search query: TITLE-ABS-KEY ( {Paris Agreement} AND {Global Stocktake} AND mitigation AND ( transformation OR transition ) )

online database “Global Stocktake Explorer” ([Climate Policy Radar, 2024](#)) served to cross-check the results for completeness. Details are described in the annex.

In addition to these calls for inputs, the GST also took in a large number of other documents. However, these are background documents to inform the assessment of collective progress, for example NDCs and the regular national reporting by Parties. A full list of the types of documents is given in the annex. These documents do not contain suggestions for how the GST could achieve its intended outcome, to inform Parties in updating and enhancing their actions and support, and enhancing international cooperation, which is the subject of this paper. These other documents are therefore not included in the analysis.

The suggestions made in literature and GST submissions were then synthesised according to the five governance functions discussed above. In the second step, the following section compares the proposals from literature and submissions as synthesised in the first step to two main outputs of the GST process, the GST decision adopted at the Dubai conference ([UNFCCC 2023a](#)) and the synthesis report by the co-facilitators on the Technical Dialogue of the first GST (SYR-TD) ([UNFCCC, 2023b](#)). The SYR-TD had the objective to provide “a comprehensive overview of the discussions held during the TD” ([UNFCCC, 2023b](#), para. 70). As such, the SYR-TD was intended to be an authoritative summary of the information gathered and discussions held during the information collection and technical assessment phases of the GST. In turn, as outlined above, the technical assessment was supposed to inform the considerations of output, and thus the ultimate GST decision adopted in Dubai. It is therefore instructive to compare to what extent proposals were reflected in the SYR-TD and ultimately in the GST decision.

### 3. Results: promotion of system transitions via the Global Stocktake

This section starts with a general discussion related to sectoral and system transitions and the governance functions in section 3.1. It then discusses proposals in literature and submissions and elements of the actual GST outcome that relate to specific phase-out and phase-in processes (section 3.2).

#### 3.1. Overall promotion of transitions

A high number of proposals for what the first GST could have done can be related to promoting transitions in general, but not to specific phase-in or phase-out processes. In terms of **guidance and signal**, the Paris Agreement 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, Bauer, et al., 2022](#)). There is therefore not really a shared understanding among Parties on what “success” of the PA would mean. One contribution of the GST cycle could therefore 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 Agreement ([Milkoreit & Haapala, 2017, 2018](#)).

In the light of the findings of the IPCC and climate science in general, such a shared understanding could include adoption of the IPCC’s finding that “[r]apid and far-reaching transitions across all sectors and systems are necessary” ([IPCC, 2023](#), p. 68). Literature suggested that the GST could also inform the enhancement of action and support more specifically by providing guidance on the transitions needed per sector and system, e.g. by adopting and periodically updating sectoral targets, benchmarks or roadmaps ([Gunfaus & Waisman, 2021](#); [Hale, 2020](#); [Hermwille et al., 2019](#); [Jeffery et al., 2021](#)).

A number of GST submissions from Parties and non-Party stakeholders similarly suggested that the GST outcome should highlight that achieving the Paris objectives requires fundamental transformations (e.g. [C2ES, 2023b](#); [European Union, 2023](#); [iGST, 2023](#); [Japan, 2023](#); [Srouji et al., 2023](#); [UK Government, 2023](#)). A range of submissions also called specifically for “clear recommendations to engage in systemic transformations” ([AILAC, 2023b](#), p. 2), “collective measures across relevant sectors to support systemic change” ([AOSIS, 2023](#), p. 7), to encourage Parties “to promote systematic low-carbon transformation” ([China, 2023](#), p. 9), to establish collective targets to support systems transformation ([UK Government, 2023](#), p. 6), sending “transformative signals” ([C2ES, 2023b](#), p. 2), “spell out system transformations” ([IDDRI, 2023a](#), p. 1), or providing signals to transform systems ([Srouji et al., 2023](#)).

However, support was not unanimous. In particular India explicitly noted that the “narrative of system transformation is not supported by India”, arguing that transformation was too challenging for developing countries and therefore only applicable for developed countries ([India, 2023](#), p. 18f). While less adversarial, Argentina, Brazil and Uruguay also suggested to focus on global progress and gaps instead of pursuing sectoral initiatives ([Argentina, Brasil, Uruguay, 2023](#)).

