

Measuring Political Economy Progress Toward Global Warming Goals

Mengye Zhu, Vaibhav Chaturvedi, Leon Clarke, Nathan Hultman



SCHOOL OF
PUBLIC POLICY
**CENTER FOR GLOBAL
SUSTAINABILITY**

ABOUT THE INDEPENDENT GLOBAL STOCKTAKE

The Independent Global Stocktake (iGST) is a consortium of civil society actors working together to support the Global Stocktake (GST), the formal process established under the Paris Agreement to periodically take stock of collective progress toward its long term goals. The iGST aligns the independent community — from modelers and analysts, to campaigners and advocates — so we can push together for a robust GST that empowers countries to take greater climate action.

The iGST Mitigation Working Group seeks to facilitate new research on the societal and institutional dimensions of mitigation to support a more robust stocktaking process. In April 2021, we invited a group of experts and practitioners to join a roundtable: "Taking Stock of the Political Economy of the Transition towards a Net-Zero World: Assessing Progress through Measurable Indicators". Based on this in-depth discussion, subsequent discussions, and a subsequent literature review, this working paper was produced. It aims to shed light on the potential to assess the political economy aspects of mitigation progress by identifying key political economy indicators and evaluating their measurability. This paper is not intended to develop or present a general theory. Instead, its goal is to set a research agenda to better incorporate societal dimensions—in this case, political economy—into the process of stocktaking

Learn more: www.independentglobalstocktake.org

ACKNOWLEDGEMENTS

This working paper is prepared by the Center for Global Sustainability (CGS) at the University of Maryland and the Council on Energy, Environment and Water (CEEW). Funding for this project was provided by ClimateWorks Foundation. We are grateful for helpful reviews from Kathryn Hochstetler, David Victor, Navroz Dubash, and Adrien Vogt-Schilb. More generally, we would like to acknowledge the participants of the roundtable who have provided insightful and constructive suggestions, the incorporation of which has greatly improved the quality of the working paper.

Suggested citation: Zhu, M., V. Chaturvedi, N. Hultman, L. Clarke (2021). Measuring Political Economy Progress Toward Global Warming Goals. Working Paper. College Park, MD: Center for Global Sustainability at the University of Maryland. 20 pp. Available at www.independentgst.org

Measuring Political Economy Progress Toward Global Warming Goals

Authors: Mengye Zhu, Vaibhav Chaturvedi, Leon Clarke, Nate Hultman

1. OVERVIEW

The Paris Agreement and the global stocktake

The Paris Agreement is a landmark for global climate action. 197 Parties adopted the agreement in 2015, and it has been ratified by 191 countries to date. Parties to the Paris Agreement committed to limit their greenhouse emissions and to regularly communicate their commitments to the global community. In contrast to previous top-down climate ambition mechanisms, these commitments, including Nationally Determined Contributions (NDCs), are based on a decentralized approach that allows countries to determine their own targets and actions unilaterally based on their specific socio-economic contexts and capabilities.

This decentralized approach relies on existing domestic political processes and diverse forms of international pressure to catalyze a cycle of increasing ambition and action. Critically, this approach will yield true cooperation only with greater transparency and credibility (Victor et al., 2017). Therefore, an “Enhanced Transparency Framework” has been proposed to facilitate tracking of Parties’ progress toward their commitments.

The global stocktake (GST) is an integral part of the transparency framework. It serves as a review process for the implementation of the Paris Agreement and for assessing the collective progress made by the Parties. In addition, it is also expected to catalyze the cycle of increasing ambition and action. The GST will take place every five years starting from 2023. The GST may be hindered by several constraints, including the long-time horizon and a focus on collective or aggregated information only, rather than examining country-level information (Clarke and Hultman, 2021).

While the GST is the formal process of the UNFCCC, the moment surrounding the GST will also be critically important, as civil society, national governments, and others use the moment to spur enhanced ambition and action in individual countries, states and provinces, regions, and sectors. In this broader view, the process of taking stock is not restricted to the specifics of information to be included in the formal GST. Information will be key to enhancing ambition and action in a multitude of national, regional, and other processes. And participation in this larger process of spurring ambition and actions goes well beyond the actions of national governments and includes contributions of the independent community, subnational governments, companies, and many others.

The need for incorporating political economy dimensions into the global stocktake

Information is the foundation of the GST. While important gaps remain, and there is value in greater coordination, techno-economic indicators such as those for energy use and supply, economic costs and technical parameters are largely available for the analyses of climate change mitigation progress. The UNFCCC, national governments, other international bodies like the International Energy Agency (IEA), and a number of independent organizations (e.g., Climate Action Tracker) track this information and make it widely available. These techno-economic indicators provide a strong physical and economic assessment of progress and lay a concrete foundation for the form of the GST and for assessing progress by individual countries and other actors.

What these techno-economic indicators do not do, however, is characterize the enabling political and societal conditions that will determine how much additional progress can be made. The transition to carbon neutrality requires systemic changes involving a wide range of actors (Worker, 2017), which inevitably creates both winners and losers as well as costs and benefits (Köhler et al., 2017). Gaps between the Paris goals and current national policies will remain unless we know how to speed up implementation and increase ambition (Roelfsema et al., 2020; UN, 2021). Political economy factors are important determinants of countries’ abilities to make progress on climate change mitigation and can be a useful supplement to the GST. Political economy factors can help to explain why

countries may have made progress or, conversely, why progress may have stalled. Despite their critical importance, there is little formal measurement of political economy factors because of their complexity and because of data limitations. The question that motivates this working paper is: How can we better characterize and measure progress on the political economy enabling conditions for, and barriers to, reaching the Paris goals? This in turn raises a related question: What political economy enabling conditions would need to be put in place, and what barriers need to be overcome, in the coming years to meet these goals?

