A logical framework for net-zero climate action

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Momentum for national net-zero greenhouse gas (GHG) commitments is growing quickly. Nonetheless, there are justifiable concerns over their credibility. And as no country has fully decarbonized yet, it is difficult to determine whether current efforts are likely to trigger the scale of transformation required for achieving net zero. Yet it will be too late if we wait until mid-century to assess whether we have achieved this global benchmark. As nations enhance near-term action to reach their climate goals, it is critically important that we utilize stronger methods for planning and tracking real progress toward net zero. We need a framework to examine national climate action that can help hold governments accountable to their net-zero targets in real time and provide confidence to the international community that governments are making adequate efforts to radically reduce GHG emissions. This paper offers the authors' perspective on what might be an initial approach for reviewing net-zero target implementation and provides recommendations for how to qualitatively assess or evaluate national governments' net zero efforts along with suggestions for further research and study.

KEYWORDS

climate change, net zero, decarbonization, greenhouse gas emissions, climate action

Introduction

Momentum for national net-zero commitments is growing quickly, spurred by innovative collaborations, such as the Carbon Neutrality Coalition (CNC) (formed in 2017), the Climate Ambition Alliance (formed in 2019), the UN Secretary General's call for a "truly global coalition for carbon neutrality" (beginning 2020), and the UK Presidency's core agenda for COP26—all underpinned by the landmark 2018 IPCC Special Report detailing pathways for limiting warming to 1.5°C (IPCC, 2018). The term "net-zero emissions" may be understood as a state wherein anthropogenic greenhouse gas (GHG) emissions are balanced by an equivalent quantity of emissions removals such that the sum-total is zero (Levin et al., 2020). Throughout this paper we use the short-hand term "net zero."

National net-zero targets connect the global goals of the Paris Agreement (particularly to pursue efforts to limit warming to 1.5°C) with domestic action, outlining individual countries' intentions to rapidly decarbonize their economies. Ensuring a just transition is also central to the deep decarbonization necessary to meet the global goals. Indeed, the COP27 cover decision text stresses that the pursuit of net-zero goals must be done "in a manner that is just and inclusive while minimizing negative social or economic impacts that may arise from climate action" (UNFCCC, 2022). This includes building a foundation of "meaningful and effective social dialogue and participation of all stakeholders" (UNFCCC, 2022).

Despite this positive momentum around national net-zero targets, there are justifiable concerns over their credibility, particularly since current global GHG emissions have yet to peak (IPCC, 2018, 2022). Many have raised concerns, for instance, that targets for the

second half of the century are too distant to be relevant for policymaking today and can serve as distractions or means by which to push back tangible action in the present (Levin et al., 2020; Stabinsky et al., 2021; Hale et al., 2022). Unless net-zero targets are meaningfully influencing the pace and scale of near-term action, they will not be credible.

In addition to concerns over the credibility of net-zero ambition, there is uncertainty associated with implementation pathways as well. While we know in some detail about what is needed—for example, the urgent phase-out of fossil fuels— precisely how to implement the change that is required in a manner that minimizes disruptions to the economy, national security and human livelihoods and equitably distributes new opportunities is less clear. At the same time, net-zero implementation will be different in every country and, as no country has fully decarbonized yet, it is difficult to distinguish whether current efforts are consistent with reaching net zero by midcentury.

Thus, understanding how countries can transform net-zero *targets* into tangible net-zero *action* is a critical research frontier requiring practical frameworks to help unpack the complexities and challenges of implementation. At the country level, this may require a "discovery-driven[1]" or measurement, evaluation, and learning (MEL) approach, attuned to future uncertainties and prioritizing rapid learning and assessment in decision-making. In this paper, we explore an applied logical-framework[2] (or "logframe") approach as a potential tool with which countries can plan for and track net-zero implementation. Time is critically short, and it is important that countries employ approaches that can help them hypothesize about the effects of policy interventions toward reaching net zero and then monitor progress toward this goal in real time.