In the GST outputs, the need for “systems transformations that mainstream climate resilience and low GHG emissions development” is indeed one of the key findings of the SYR-TD ([UNFCCC, 2023b](#), para. 3). However, the GST decision makes no reference to system transition or transformation. This is likely due to resistance among Parties as indicated by the submissions from India, Argentina, Brazil and Uruguay. Nonetheless, as will be discussed in section 3.2, GST discussions did to a large extent focus on defining targets for specific sectoral systems and to some extent these were adopted into the ultimate GST decision.

**Rules and standards** under the UNFCCC have so far similarly mostly focused on defining adequate overall GHG emission targets, leaving it to Parties how to actually achieve them. The Paris Agreement leaves even wider scope to Parties by leaving the form and content of their contributions to their national determination. Yet, the Agreement still retains an emphasis on emission targets by encouraging all Parties to move towards economy-wide emission targets over time (Art. 4.4). To promote transitions more directly, literature suggested that the GST outcome could have requested Parties to include information on sectoral targets and policies in their NDCs and in their mid-century long-term climate strategies ([Obergassel, Bauer, et al., 2022](#); [van Asselt et al., 2023](#)).

Some submissions by non-Party stakeholders included similar suggestions, recommending that NDCs should in particular include information on how they will contribute to any new global targets established in the GST outcome ([C2ES, 2023b](#); [Climate Action](#)

Network, 2023; WWF, 2023). However, similar recommendations cannot be found in submissions from Parties. Consequently, 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, para. 169).

In terms of **transparency and accountability**, a key limitation of the GST is that it may assess collective progress only, thus 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 by assessing the collective progress and gaps of mitigation efforts at the level of sectoral systems (Obergassel, Bauer, et al., 2022) or by greenhouse gas (Pekkarinen, 2020).

GST submissions largely did not echo the call to disaggregate the stocktake by sector. One exception is the Carbon Disclosure Project which suggested that the evolution of commitments to science-based targets by non-Party stakeholders disaggregated by sectors as a key indicator for the GST. However a number of submissions called for strong transparency and accountability in the follow-up to the GST, e.g. in regular reporting, dedicated discussion spaces at UNFCCC sessions and a synthesis report (AILAC, 2023b; EIG, 2023; European Union, 2023; LDC, 2023).

Here as well, the GST took up only a few of the suggestions made. Both the SYR-TD and the GST decision do not take stock of the situation at the level of sectoral systems but remain at the global level, noting emissions trajectories are not yet in line with the objective of the Paris Agreement (UNFCCC, 2023a, para. 24). The GST decision also does not mandate specific follow-up on specific GST outcomes, it only establishes an “annual global stocktake dialogue” “to facilitate the sharing of knowledge and good practices” on how GST outcomes are informing NDC preparation (UNFCCC, 2023a, para. 187).

**Means of implementation** were not discussed much in the academic literature beyond the general point that the GST could analyse and highlight support needs, provision of support and support gaps (Sun et al., 2022). One article suggested that the GST could assess financial and technological support needs towards the realisation of sectoral visions (Hermwille et al., 2019). Some submissions similarly suggested that analysis of gaps could be done with a focus on systemic transformations and how to best support transformational change (AILAC, 2023b; EIG, 2023; IDDRI, 2023b). More generally, developing country submissions regularly emphasised that their level of action strongly depended on the provision of international support (e.g. AGN, 2023; AOSIS, 2023; LMDCs, 2023).

The actual GST decision does provide an indication of financing needs, highlighting that needs to implement developing country NDCs are currently estimated at USD 5.8–5.9 trillion for the pre-2030 period. However, it does not discuss needs at the level of individual sectoral systems (UNFCCC, 2023a, para. 66).

In terms of **knowledge and learning**, the general sense in existing literature was that the GST’s periodic synthesis of knowledge on the severity of climate change, the state of collective climate action, technological progress, and successful policies and practices could help to improve NDCs and implementation (Huang, 2018; Rajamani & Bodansky, 2019; Sun et al., 2022). More specifically, 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 (see also Gunfaus & Waisman, 2021; Hermwille et al., 2019; Streck, 2021). Zhu et al. (2023) suggested to in particular use the GST to enhance knowledge on political economy transition enablers and barriers, which is in their view much less developed than techno-economic knowledge.