In this working paper, we identify five political economy dimensions (national ambition; institutional arrangements; stakeholders and interests; policy effectiveness; and public opinion) that influence the ability to meet the Paris goals and discuss the current understanding of how to measure progress on each of these dimensions. Our goal in this working paper is to highlight the potential for future research and analysis to better characterize progress and needs.

In the following of the paper, Section 2 briefly introduces each dimension by answering: (1) What sorts of issues or dynamics does the dimension represent? (2) What are relevant indicators? (3) Why and how do these indicators link to progress? (4) How, and how well, can we measure the indicators? For each dimension, we list potential data sources and existing literature (not limited to climate change research) that are useful to quantify these indicators. Section 3 provides a brief evaluation of the data availability of the indicators based on the data sources we have reviewed in Section 2. Finally, in Section 4 we present a discussion on the future application and limitations of the political economy dimensions we proposed in this working paper.

2. CHARACTERIZING THE POLITICAL ECONOMY DIMENSIONS OF PROGRESS TOWARDS THE PARIS AGREEMENT GOALS

Any assessment of the political economy factors driving climate mitigation must wrestle first with what is and is not to be included under the heading of “political economy”. There are many factors that might be characterized as political economy factors and that influence a country’s ability to reduce emissions, including rules and norms, stakeholders, and political systems (Averchenkova and Bassi, 2016; The world in 2050 initiative, 2018; Worker, 2017; Worker and Palmer, 2020). And no two researchers will characterize the breadth and scope of political economy in exactly the same way.

The challenge for stocktaking is to navigate this complexity and identify a set of key indicators that relate to political economy and ways to overcome barriers to progress. Rather than wade into broad issues of definition and scope, we focus on five political economy dimensions that are particularly relevant for understanding societal progress towards mitigation goals: **national ambition; institutional arrangements; stakeholders and interests; policy effectiveness, and public opinion**. These factors were chosen based on literature review and discussions with experts. There is a general causal relationship among the five dimensions (Figure 1). Given the likely synergies among these indicators, their combined effect could be larger than the sum of their parts.

We discuss the challenges and possibilities for the measurement of each of these five dimensions, and we propose potential indicators of progress for each. The five dimensions and the associated indicators are constructed with a practical, rather than theoretical, purpose: they are intended to provide information that the independent community of researchers and other civil society actors might use to better understand and document progress (Table 1).

A political economy framework

Dimension	Question Explored	Indicators of Progress
National ambition	Has this country offered strong goals and actions to combat climate change?	<ul style="list-style-type: none"> ● Existing climate pledges ● National commitments by heads of state or government
Institutional arrangements	Does this country have functioning institutions to support ambitious climate actions?	<ul style="list-style-type: none"> ● Scales and scope of climate institutions ● Robustness of climate institutions ● Prevalence of institutional veto points
Stakeholders and interests	Has this country managed to coordinate stakeholders to reach a consensus on climate targets and actions?	<ul style="list-style-type: none"> ● Stakeholder inclusiveness ● Support from political elites ● The political influence of interested coalitions ● Number of co-benefits partnerships
Policy effectiveness	Has this country adopted and implemented effective policies to fulfill climate commitments and facilitate more ambitious actions?	<ul style="list-style-type: none"> ● Effectiveness of policy adoption ● Effectiveness of policy implementation ● Policy coherence ● Track record on previous climate commitments
Public opinion	How does the public perceive climate change and the potential strategies to address it?	<ul style="list-style-type: none"> ● Climate awareness ● Public support for climate actions ● Heterogeneity in perception and specific interests

Table 1. A political economy framework for assessing progress towards the Paris Agreement goals. The framework highlights five dimensions by which progress might be assessed, the core question about progress that the dimensions addresses, and possible indicators of progress along that dimension.

Political economy dimensions relationships

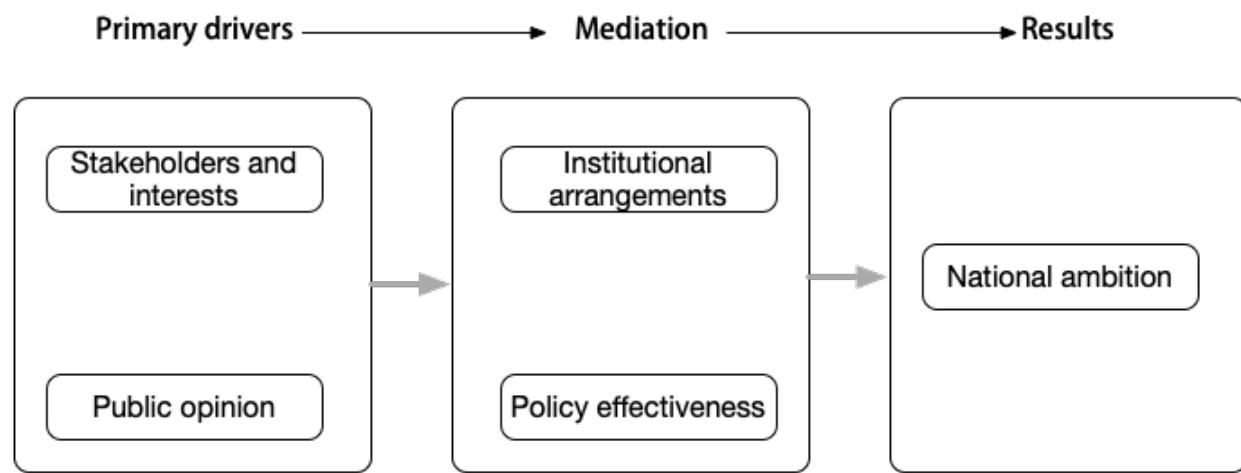


Figure 1. **Directional relationship among the political economy dimensions.** “Stakeholders and interests” and “public opinions” are the primary drivers of mitigation actions and are mediated by “institutional arrangements” and “policy effectiveness”. The level of national ambition towards the Paris goals results from this process.