Overview of logical framework for net-zero climate action

An examination of net-zero implementation through a logical framework approach may have several uses. First, it may support national planning by helping to illustrate the theory of change behind specific policy decisions. It may also provide a means to track or assess progress; indeed, once expected effects of policies and actions have been presented, they can be monitored and tested. This approach may be applied by country governments as a self-evaluation and transparency tool, or by external actors or advisory bodies to explore why progress in countries may or may

not be occurring, equipping them to provide recommendations for course correction.

Building on program theory literature (W. K. Kellogg Foundation, 2004; Lamhauge et al., 2012; Kanyamuna and Phiri, 2019; Mertens and Wilson, 2019), we propose a "logical framework for net-zero climate action" as a causal model for exploring implementation of net-zero targets. A core assumption is that exclusively reducing emissions to net zero, while all else remains the same, is insufficient, undesirable, and perhaps impossible given current social, political and economic considerations. In order for net-zero targets to be credible and achievable, countries should be aiming for the central goal (or "impact") of a **net-zero *and* just and equitable future**. This means emissions must be reduced to net zero while also ensuring a just transition.

Delivery on the desired impact will require achievement of two complementary long-term imperatives (or "outcomes"). First, it is critical that countries unlock **major transformational shifts** to decarbonize economic systems. Transformational shifts refer to fundamental system changes resulting in established emissions-intensive practices being disrupted and replaced with newly reconfigured systems that contribute to a net-zero emissions society (Boehm et al., 2022). This requires overcoming barriers to low- or zero-carbon technologies and practices and targeted, sustained efforts to ensure their durability. Rapid, far-reaching transitions of unprecedented scale are needed in countries across all major sectors—power, buildings, industry, transport, agriculture, and others—leading to long-term systemic shifts at the global scale. Phasing out fossil fuels, ushering in renewable power while reducing overall energy demand, transitioning to electric mobility, and adopting circular economy are some examples of the types of transitions needed across economic systems.

Second, the pursuit of net-zero climate targets, must be done in the context of sustainable development and efforts to eradicate poverty.[3] This includes a focus on the lives and livelihoods of people—whether it be retraining workers as their jobs are lost in the fossil fuel industry, providing support (technical, financial) to small scale farmers to improve the management of their herds (better health, better feed, better breeding, etc.), or offering quality education to learners to help seize the opportunities of a cleaner energy future. In essence, a **just transition** must be ensured — maximizing the social and economic opportunities of climate action, while minimizing and carefully managing any challenges [International Labor Organization (ILO), 2015]. Indeed, a just transition is part of a country's broader sustainable development efforts, in that it puts the lives and livelihoods of people at the center of decision-making around climate action.

Specific interventions are needed that mutually reinforce each other and drive the achievement of these abovementioned two outcomes. In this logical framework, we present five categories of national enabling action areas that can drive progress toward major transformational shifts and achieving a just transition (Figure 1). For each enabling action area, national governments may undertake specific climate actions

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1   Although initially coined by Rita Gunther McGrath and Ian C. MacMillan in the mid-90's in the context of corporate management and planning, the core principles of making informed decisions based on operational requirements and testing assumptions are arguably relevant to the high-risk and uncertain practice of implementing net-zero targets (McGrath and MacMillan, 1995).

2   Hale et al. (2021) have previously proposed a logframe approach in the literature as a means to examine climate action based on modeled causal progress. Theory-based approaches have also been proposed for evaluation of adaptation actions (see for e.g., McKinnon and Hole, 2015). This paper employs a modified concept specifically for national net-zero targets and describes how it may be applied to plan for and track net-zero implementation.

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3   As noted in Article 2, the Paris Agreement aims to strengthen the global response to climate change including national mitigation efforts, in the context of sustainable development and efforts to eradicate poverty.