A number of submissions from Parties and non-Party stakeholders also discussed the GST’s potential to promote learning and

**Table 1**  
Proposals and GST outcomes relevant for promoting transitions.

Proposals	Technical Dialogue Synthesis Report	GST Decision
<b>Guidance and Signal:</b> <ul style="list-style-type: none"> <li>Adopt IPCC’s finding that “[r]apid and far-reaching transitions across all sectors and systems are necessary” (literature and submissions)</li> <li>Break global mitigation targets down to sectoral system level (literature and submissions)</li> </ul>	<ul style="list-style-type: none"> <li>Key finding that “governments need to support systems transformations that mainstream climate resilience and low GHG emissions development” (UNFCCC, 2023b, p. 3)</li> <li>See subsequent sections on specific sectoral systems</li> </ul>	<ul style="list-style-type: none"> <li>No mention of system transition/transformation</li> <li>See subsequent sections on specific sectoral systems</li> </ul>
<b>Rules and Standards</b> <ul style="list-style-type: none"> <li>Require inclusion of sectoral targets and policies in NDCs and long-term climate strategies (literature)</li> <li>Require explicit contribution to sectoral global objectives in NDCs (submissions)</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable, no mandate to establish rules and standards</li> </ul>	<ul style="list-style-type: none"> <li>Only general requirement to reflect on GST outcome in NDCs</li> </ul>
<b>Transparency and accountability</b> <ul style="list-style-type: none"> <li>Take stock of current status at sectoral system level (literature)</li> <li>Establish process to track implementation of GST outcome (submissions)</li> </ul>	<ul style="list-style-type: none"> <li>Took stock only of global situation</li> </ul>	<ul style="list-style-type: none"> <li>Took stock only of global situation</li> <li>No enhancement of transparency requirements</li> </ul>
<b>Means of Implementation</b> <ul style="list-style-type: none"> <li>Take stock of support needs at sectoral system level (literature and submissions)</li> </ul>	<ul style="list-style-type: none"> <li>Took stock only of overall support needs, not sector-specific</li> </ul>	<ul style="list-style-type: none"> <li>Took stock only of overall support needs, not sector-specific</li> </ul>
<b>Knowledge and Learning</b> <ul style="list-style-type: none"> <li>Act as platform to create and exchange knowledge on how to promote transitions (literature and submissions)</li> <li>Create actionable toolkit (submissions)</li> </ul>	<ul style="list-style-type: none"> <li>Discussions and conclusions on how to transform sectors, see subsequent sections</li> <li>Creation of online “Global Stocktake Explorer”, but use of the material is challenging</li> </ul>	<ul style="list-style-type: none"> <li>Encouragement to use best practices and lessons learned collected in technical dialogue</li> </ul>

specifically recommended that the GST outcome should suggest actionable opportunities, policies and measures in different sectors, e.g. as technical annexes of the GST decision (e.g. AILAC, 2023b; AOSIS, 2023; C2ES, 2023a, 2023a; EIG, 2023; European Union, 2023; Rajamani et al., 2023).

There was indeed a large amount of discussions on how to transform specific sectoral systems in the technical dialogue and Parties did discuss proposals to make 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 1,800 documents and 200,000 pages. 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 but depending on the specificity of the search term this can again result in a large number and wide range of meta-level results. 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 and other actors that may want to make use of them.

The following table summarises the proposals made and to what extent they are reflected in the technical dialogue synthesis report and in the GST decision.

Table 1

### 3.2. Promotion of specific phase-out and phase-in processes

#### 3.2.1. Proposals to promote specific phase-outs and phase-ins in the GST outcomes

Following the discussion in section 3.1 on elements that may generally promote transition processes, section 3.2 summarises suggestions from literature, GST submissions and elements of the GST outcome that relate to specific phase-out and phase-in processes. These suggestions can be related to the guidance and signal and to the means of implementation functions.

As introduced in the previous section, to strengthen guidance and signal, literature and a number of submissions suggested that the GST could break the Paris Agreement’s global emission targets down to targets or roadmaps for individual sectors or systems. While the academic literature on the GST did not suggest specific targets or roadmaps, in the political process, COP26 in Glasgow had already started a move in this direction 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). COP27 in Sharm el-Sheikh struggled but ultimately failed to go beyond Glasgow by calling for the phase-out of all fossil fuels (Obergassel, Arens, et al., 2022). In the run-up to the Dubai conference, whether the GST outcome would call for a phase-out of all fossil fuels became a central point of contestation (Obergassel et al., 2024; Voigt, 2024).