Dimension 1: National ambition

National ambition explores how strongly a country has demonstrated its climate commitments. An ambitious stance establishes political foundations and leadership (Levin et al., 2015). It also indicates the likelihood that a country (at least at the national level) will proactively engage in climate actions. Numerous studies have shown that current national policies and commitments fall well short of meeting the Paris warming goal, highlighting the need for national governments to increase their climate ambitions (Roelfsema et al., 2020). Indicators for this dimension include existing climate pledges of a country (e.g., NDCs, LTSs, net-zero pledges) and commitments that are publicly announced by the heads of state or government.

National ambition

Indicator	Linkage to the progress	Data sources	Literature
Existing climate pledges	The higher ambition current pledges demonstrate, the larger possibility to act on climate change	<ul style="list-style-type: none"> ● NDCs and LTSs from UNFCCC ● Independent data and assessment platforms (e.g. Climate Action Tracker) ● Laws, regulations, and official policy document ● Official government announcements 	(Giorgio et al., 2015; Höhne et al., 2018)
National commitments by heads of state or government	The stronger commitments are, the more likely climate issues will be incorporated into the policy agenda.	<ul style="list-style-type: none"> ● IISD Earth Negotiations Bulletin ● Climate Action Tracker ● Social media ● Official government announcements ● Documents (e.g., newspaper articles, government hearings, policy, policy files) 	N/A

Table 2. Indicators and potential data sources for the national ambition dimension.

Existing climate pledges: This indicator examines the latest climate commitments a country has officially proposed. It helps us understand a country's determination to reduce emissions, and it implies forward planning to make progress towards the Paris goals. Relevant information is readily available from NDC and LTS submissions (UNFCCC, 2021), laws, domestic policy documents, and official government announcements. The independent community has established several platforms for collecting and assessing pledges that already characterize these aspects (e.g., Climate Action Tracker (CAT)).

National commitments by heads of state or government: This indicator captures commitments by national leaders such as presidents and prime ministers. The commitments complement formal climate pledges and can be a substitute when formal pledges are not available. These commitments demonstrate that climate change is an integral part of the country's political/policy agenda and show progress or retrogression in national ambition and leadership on climate change. Additionally, national decision-makers with positive attitudes towards mitigation can push to overcome barriers to progress (Averchenkova and Bassi, 2016). Information on commitments of national leaders can be collected from existing platforms and sources such as *IISD Earth Negotiations Bulletin* and *Climate Action Tracker*. Media/social media, official government announcements, and other documents are also potential data sources for this indicator.

Dimension 2: Institutional arrangements

Institutional arrangements reflect the readiness of a country's governance system to carry out emissions reductions. Institutions that promote climate change mitigation by the government, civil society, and/or the private sector (hereafter referred to as climate institutions) can be defined as the sets of governance procedures or mechanisms - including government agencies (e.g. various government ministries), the legislative process and corporate environmental responsibility guidelines - that state and non-state actors can follow to address climate change mitigation challenges such as increasing energy efficiency or reducing fossil fuel consumption. Climate institutions translate emission targets into action by guiding policy development and implementation, and mediate political interests which are often barriers to implementing mitigation actions (Dubash et al., 2021a). The climate institutions of a country are not limited to the ones that were created intentionally for climate change mitigation. Institutions whose primary objectives are not climate change mitigation, and were not created for that purpose, but which nonetheless have a role to play in a country's climate change mitigation efforts also need to be taken into account (Mahoney and Thelen, 2009; Hochstetler, 2021a; Dubash et al., 2021a). For example, many government ministries of energy, agriculture and transport across countries (e.g. the US Department of Energy, the Brazil Ministry of Transport) can be treated as climate institutions since they have been granted responsibilities for climate change mitigation. The development of climate institutions in the US includes adding new responsibilities to existing institutions (Mildenberger, 2021). Based on this definition, we have identified three indicators for this dimension (Table 3).

Institutional arrangements

Indicator	Linkage to the progress	Data sources	Literature
Scales and scope of climate institutions	Progress is made by establishing national, subnational and non-state climate institutions that cover as many key sectors as possible	<ul style="list-style-type: none"> ● Documents (e.g., newspaper articles, government hearings, policy files) ● Small-scale questionnaires/surveys ● Interviews 	(Heikkila and Weible, 2018; Mewhirter et al., 2018)
Robustness of climate institutions	Progress is made by improving quality and maintaining stability of the climate institutions	<ul style="list-style-type: none"> ● The Political Constraint Index (POLCON) Dataset ● Worldwide Governance Indicators ● Interviews ● Small-scale questionnaires/surveys 	(Averchenkova and Bassi, 2016; Boin and Lodge, 2016; Hochstetler, 2021a)
Prevalence of institutional veto points	The linkage can be either way. More veto points are more likely to create barriers for climate actions, but less likely to overturn adopted climate policies. Progress is made by neutralizing the influence of veto points on climate mitigation	<ul style="list-style-type: none"> ● The parliaments and governments database (ParlGov) ● The Political Constraint Index (POLCON) Dataset ● CHECKS3 (developed by Beck et al (2001)) ● National/cross-national surveys ● Documents (e.g., newspaper articles, government hearings, policy, policy files) ● Interviews ● Small-scale questionnaires/surveys 	(Madden, 2014; Thürk et al., 2021; Henisz and Zelner, 2006; Beck et al., 2001)