FIGURE 1
Logical framework for net-zero climate action.
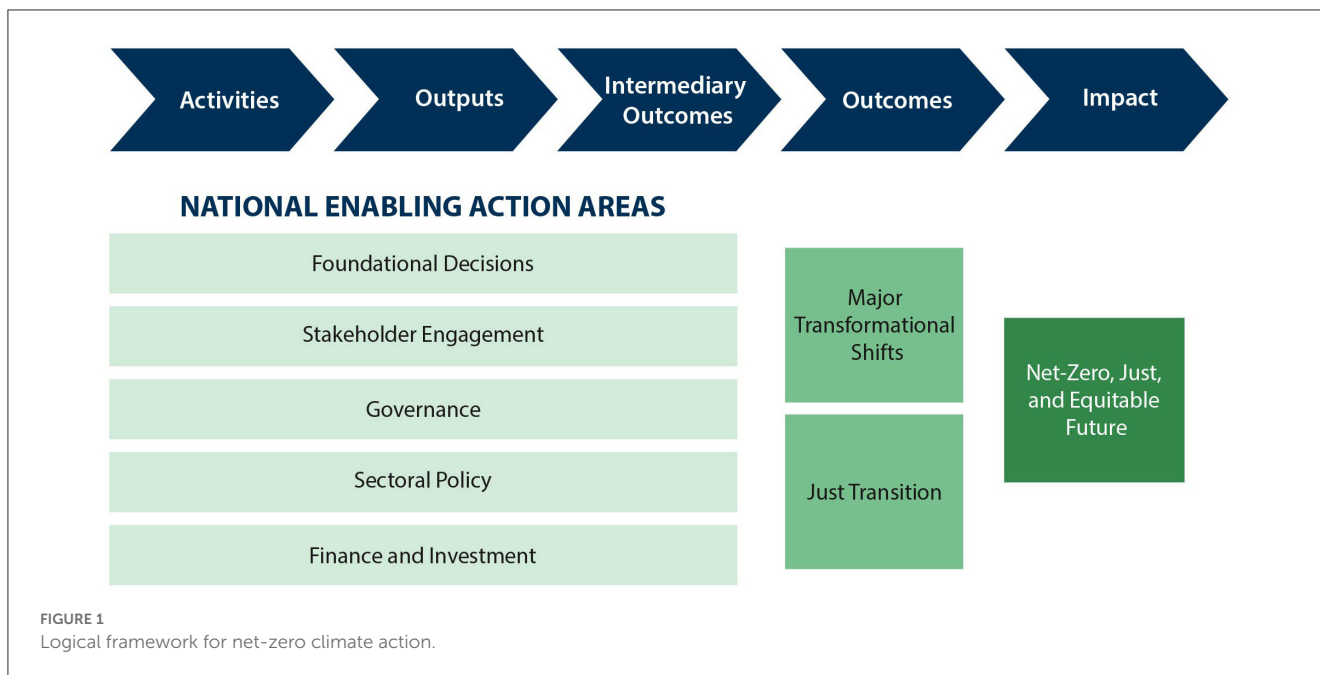
[or "activities" (A)], contributing to specific outputs (O), and specific intermediary outcomes (IO) that may result if the outputs perform as intended. These enabling action areas are interlinked, and an activity (A) in one area, may contribute to multiple outputs (O) or intermediary outcomes (IO) within the same area or influence other enabling action areas.

There are limitations to this approach. First, a logframe will require subjective assumptions around cause-and-effect impact pathways in which there are numerous uncertainties. Validity of all assumptions within the framework must be tested. If national government actions are not achieving the intended outputs or outcomes, then they will be insufficient to drive the change needed to reach net zero and governments should adjust course. Second, the logframe is not likely to be entirely comprehensive or representative of everything a country needs to do to reach net zero and may also overlook country actions that directly counter the theory of change (e.g., if a country with a net-zero target continues to invest in fossil fuels). However, the logframe approach is very flexible and can be adapted and updated based on real-time learnings in a given country.