On phase-ins, discussions to enhance guidance and signal strongly focused on a suite of targets championed by the International Energy Agency (IEA), namely to by 2030 triple global renewable power capacity, to double the global rate of energy efficiency improvements from 1.96% in 2022 to over 4% annually, and to establish large-scale financing mechanisms to triple clean energy investment in emerging and developing economies. According to the IEA, implementing these measures would deliver 80% of the emission reductions needed by 2030 to get onto a 1.5°C trajectory (IEA, 2023). These suggestions were echoed in a number of GST submissions. In addition, submissions also suggested a large number of other sector-specific targets for adoption into the GST outcome. Two overview tables in the annex of this article illustrate the range of suggestions made for phase-ins and phase-outs respectively.

In terms of means of implementation and overall financial flows, the objectives of the Paris Agreement include to make financial flows “consistent with a pathway towards low greenhouse gas emissions and climate-resilient development” (Article 2.1(c)). However, there so far is no shared understanding of what this should mean. Some submissions suggested that the GST could have contributed to the development of such a shared understanding by building on sectoral roadmaps and actions to identify which financial flows should be enhanced to support phase-ins, and which flows should be phased out, for example by building on existing commitments to phase out fossil finance (C2ES, 2023a; Climate Action Network, 2023; EIG, 2023).

#### 3.2.2. Specific phase-outs and phase-ins in the actual GST outcomes

One of the key findings in the SYR-TD is that while systems transformations entail many opportunities, they can be disruptive, and therefore just transition, inclusion and equity need to be put into focus to be able to increase ambition (UNFCCC, 2023b, paras. 6, 23). Specifically, it finds that enhancing renewable energy and phasing out all unabated fossil fuels are “indispensable elements of just energy transitions” (UNFCCC, 2023b, para. 19) and references specific figures from IPCC AR6 (see overview table in the annex). The report also suggests a quantitative benchmark for deforestation and discusses system transformations in other sectors in qualitative terms (see overview table).

In the political process, while, as noted in section 3.1, the overall system transformation perspective from the SYR-TD was not taken up explicitly in the GST decision, the decision highlighted the need for equity and just transition (UNFCCC, 2023a, para. 10). Moreover, targets for sectoral transformation were a main focus of attention, in particular on fossil fuels. The final decision “calls on Parties to contribute to” a list of goals, “in a nationally determined manner” (UNFCCC, 2023a, para. 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, para. 28(d)). The UNFCCC process thereby for the first time ever recognised that a transition away from fossil fuels is necessary (van Asselt, 2023). However, the legal language has a very low degree of legal bindingness and the decision includes a number of caveats (see overview table in the annex).

Agreeing to promote shifts to climate-friendly systems was apparently substantially easier than agreeing to a phase-out of fossil

fuels: Already the G20 summit in September 2023 agreed on goals to triple renewable energy and doubling energy efficiency improvement rates (G20, 2023). However, the final GST decision omitted the 2022 base year and absolute targets contained in a previous draft decision, namely 11,000 GW new renewable energy capacity and an annual decrease of energy intensity by 4.1% by 2030 (UNFCCC, 2023c, para. 36).

The decision also emphasises the need for “enhanced efforts towards halting and reversing deforestation and forest degradation by 2030” (UNFCCC, 2023a, para. 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 (Chandrasekhar, Dunne, Dwyer, Quiroz, et al., 2023). Finally, the GST decision also touches on transport, but only in a very general manner (see overview table in the annex).

In terms of means of implementation, at COP28, many developing countries emphasised that they required sufficient support to enable just transitions away from fossil fuels. However, negotiations were complicated by the fact that Parties were scheduled to agree on a new collective quantified goal (NCQG) for climate finance at COP29 in 2024. Therefore, developed countries argued against prejudging the adoption of the NCQG (Chandrasekhar, Dunne, Dwyer, Evans, et al., 2023; International Institute for Sustainable Development, n.d.), leaving “a significant gap in the COP28 outcomes” (Winkler et al., 2024, p. 16).