Table 3. **Indicators and potential data sources of the institutional arrangements dimension.**

Scales and scope of climate institutions: This indicator measures the extent to which a country's climate institutions cross governance levels (scale) and sectors (scope). Examples of governance levels include national, subnational, sub-state, and non-state. Examples of sectors include energy, building, and transport. The scales and scope of climate institutions can reflect a country's progress in climate change mitigation. There is a growing belief that a single, centralized national strategy or mechanism is necessary yet insufficient for effective climate change mitigation (Jordan et al., 2015; Ostrom, 2012). Sub-state and non-state actors, such as local authorities, businesses, and NGOs, can act on directly reduce emissions and support or hinder climate actions at all levels through political systems (Hale, 2018, Hultman, 2020). For instance, one study suggests that two-thirds of global greenhouse gas emissions are produced by less than one hundred companies (Heede, 2014). Political scientists have argued that more decentralized and pluralistic institutions constituted by sub-state and non-state actors are more flexible and politically realistic in forging collective action on climate change (Keohane and Victor, 2011; Ostrom, 2012; Dubash, 2021b). Therefore, the more scales that climate institutions cross, the greater the impact they will likely have.

In addition, the scope of climate institutions should be expanded to cover key emission sectors and climate change issues. Evidence suggests that the implementation of climate plans is largely operationalized through sectoral actions (Somanathan et al., 2014). The more sectors restructure their institutions based on climate change considerations, the greater actions will be taken in terms of greenhouse gas emissions reduction. For instance, climate actions institutionalized by the forest sector of Brazil have largely facilitated the climate change mitigation agenda of this country (Somanathan et al., 2014).

The indicator, given the lack of other relevant measures, could potentially be quantified by identifying and calculating the numbers of climate institutions within a country by different governance levels and sectors. No existing databases have been found yet to quantify this indicator directly. Such data could potentially be collected and coded from government documents and other official reports. Qualitative approaches such as surveys, interviews, and historic documents could also be used. However, the biggest obstacle to quantifying this indicator is to further narrow down the definition of climate institutions since it has been used to cover diverse topics and has diverse meanings in the academic literature.

Robustness of climate institutions: This indicator measures the capacity of domestic climate institutions to quickly recover from shocks such as changes in national political leadership, to be transformative, and to retain flexibility in changing conditions (Boin and Lodge, 2016; Hochstetler, 2021a). Climate institutions may face various challenges from political and socio-economic disturbances, which threaten their stability and existence. Robustness is crucial to guaranteeing institutional effectiveness, particularly with respect to transboundary crises and long-term commitments such as climate change. The robust domestic institutions needed to meet the Paris goals should be able to avoid disruptions from anti-decarbonization interest groups and changes of domestic political leadership (e.g. presidential election) and in the international system (e.g., breakdown of multilateral organizations and treaties, or heightened diplomatic tensions between countries).

However, the study of robust institutions is in its infancy. Few data sources exist in terms of institutional robustness in the face of climate change. It is still uncertain whether this indicator is quantifiable. Existing databases on political risks and overall institutional environments could potentially be used to predict the institutional robustness of climate actions. However, they are indirectly related to this indicator. In this regard, documents and interviews could help to better understand this indicator.

Prevalence of institutional veto points: This indicator identifies the strength and prevalence of key veto points in a country's political institutions with respect to the Paris goals. Veto points are stages in the process of policymaking when actors or institutions can halt or impede passage (Immergut, 1990). Institutional veto points create major barriers to the adoption of new policies to address rising challenges, and they present obstacles to the alteration of pre-existing policies (O'reilly, 2005). Scholars have identified the existence of institutional veto points as an obstacle to the adoption of effective climate change policies, including the "institutional prerequisites" of direct democracy (Stadelmann-Steffen, 2011). This may include political orientations and policies that favor fossil fuel industries or other anti-decarbonization interests. For instance, based on empirical data of policies and legislation in OECD countries, Madden (2014) concluded that the existence of veto points leads to lower rates of adoption of climate change actions, including those that may significantly benefit mitigation efforts. However, more veto points also mean that once a policy is adopted, it is more difficult to overturn.

There are varied approaches to operationalize institutional veto points in the existing literature. Types of government/political systems (e.g., federalism, bicameralism, and separately selected executive) are commonly coded to measure veto points. There are existing databases that quantify this indicator, such as the parliaments and governments database (ParlGov). In addition, Henisz and Zelner (2006) provide an approach to quantify institutional veto points using the POLCON and CHECKS3 databases. Such data could be collected and coded from questionnaires/surveys, interviews with key participants, and documents to identify veto points more accurately.

Dimension 3: Stakeholders and interests

The stakeholders and interests dimension assesses the extent to which different stakeholders and interests within a country align with the Paris goals. All actors in society have interests, incentives, and constraints. Transitions towards a carbon-neutral economy are largely determined by power struggles between alliances of collective actors, such as policymakers, industrial actors, banks, and academic organizations, who might support and benefit from a low-carbon transition and others who might be negatively impacted (Geels, 2014). The balance and evolution of these diverse groups, as well as who will pay for the costs and receive benefits remains a fundamental question of this dimension (Hochstetler, 2021b). This dimension is one of the most important elements in prevailing political economy research, therefore it is also a key component of the framework proposed here. However, assessing the actions and impacts of stakeholders can be methodologically challenging due to a lack of data availability and standard quantification approaches.