In the following subsections, we provide examples of how specific activities across five national enabling action areas[4] may contribute to outputs that drive intermediary outcomes toward the ultimate outcome and impact objectives.

Foundational decisions

After a national government commits to reaching net-zero emissions, it is critical that it takes immediate first steps to delineate the scope of the target it has set and tie it to real policymaking today. For example, determining sectoral and gas coverage and determining the extent to which offsets will be relied on (A) will result in a defined scope for a net-zero target (O), which in turn can ensure a clear understanding of the scope of work ahead and transparency to the international community (IO). Modeled pathways to achieve net zero (O), developed by building new quantitative or qualitative models or scenarios, or incorporating existing sectoral scenarios into an economy-wide pathway (A) can help countries to gain an analytical understanding of key milestones, tradeoffs, and opportunities associated with the transition (IO). And adopting a net-zero target into law or legal frameworks (O) through legislative or executive interventions (A) will support bindingness of the target and long-term effectiveness and predictability of climate action, despite political turnover (IO) (Rüdinger et al., 2018; Levin et al., 2020; Averchenkova et al., 2021). These foundational decisions start the needed momentum for action, ensuring that a commitment to reach net zero moves beyond target-setting and into tangible implementation.

Stakeholder engagement

Substantive engagement[5] among the government, private sector, and civil society is critical for net-zero implementation,

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4   The five enabling action areas are not mutually exclusive categories. Indeed, specific actions may be relevant to more than one category. For example, actions that are considered "foundational decisions" could also be categorized into other categories. However, the emphasis of this theme is on actions that should occur chronologically early to lay groundwork for implementation thereafter.

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5 Stakeholder engagement is the process by which governmental actors interact with nongovernmental actors on an issue, from one-way information sharing to collaborative consultation processes and partnerships. Climate Investment Funds (CIF) (2020) and Initiative for Climate Action Transparency (ICAT) (2020) provide detailed discussions of stakeholder definitions and types of engagement.

although specific cause and effect relationships will vary on a case-by-case basis and may be impacted by format, timing of interventions and degree of agency afforded to participants as well as the broader socio-political context (Torney, 2021; Wells et al., 2021). Stakeholder engagement can include a variety of A, such as organizing deliberative processes and mini-publics around country net-zero strategies, supporting the formation of citizens climate assemblies, establishing climate advisory councils, and targeted private sector engagement, among others.

Inclusive, strategic, and well-organized stakeholder engagement activities can support multiple O such as: economy-wide or sectoral roadmaps to net zero; specific policy recommendations for net-zero implementation; technical analytical advice or progress reports around GHG reductions; identification of vulnerable groups and industries and identification of policy impacts and difficult trade-offs.

Ultimately, IO that result from stakeholder engagement may include greater momentum around reaching net zero; buy-in around the social, behavioral and technological changes needed to achieve an economy-wide transformation; and well-designed policies, grounded in independent, scientific analysis.

Governance

Governance plays a central role in shaping the economy, and national governments must shift practices to enable a socio-economic transformation to net zero. Establishing a robust planning framework (O) by carefully integrating net-zero goals into development plans (A) can help create a more coherent domestic plan for implementation across all agencies (IO) (Rogelj et al., 2021). Permanent coordination mechanisms (O), enabled by establishing inter-governmental coordination bodies, or by clearly defining implementation roles and responsibilities (A) can help avoid duplication, manage trade-offs between different sectoral approaches, and maximize efficient implementation (IO) (Elliott, 2019). Governments may also seek to establish accountability mechanisms (O), for example, by adopting net zero monitoring and public reporting procedures into law, or by establishing independent evaluation protocols to assess progress and ensuring a process for government to respond to the assessment (A). Meaningful accountability should improve trust, performance, and participation in implementation (IO) (Rüdinger et al., 2018).