On shifting overall financial flows, the SYR-TD 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 (UNFCCC, 2023b, para. 121). In the political process, 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 merely decided to continue the ongoing “Sharm el-Sheikh dialogue” on shifting financial flows (UNFCCC, 2023a, para. 92).

The overview tables in the annex summarise and compare phase-out and phase-in elements as contained in proposals to the GST, the SYR-TD, and the GST decision. The coverage of sectoral systems in the tables corresponds to the coverage in the SYR-TD, which discusses energy systems, industry, transport, buildings, cities, and agriculture, forestry and other land use. The column on proposals is meant to be illustrative, it does not claim to fully represent all suggestions made in the about 400 submissions that were contributed to the GST.

Comparing proposals, technical dialogue reports and the ultimate GST decision reveals that while proposals covered all sectors, the SYR-TD did not explicitly cover phase-outs in buildings, transport and industry, and the GST decision covers only fossil fuel phase-out and ending deforestation and forest degradation. The decision does not address phase-out processes in the other sectors. In terms of phase-ins, proposals and the SYR-TD cover all sectors. Nonetheless, buildings, industry and waste are not covered in the GST decision.

#### 4. Discussion

Based on suggestions from existing literature and submissions to the GST process, section 3 analysed how the GST outcome could have activated five potential functions of international institutions to promote transition processes, and to what extent the actual outcome corresponds to these suggestions. This section summarises the main results and further expands on the potential impact of the GST outcome on socio-technical transitions.

In terms of guidance and signal, scholarly literature as well as a number of GST submissions suggested that the GST should break the challenge of combating climate change down into more specific and manageable pieces by focusing on specific sectoral systems. In the political process, attention in particular focused on whether the GST outcome should call for phasing out all fossil fuels. That is, one main item of controversy was whether the GST could promote phase-out of fossil fuels by strengthening what some scholars have called ‘anti-fossil fuel norms’ (Green, 2018; Van Asselt & Green, 2023), i.e. immaterial system dimensions. Such international norms may help shift the political balance of power among system actors, as emphasised by liberalism, since pro-transition actors can use them in political contestations at domestic and intra-firm levels to put pressure on incumbent actors. They may also serve to strengthen the case of actors that seek to strengthen climate policy by litigation (Preston, 2023; van Asselt, 2023).

The suggestions to include sector-specific targets in the GST outcome were successful to some extent. The GST decision calls for a “transition away” from all fossil fuels by 2050 and sets targets for renewable energy, energy efficiency and for ending deforestation and forest degradation. However, the sectoral coverage is limited. In terms of phase-outs, while submissions included proposals for all sectors, the SYR-TD did not explicitly cover phase-outs in buildings, transport and industry, and the GST decision covers only fossil fuel phase-out and ending deforestation and forest degradation. In terms of phase-ins, proposals and the SYR-TD cover all sectors, but buildings, industry and waste are not covered in the GST decision.

Suggestions from academic literature and GST submissions also related to further dimensions of socio-technical systems. Strengthening rules and standards and transparency and accountability provisions would have increased pressure on national governments to enhance their policies, i.e. formal institutions, and would have enhanced states’ ability to predict other states’ behaviour, as emphasised by liberalism. It could also have provided additional levers for pro-transition system actors to demand actual implementation of GST outcomes.

Specifically, in terms of rules and standards, literature and some submissions suggested to require inclusion of sectoral targets and policies in NDCs and long-term climate strategies, in particular to require explicit national contributions to global sectoral objectives. In terms of transparency and accountability, literature suggested to take stock of current collective progress at a sectoral system level and a number of submissions called for establishing a process to track actual implementation of the GST outcome.

These suggestions were not successful. The GST 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. Neither the SYR-TD nor the GST decision take stock of current progress at the level of sectoral systems. The GST decision also does not establish a system to provide transparency and accountability for progress towards the achievement of the new global goals.

Enhancing means of implementation and knowledge and learning could have allowed to directly support pro-transition actors by strengthening institutional and technical capacity in recipient countries and by fostering the development of low-emission infrastructure and technologies, i.e. material system dimensions. Some submissions suggested to analyse support needs with a focus on systemic transformations. However, while the SYR-TD and the GST decision provide a quantification of support needs, they do so only at a global level, not at the level of individual systems. Furthermore, developed countries blocked all calls for underpinning the new global goals by enhancing support.