Table 4. Indicators and potential data sources for the stakeholders and interests dimension

Indicator	Linkage to the progress	Data sources	Literature
Stakeholder inclusiveness	Stakeholder inclusiveness should be balanced between efficiency and equity of climate actions.	<ul style="list-style-type: none"> ● Documents (e.g., newspaper articles, government hearings, policy, policy files) ● Interviews ● Small-scale questionnaires/surveys 	(Averchenkova and Bassi, 2016; Nachmany et al., 2015; Worker and Palmer, 2020)
Support from political elites	Progress is made by gaining more support from powerful political figures.	<ul style="list-style-type: none"> ● Social media/media ● Documents (e.g., newspaper articles, government hearings, policy, policy files) ● Interviews ● Small-scale questionnaires/surveys 	(Shehata and Hopmann, 2012; Kousser and Tranter, 2018))
Political influence of interested coalitions	Progress is made by expanding pro-decarbonization coalitions and neutralizing anti-decarbonization ones	<ul style="list-style-type: none"> ● Economic databases associated with key sectors (e.g., World Trade Organization database) ● Interviews ● Small-scale questionnaires/surveys ● Documents (e.g., newspaper articles, government hearings, policy files) 	(Hardy et al, 2013; Junk, 2020; Rennkamp et al., 2017; Yackee and Yackee, 2006)

Number of co-benefits partnerships	Progress is made by discovering and engaging more interest groups that can benefit from climate actions.	<ul style="list-style-type: none"> ● Interviews ● Small-scale questionnaires/surveys ● Documents (e.g., newspaper articles, government hearings) 	(Worker and Palmer, 2020; Giordano et al., 2020)
------------------------------------	--	---	--

Stakeholder inclusiveness: This indicator measures the extent to which stakeholders, such as government organizations, business actors, media, and NGOs, have been identified and engaged in national climate pledges and actions. Its linkage to progress, however, is a “two-way street”. On the one hand, interests are better represented by broadening the inclusiveness of stakeholders, thereby increasing the equity or fairness of climate actions. High stakeholder inclusiveness often indicates vigorous dynamics and resource mobility of climate change issues in policy agendas. It also helps to identify the absence of influential stakeholders. On the other hand, multi-stakeholder engagement does not necessarily lead to efficiency in climate actions due to the disparities of interests (Cheyns, 2011). There is potential to refine or quantify this indicator as researchers could count the numbers of stakeholders engaged. However, it is possible that in certain cases, more accurate or relevant data for this indicator could be collected through qualitative data sources, including government documents, interviews, and other text-based content.

Support from political elites: This indicator measures the level of pro-decarbonization gestures made by influential political leaders (e.g., key government officials, political party leaders, and leaders of large political groups) in public announcements, commitments, decisions, or other actions. Political elites are an integral part of a country’s political system. They exercise power to align political and policy agendas with their interests, values, and beliefs. In terms of climate change challenges, they can drive and frame political issues in the media, influence public concerns, and determine what policies are chosen to solve problems (Kammermann and Dermont, 2018; Shehata and Hopmann, 2012; Tranter, 2011). For instance, research focusing on the influence of political elites in Australia found that voters respond to the position of political leaders on climate change policy, and voter polarization increases when leaders diverge (Kousser and Tranter, 2018). Therefore, the higher level of support from these political elites for more ambitious climate actions, the more progress a country has made towards the Paris goals. We have found no existing databases to quantify this indicator. However, such data could be collected from social media/media, official documents, surveys, and interviews with key stakeholders.

Political influence of interested coalitions: This indicator measures the influence of pro- and/or anti-decarbonization coalitions (e.g., fossil fuel industries versus renewable energy industries) on a country’s political and policy agendas of climate change mitigation. The outcomes of the competition between these two political forces advance or prevent carbon lock-in. In general, countries with stronger and more influential pro-decarbonization coalitions are more likely to take ambitious climate actions. Therefore, building winning coalitions for decarbonization contributes to the development of climate change mitigation initiatives (Bernstein and Hoffmann, 2018; Meckling et al., 2015). Progress is made by empowering “winners” (particularly low-carbon niches) to support decarbonization while neutralizing “losers” by altering incentives (Bernstein and Hoffmann, 2018).

Even though coalitions have been in the spotlight of the political economy discussions of climate change, measuring their political influence is challenging. Qualitative methods such as case studies are more commonly used than quantitative approaches in coalition or interest group research due to data and method constraints (Dür, 2008; Downie, 2018). However, qualitative approaches can only apply to studies with small numbers of individuals or cases (i.e., small-N studies). There are potentially more objective measurements such as the size of coalitions, profiles of coalition participants, and economic data of related sectors (e.g., employment and export data), yet the applicability of these measurements may be limited by the ambiguity of this indicator.

Other methods are also discussed in the existing literature, including attributed influence methods based on self-evaluation or expert assessment, and preference attainment approaches which link interest group or coalition influence with policy outputs (Dür, 2008). The latter is more objective and can be applied to a larger number of cases, particularly by using quantitative text analysis (Klüver, 2009). In addition, Rennkamp and colleagues used network analysis to quantify this indicator. The study established a dataset of 560 coded statements in support or opposition of renewable energy from media articles, policy documents, and interviews. A network analysis using the dataset was conducted to quantify the political influence of the competing coalitions (Rennkamp et al., 2017). Similar data collection and analysis approaches could be a valuable line of future research.