Sectoral policy

Sectoral policy, or the policy interventions that governments deploy to reduce emissions across power, buildings, industry, transport, forests and land, food and agriculture, and more, are critical for sending the right signals to economic actors, whether through mandating or incentivizing change. To unlock a net-zero and just and equitable future, countries will need to adopt new policies, strengthen, and modify existing policies for greater impact, and dismantle those not aligned with their net-zero goals.

Under the logframe approach, countries can hypothesize about how key policy activities will drive the transformational change that is required to reach net zero. For example, a country can postulate that policy to ensure zero-carbon power sources replace fossil fuel-intensive sources (O), including measures like setting tax incentives for renewable electricity generation, establishing programs to relocate workers from coal and gas industries, implementing incentives for energy storage innovations, implementing load-shifting regulations, investing in transmission and distribution grids, and investing in battery storage (A) will result in the intermediary outcome of a decarbonized and equitable power system (IO). Similarly, if decarbonized and equitable buildings, industry, transport, forests and land, and food and agriculture systems (IO) are sought, the country can consider what A will result in tangible policy O that incentivize or mandate the desired shifts.

Finance and investment

Unlocking net zero will require shifting global climate finance flows from underwriting fossil fuels to supporting critical system-wide transformations across all sectors (Buchner et al., 2021; IEA, 2021).

To ensure finance and investment interventions help countries to achieve domestic net-zero targets, governments can implement robust fiscal policy (O), driven by measures like carbon pricing programs, ending public financing for fossil fuels, and implementation of clean fuel subsidies and tax credits (A), to restructure incentives so that low-carbon emitting technologies and practices are rendered more economical than high-emitting approaches (IO). Providing for expansive domestic public climate finance (O), including through measures to integrate climate change into national budget preparation and approval processes, establish public procurement processes that mandate low-carbon purchases, issue green bonds, and invest in climate-related research and innovation (A), can help to ensure that the power of government is used to drive innovation, development, and uptake of green solutions (IO). Effective domestic finance and investment measures can also be significantly improved—or undermined— by international finance and trade decisions. To support global goals for international climate finance (e.g., under the UNFCCC), countries may seek to phase out foreign fossil fuel investment and contribute to global climate funds (A) to ensure that trade and international public finance are aligned with climate goals (O), and, accordingly, domestic action is complemented by strong international support for climate mitigation (IO).

Discussion

In order to reach net zero, we need rapid and enhanced climate action. As such, it is critical that we plan for implementation and assess and track such implementation in real time. The logical framework for net-zero climate action may be a useful tool for countries—and other stakeholders—to begin to analyze how foundational decisions, sectoral policy, governance, finance and investment, and stakeholder engagement interventions can help