In terms of knowledge and learning, literature and submissions suggested to use the GST as a peer-learning platform and submissions specifically suggested to compile actionable solutions, e.g. as an annex to the GST decision. Indeed, a large amount of best practice examples and lessons learned were highlighted in submissions and showcased at the Technical Dialogue sessions. However, access is challenging since, instead of preparing a selection of this material, it was made accessible in its entirety in an online data interface with limited curation.

In summary, therefore, the GST provided new guidance and signal by adopting new global goals for specific sectoral systems and also fostered exchange of knowledge and learning. However, the sectoral coverage of the new global goals is limited and the GST failed to promote actual implementation of the new goals by strengthening rules and standards, transparency and accountability and means of implementation.

## 5. Conclusion

While the socio-technical transitions literature has so far analysed international dimensions only to a limited extent, the international climate policy literature shows gaps in engaging with transformational change. This article has sought to help close this gap by building a conceptual framework of how functions of international institutions may impact the different dimensions of socio-technical systems, and applying this framework to the GST. Potential functions of international institutions include 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 functions can be used similarly to how typologies of national policy instruments are used in literature to analyse impacts of national policies on transitions. Furthermore, we operationalised the key consideration in the socio-technical transitions literature that policy strategies should seek not only to promote the phase-in of low-emission solutions but also need to actively phase out high-emission socio-technical regimes.

Reactions to the GST outcome have ranged from “historic” to “failure” (Voigt, 2024), or “not up to the task” (Harris, 2024, p. 3/4). Our analytical framework has allowed us to develop a more fine-grained analysis of the achievements and limitations of the first GST. Our conclusion is that the GST has mainly enhanced the guidance and signal sent by the UNFCCC process, i.e. broad international guidelines for how states and non-state actors should behave. After the UNFCCC had historically focused on aggregate global emission targets, the Dubai conference now called for a “transition away” from all fossil fuels and also set targets for expanding renewables, enhancing energy efficiency, and ending deforestation and forest degradation. While the legal language is weak and includes many caveats, the GST outcome may help shift the political balance of power among system actors by providing additional ammunition to pro-transition actors.

However, the enhanced guidance and signal relates only to the energy and forestry sectors. Furthermore, the new global goals are not underpinned by more formal norms such as binding rules and standards or transparency and accountability provisions, nor by material means of implementation. In terms of knowledge and learning, while a large amount of best practice examples and lessons learned was assembled, it seems doubtful whether the presentation in an online database with limited curation will indeed be useful for countries or other actors that are looking for inspiration or concrete guidance.

Further research could apply the conceptual framework developed in this article to other international institutions and elaborate it further. To facilitate the transparency of the analysis, our conceptual framework gave a narrow and limited interpretation of the sustainability transitions literature, limiting to whether the GST outcome relates to phase in or phase out. This does not do justice to the richness and sophistication of the sustainability transitions field, including key contributions on international action (Binz & Truffer, 2017; Caiafa et al., 2023; Fuenfschilling & Binz, 2018; Miörner & Binz, 2021). An improved framework would have to take this into account.

In terms of political ways forward, 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, such as the Powering Past Coal Alliance. These initiatives may therefore be useful to analyse for signs of system transition and may be avenues to take up the system-specific GST outcomes (Rayner et al., 2021).

Subsequent iterations of the GST could further develop the focus on system transitions, including better sectoral coverage. A framework for progress made could incorporate this system transition perspective more, leading to an improvement of how the governance functions are fulfilled. Future GSTs would then be able to take stock of the extent to which the lines of action adopted at the Dubai conference have actually been pursued, and to further flesh out the needed actions in more detail. As research and public discussions on system transitions continue to develop, the second and subsequent GSTs may be even more able to break the global challenge down into more manageable details and give action-oriented guidance and support to Parties and non-Party stakeholders (see also Qi et al. (2024)).

## CRediT authorship contribution statement

**Wolfgang Obergassel:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Christiane Beuermann:** Writing – review & editing, Writing – original draft, Project administration, Investigation, Formal analysis. **Carsten Elsner:** Investigation, Writing – review & editing. **Heleen de Coninck:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.eist.2025.101005](https://doi.org/10.1016/j.eist.2025.101005).

## Data availability

No quantitative data was used for the research described in this article.

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