Number of co-benefits partnerships: This indicator assesses the extent to which stakeholders/interests that receive co-benefits from climate mitigation are included in efforts to meet the Paris goals, such as air pollution control agencies, health, and agricultural sectors. Climate co-benefits are described as linkages between mitigation and other key national priorities. Actions on carbon emissions reductions may positively impact other development challenges such as air pollution, health issues, and poverty. Addressing co-benefits helps to shape narratives around domestic climate change mitigation and to improve the political feasibility of climate actions (Dubash, 2013a; Jordan et al., 2015). For instance, energy security was originally the primary reason for promoting renewable energy deployment in both India and China. The progress of domestic climate actions can therefore be stimulated by engaging and building partnerships with these co-benefit interests (Worker and Palmer, 2020). This indicator focuses on stakeholder engagement rather than calculating co-benefits, as many policy- and economics-oriented studies have done (Karlsson et al., 2020; Ürge-Vorsatz et al., 2014). An example would be the Partnership for Air Quality, Climate & Health (PACH) of Colorado State University.

The assessments of this indicator are largely driven by qualitative sources. However, we have found no existing databases that can be directly used to quantify this indicator. Data collected and coded from documents, interviews, and/or surveys could serve as measures of this indicator (Giordano et al., 2020; Worker and Palmer, 2020).

Dimension 4: Policy effectiveness

The policy effectiveness dimension investigates the extent to which policies are facilitating domestic climate change mitigation. Policies in this working paper include laws, regulations, policy instruments, and anything a government chooses to do or not to do (Dye, 1992). Effectiveness here is defined as “how well something works or whether it works as intended and meets the purposes for which it is designed” (Sadler, 1996). Four indicators are suggested, including the effectiveness of policy adoption, the effectiveness of policy implementation, policy coherence, and the track record of a country in delivering on its commitments.

Several additional questions arise in the measurement of policy effectiveness. One can simply ask yes-or-no or descriptive questions such as: “Has a given country adopted any regulations and laws to support climate actions?” or “How many climate regulations does a country have?”. Effectiveness, in reality, is much more complicated, however, since it can be difficult to demonstrate causal links between policies and desired outcomes. The gold standard for evaluating policy effectiveness is the experimental/quasi-experimental design which compares empirical observations with a control group. Such approaches are often costly and control groups are difficult to identify (Jacob et al, 2019). And they are often a poor match to the scale on which the policies need to operate.

Political effectiveness

Indicator	Linkage to the progress	Data sources	Literature
Effectiveness of policy adoption	Stakeholder inclusiveness should be balanced between efficiency and equity of climate actions.	<ul style="list-style-type: none"> ● Climate Change Laws of the World (LSE the Grantham Institute) ● Climate Policy Database (NewClimate Institute) ● Energy Policy Tracker ● Documents ● Interviews ● Small-scale questionnaires/surveys 	(Nachmany et al., 2015; Roelfsema et al., 2020)
Effectiveness of policy implementation	Progress is made by gaining more support from powerful political figures.	<ul style="list-style-type: none"> ● Techno-economic data ● Interviews ● Small-scale questionnaires/surveys 	(Nicholson-Crotty and Carley, 2016; Van Den Hoek et al., 2014; Allen et al., 2020; Proctor et al, 2011)
Policy coherence	Progress is made by expanding pro-decarbonization coalitions and neutralizing anti-decarbonization ones	<ul style="list-style-type: none"> ● Policy documents ● Interviews ● Small-scale questionnaires/surveys 	(Gara et al., 2020; Jacob et al., 2019; Mallory, 2016; OECD, 2016; Worker and Palmer, 2020)
Track record on previous climate commitments	Progress is made by discovering and engaging more interest groups that can benefit from climate actions.	<ul style="list-style-type: none"> ● UNFCCC ● National Communications and Biennial Update Reports ● International Environmental Agreements (IEA) Database Project ● Climate Change Performance Index ● Climate Action Tracker ● National climate change mitigation legislation and strategy survey (Newclimate Institute) 	(Averchenkova and Bassi, 2016; Dubash et al., 2013b; Morel and Shishlov, 2014; Höhne et al., 2012)

Table 5. **Indicators and potential data sources for the policy effectiveness dimension.**

Effectiveness of policy adoption: This indicator measures the extent to which policies that are capable of meeting the Paris goals have been designed, identified, and adopted (Bali et al., 2019) – i.e. if the most effective climate policies for this country to reduce greenhouse gas emissions can be adopted successfully. For example, a country has to decide whether to choose carbon taxes or carbon markets for better mitigation results, and it needs to come up with the best design of the instrument it chooses.

It is practical to assess this indicator by using the types (e.g. regulations or market-based instruments) and numbers of current policies addressing climate change. Such data can be retrieved from existing policy databases such as *Climate Change Laws of the World* developed by the London School of Economics and Political Science (LSE), *Climate Policy Database* maintained by the NewClimate Institute and various government documents. However, the above measurements are based on the assumption that the adopted policies are all effective in terms of achieving the Paris goals. In reality, this is not necessarily true. Decision-making on policy design and adoption significantly influences the effectiveness of climate policies, yet policy decision-making is difficult to assess since it often relates to political processes and the context of these policies (Bernauer, 2013; Rodrik, 2008). In this case, interviews, surveys, and/or documents could potentially be used to understand this indicator more accurately.