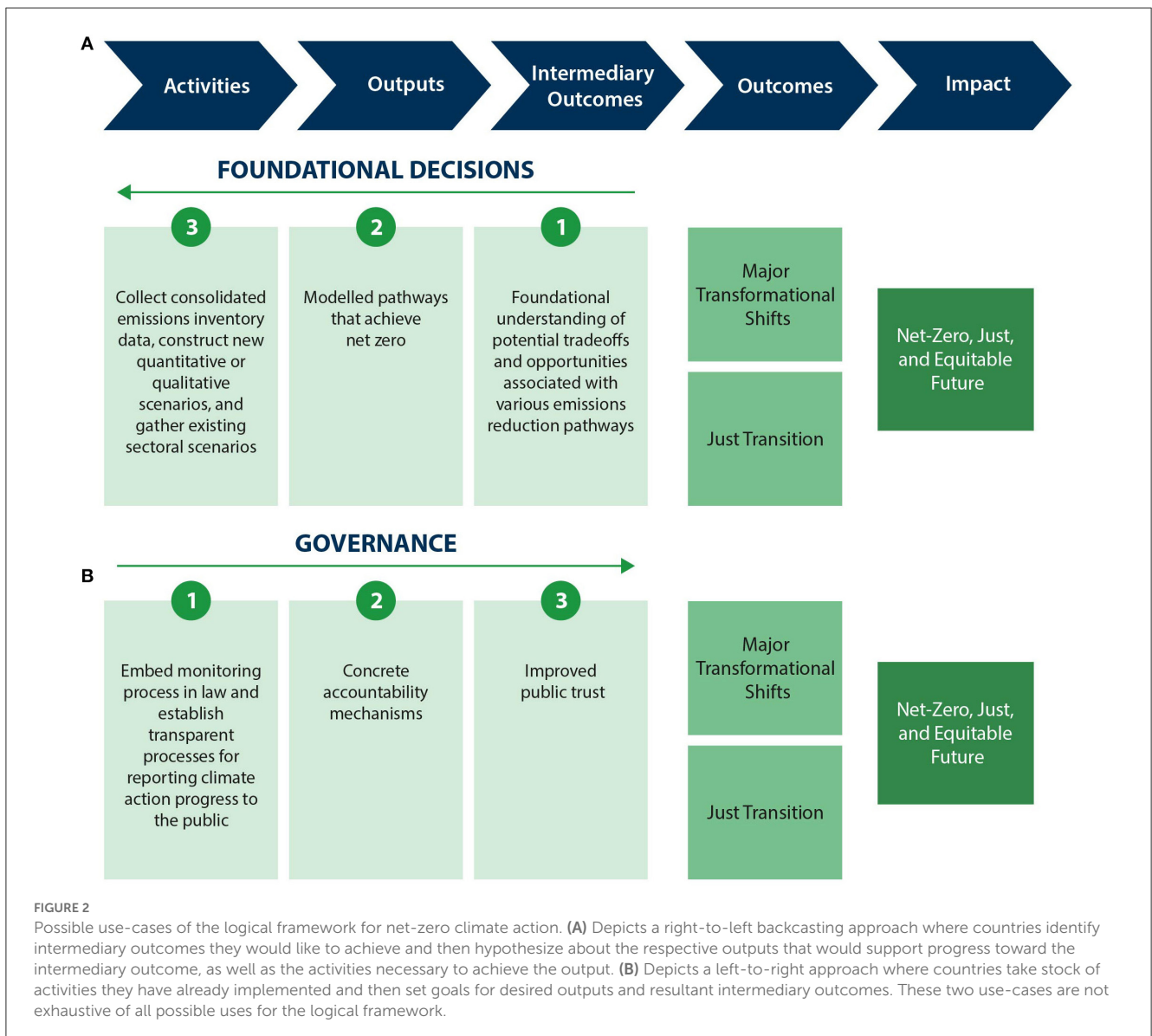unlock the major outcomes required to realize a net-zero and equitable future.

As noted above, the logical framework approach can help countries to plan for and map out their theory of change for pathways to net zero. In one use-case, for instance, a country can start by identifying IO it would like to achieve, and then hypothesize about the respective O that would support progress toward the IO, as well as the A necessary to achieve the O. This back-casting approach can help countries to determine a "checklist" of legislative, policy, and financing priorities, or activities they should implement right away.

For example, working backwards from the foundational need to analyze tradeoffs and opportunities associated with various emissions reduction pathways (IO), a country may determine that it should derive and compare modeled pathways that achieve net zero (O). To build these modeled pathways, the government may presume several A will be required: collecting consolidated emissions inventory data, constructing new quantitative or

qualitative scenarios, and gathering existing sectoral scenarios (e.g., from prior energy modeling exercises). Figure 2A depicts this right-to-left process, starting from 1 (IO), to 2 (O), to 3 (A).

The framework can also be used left-to-right to take stock of the activities that a country has already implemented, help the country set goals for established outputs that it would like each activity to generate, and hypothesize about the intermediary outcomes that could be achieved resultantly. For example, when looking across its existing governance structures, a country may determine that it has already embedded an MRV process into law and has established transparent processes for reporting its climate action progress to the public. These A, the country may hypothesize, should output concrete accountability mechanisms (O), which ultimately should lead to improved public trust (IO). This process is illustrated in Figure 2B starting with 1 (A), to 2 (O), to 3 (IO).

With clear theories of change in place, national governments should incorporate a process of intentional reflection, holistically reviewing all actions and applying learning to decision-making on a

FIGURE 2
Possible use-cases of the logical framework for net-zero climate action. (A) Depicts a right-to-left backcasting approach where countries identify intermediary outcomes they would like to achieve and then hypothesize about the respective outputs that would support progress toward the intermediary outcome, as well as the activities necessary to achieve the output. (B) Depicts a left-to-right approach where countries take stock of activities they have already implemented and then set goals for desired outputs and resultant intermediary outcomes. These two use-cases are not exhaustive of all possible uses for the logical framework.

regular basis. Credibility of net zero will come from actions to meet the target, not the commitment alone. For instance, following the example in Figure 2B, if the existing MRV system is not producing this intended effect and improving public trust that the net-zero target can be achieved (IO), then adjustments to the system will be needed.

National governments must be willing to take a serious look at how current efforts align or do not align with what is needed to reach net zero. Further research or case studies on how to conduct this evaluation and learning in real-time, at the same pace as policymaking, may be a practical next step. This evaluation process could be conducted by governments individually, or collectively as part of the international climate negotiations process for any country that might seriously be willing to undergo self-reflection.

We know that current action is insufficient to drive the pace and scale of change needed to reach net zero. And, although we cannot determine the exact recipe that will be required for countries to achieve a net-zero and just and equitable future over the next decades, a framework approach can help countries generate and test ideas of what is needed to make tangible progress and put targets for the future in good stead today.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

CE led the overall drafting process, the coordination of author inputs, and the development of the logframe approach. CE and CS conducted several rounds of testing the logframe approach for different types of known climate actions and drafted the bulk of the paper. CS drafted the sections on foundational decisions, sectoral policy, and finance and investment. KR drafted the sections on just transition. RG drafted the content on stakeholder engagement.

NS and CS drafted the content on transformational shifts. CE, CS, and KR conducted editing after internal review by colleagues at WRI. All authors reviewed each other's sections and contributed edits. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fclim.2023.1128498/full#supplementary-material

References

Averchenkova, A., Fankhauser, S., and Finnegan, A. J. (2021). The impact of strategic climate legislation: evidence from expert interviews on the UK climate change act. *Clim. Policy* 21, 251–263. doi: 10.1080/14693062.2020.1819190

Boehm, S., Jeffery, L., Levin, K., Hecke, J., Schumer, C., Fyson, C., et al. (2022). *State of Climate Action 2022*. Berlin and Cologne, Germany, San Francisco, CA, and Washington, DC: Bezos Earth Fund, Climate Action Tracker, Climate Analytics, ClimateWorks Foundation, NewClimate Institute, the United Nations Climate Change High-Level Champions, and World Resources Institute. doi: 10.46830/wrirpt.22.00028

Buchner, B., Naran, B., de Aragao Fernandes, P., Padmanabh, R., Rosane, P., Solomon, M., et al. (2021). *Global Landscape of Climate Finance 2021*. London: Climate Policy Initiative.

Climate Investment Funds (CIF) (2020). *Enhancing Climate Action through Stakeholder Engagement at the National Level*. Available online at: https://www.cif.org/sites/cif_enc/files/knowledge-documents/country_level_stakeholder_engagement_study.pdf (accessed February 10, 2023).

Elliott, C. J. (2019). *Good Governance for Long-Term Low-Emissions Development Strategies*. Washington, DC: World Resources Institute.