Effectiveness of policy implementation: This indicator measures how well climate policies aimed at meeting the Paris goals have been implemented. Adopted policies are not necessarily effectively implemented, undermining the achievement of desired outcomes. For example, policies could be poorly implemented when the incentives of the implementers and the policymakers are not aligned. This indicator can be assessed by the degree to which a policy achieves its stated goals (Bali et al., 2019). We have found no existing databases to quantify this indicator directly. However, in many cases, policy outputs are often used as a proxy of the effectiveness of policy implementation (Nicholson-Crotty and Carley, 2016; Van Den Hoek et al., 2014). It makes techno-economic data such as carbon emissions potential measures for implementation effectiveness. But such outputs are not always solely or directly caused by a certain policy. In this case, questionnaires/surveys and interviews with key participants are suitable to assess as well as to quantify this indicator, such as surveys on how people perceive the effectiveness of policy implementation (Pradhan et al., 2017).

Policy coherence: This indicator measures the extent to which domestic climate policies are consistent with each other and coherent at different levels of government from national to local. The indicator aims to answer the question: are a country's climate policies consistent, or are they operating at cross-purposes? Policy coherence is the systematic promotion of mutually-reinforcing policies that can accumulate synergies to achieve objectives. This occurs when the balance of policies is aligned with a common goal or set of intentions (Jacob et al., 2019). Incoherent policies hinder policy effectiveness by creating negative spill-over effects (Hochstetler, 2021b; Mallory, 2016; OECD, 2016). For example, policies to promote renewable energies may conflict with policies to preserve/increase carbon sinks such as forests and grassland due to competition for land use.

Monitoring interactions among related policies is key to evaluating policy coherence. OECD (2016) discusses methods and data sources for assessing policy coherence for the Sustainable Development Goals (SDGs). It introduces a simulation model called Integrated Sustainable Development Goals (iSDG) that monitors the interactions and coherence among various SDG policies. However, few existing datasets can be used to quantify policy coherence in climate change mitigation directly. Policy documents are major sources to generate quantifiable data for this indicator. Interviews with policy-makers and surveys/questionnaires can also be used when necessary.

Track record on previous climate commitments: this indicator measures the past performance of a country's policy effectiveness on climate change prior to the Paris Agreement, particularly with respect to the Kyoto Protocol. Were previous targets met by implementing the right policies? If so, how did the country adopt effective policies and implement them successfully? It is implied that the better the record of a given country on climate actions, the more credible that country will be in making effective policies for the Paris goals.

There are existing datasets that can be directly used to quantify this indicator, including *Climate Change Performance Index*, *Climate Action Tracker* and *National climate change mitigation legislation and strategy survey* (Dubash et al, 2013b). In addition, other data sources have been used to quantify similar indicators. For example, meeting the pledged targets of the Kyoto Protocol is a potential measurement of policy effectiveness for countries that had mandatory targets. And for countries without mandatory targets, the National Communications and Biennial Update Reports requested by UNFCCC could be potential data sources for this indicator (Averchenkova and Bassi, 2016).

Dimension 5: Public opinion

Public opinion provides the socio-political context within which decision-making and operations for climate actions are rooted (Averchenkova and Bassi, 2016; Bernauer, 2013). The public plays a key role in mitigation strategies (Lowe et al., 2006). Awareness of climate change consequences, knowledge on climate change, and concern for climate risks not only influence support for climate policies but also motivate individual climate actions (Marquart-Pyatt et al., 2011). The public opinion dimension evaluates the popular perception of climate change and popular support for climate actions, and it aims to identify barriers to public consensus.

Public opinion

Indicator	Linkage to the progress	Data source	Literature
Climate awareness	Progress is considered to have been made if the public's knowledge on climate change has increased	<ul style="list-style-type: none"> ● Gallup World Poll (2007-2008) ● "Peoples' Climate Vote"(UNDP and University of Oxford, 2021) ● Country-specific surveys: UK (Setterfield and Murray, 2020), US (Funk and Kennedy, 2020) 	(Averchenkova and Bassi, 2016; Lee et al., 2015; Wang and Zhou, 2020)
Public support for climate actions	Progress is considered to have been made if the actions gain more support from the public	<ul style="list-style-type: none"> ● "Peoples' Climate Vote" (UNDP and University of Oxford, 2021) ● Country-specific surveys: UK (Setterfield and Murray, 2020), US (Tyson and Kennedy, 2020) 	(Setterfield and Murray, 2020; Tyson and Kennedy, 2020)
Heterogeneity in perception and specific interests	Progress is considered to have been made by building consensus and a convergence of interests among the public	<ul style="list-style-type: none"> ● Social media ● National/cross-national surveys ● Interviews ● Small-scale questionnaires/surveys 	(Ban Rohring and Akerlof, 2020; Brulle et al., 2012)

Table 6. Indicators and potential data sources for the public opinion dimension.

Climate awareness: This indicator measures the public's level of knowledge on climate change. Climate awareness reflects people's perceptions of climate risks. Increased knowledge of climate risks facilitates behavioral changes toward decarbonization across society (Halady and Rao, 2010), and shapes a country's climate policy preferences (Leiserowitz, 2006). This indicator is quantifiable and generally relies on existing databases (mostly large-scale surveys/polls). Commonly-used databases include the following:

- *Gallup World Polls in 2007 and 2008*, which is the first widely available and remains the largest global survey of public climate awareness to date. For instance, it was recently used by Wang and Zhou (2020). A total of 206,193 interviews were conducted across 128 countries (Pugliese and Ray, 2009).
- *"Peoples' Climate Vote"* is the latest survey conducted by the United Nations Development Program (UNDP) and the University of Oxford on public opinion on climate change, carried out in late 2020. It claims to be the largest international survey of its kind, with 1.2 million respondents from 50 countries (UNDP and University of Oxford, 2021).