Hale, T., Chan, S., Hsu, A., Clapper, A., Elliott, C., Faria, P., et al. (2021). Sub- and non-state climate action: a framework to assess progress, implementation and impact. *Clim. Policy* 21, 406–420. doi: 10.1080/14693062.2020.1828796

Hale, T., Smith, S., Black, R., Cullen, K., Fay, B., Lang, J., et al. (2022). Assessing the rapidly-emerging landscape of net zero targets. *Clim. Policy* 22, 18–29. doi: 10.1080/14693062.2021.2013155

IEA (2021). *World Energy Investment 2021*. Paris: IEA.

Initiative for Climate Action Transparency (ICAT) (2020). "Stakeholder participation guide: supporting stakeholder participation in design, implementation and assessment of policies and actions," in eds J. C. Durbin and S. Vincent (Washington, D.C.: Climate, Community and Biodiversity Alliance and Verra; Bonn: ICAT). Available online at: https://climateactiontransparency.org/icatguidance/stakeholder-participation/ (accessed December 12, 2022).

International Labor Organization (ILO) (2015). *Guidelines for a Just Transition Towards Environmentally Sustainable Economies and Societies for All*. Geneva: International Labor Organization.

IPCC (2018). *Special Report: Global Warming of 1.5C*. Geneva: IPCC.

IPCC (2022). *WG III Contribution to the Sixth Assessment Report, Chapter 5: Demand, Services and Social Aspects of Mitigation*. Geneva: IPCC.

Kanyamuna, V., and Phiri, M. (2019). Who said monitoring and evaluation is not rooted in firm theoretical foundations? A review of relevant literature. *Int. J. Human. Art Social Stud.* 1, 1–23.

Lamhauge, N., Lanzi, E., and Agrawala, S. (2012). *Monitoring and Evaluation for Adaptation: Lessons from Development Co-operation Agencies*. Paris: Organisation for Economic Cooperation and Development. doi: 10.1080/17565529.2013.801824

Levin, K., Rich, D., Ross, K., Fransen, T., and Elliott, C. (2020). *Designing and Communicating Net-Zero Targets*. Washington, DC: World Resources Institute.

McGrath, R. G., and MacMillan, I. C. (1995). Discovery-Driven Planning. *Harvard Bus. Rev.* 1995, 44–54.

McKinnon, M., and Hole, D. (2015). Exploring program theory to enhance monitoring and evaluation in ecosystem-based adaptation projects. *New Direct. Eval.* 147, 49–60. doi: 10.1002/ev.20130

Mertens, D., and Wilson, A. (2019). *Program Evaluation Theory and Practice, 2nd Edition*. New York, NY: The Guilford Press.

Rogelj, J., Geden, O., Cowie, A., and Reisinger, A. (2021). Three ways to improve net-zero emissions targets. *Nature* 591, 365–368. doi: 10.1038/d41586-021-00662-3

Rüdinger, A., Voss-Stemping, J., Sartor, O., Duwe, M., and Averchenkova, A. (2018). *Towards Paris-Compatible Climate Governance Frameworks*. Paris: IDDRI.

Stabinsky, D., Bhatnagar, D., and Shaw, S. (2021). *Chasing Carbon Unicorns: The Deception of Carbon Markets and "Net Zero"*. Amsterdam: Friends of the Earth International.

Torney, D. (2021). Deliberative mini-publics and the european green deal in turbulent. *Polit. Govern.* 9, 380–390. doi: 10.17645/pag.v9i3.4382

UNFCCC (2022). *Sharm el-Sheikh Implementation Plan*. Retrieved from https://unfccc.int/documents/624444 (accessed November 20, 2022).

Wells, R., Howarth, C., and Brand C. L. (2021). Are citizen juries and assemblies on climate change driving democratic climate policymaking? An exploration of two case studies in the UK. *Clim. Change* 168, 5. doi: 10.21203/rs.3.rs-273650/v1

W. K. Kellogg Foundation (2004). *Logic Model Development Guide*. Battle Creek: W. K. Kellogg Foundation.