- Country-specific surveys include surveys on public attitudes towards climate change in the UK by Ipsos MORI (Setterfield and Murray, 2020), and Pew surveys in the US (Funk and Kennedy, 2020).

Public support for climate actions: This indicator measures the level of support from the public for actions aimed at meeting the Paris goals. Climate policy actions generally depend on gaining and maintaining public support for a wide range of societal changes (Lee et al., 2015). More support from the public also increases political feasibility at all levels. This indicator is quantifiable, and data can also be obtained from the databases identified above for measuring climate awareness.

Heterogeneity in perception and specific interests: This indicator measures the divergence in climate change perceptions and interests of people from the same community, region, state, or other social groups (Ban Rohring and Akerlof, 2020). Despite the broad scientific consensus that climate change is a real phenomenon caused by anthropogenic greenhouse gas emissions, there are nonetheless major public disagreements on the reality and causes of climate change in many countries. For instance, the difference between the stances of liberals and those of conservatives (e.g., Democrats and Republicans) on climate change have widened in the last twenty years in the United States (Deryugina and Shurckov, 2016).

This is a necessary indicator since people's attitudes can be strongly influenced by perceptions of the beliefs and behaviors of others in their social group (Ban Rohring and Akerlof, 2020). In addition, those who benefit and those who suffer from climate change mitigation may hold divergent perceptions towards climate change and defend their interests accordingly. The polarization of perceptions and interests severely undermines the capacity for collective action, as public advocacy is one of the strongest determinants influencing climate change concerns (Brulle et al., 2012). Therefore, building social consensus and convergent interests among the public are key to making progress on climate change mitigation. There are few existing databases that can directly quantify this indicator. Data could be obtained from national/cross-national surveys and polls, social media, and qualitative interviews.

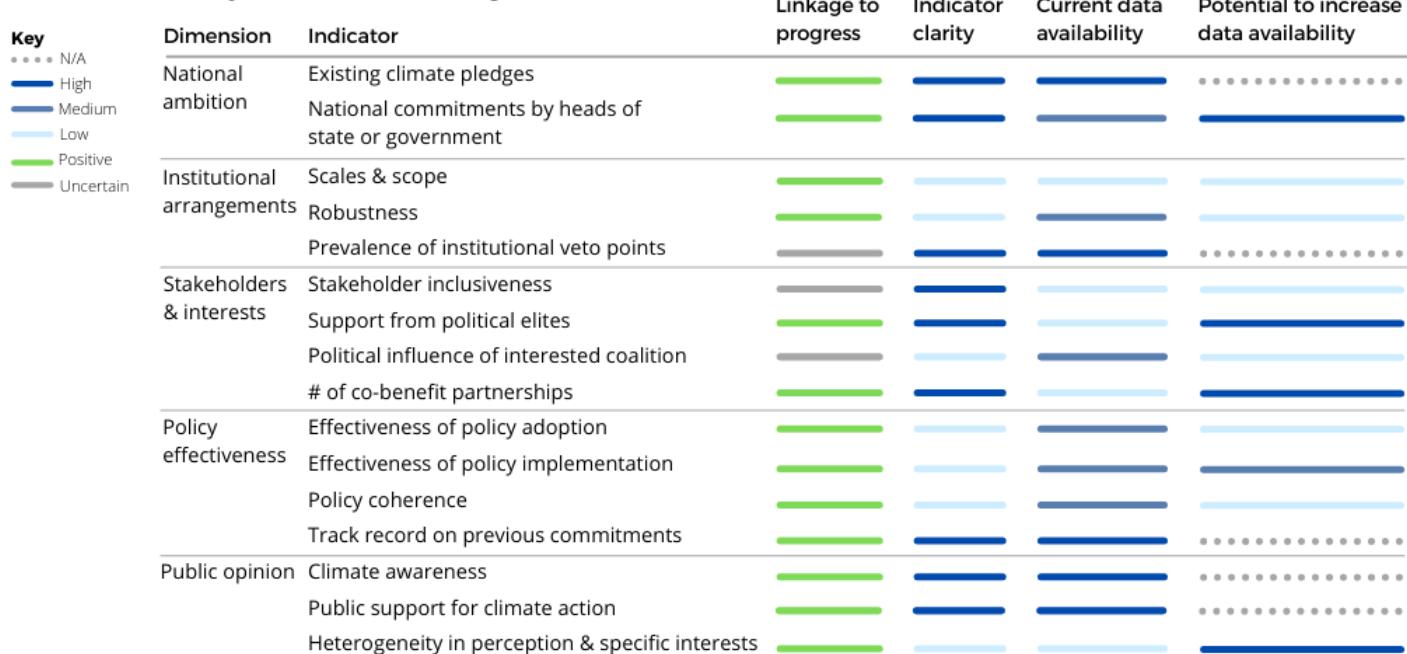
3. EVALUATING DATA AVAILABILITY

In this working paper, we identify 16 indicators from five political economy dimensions that can help to assess progress towards national mitigation goals. We also briefly review the data sources and linkage to the progress for each indicator. We limit our evaluation of data available to the data sources/data collection approaches we have reviewed. Generally speaking, data for these indicators are qualitative as opposed to techno-economic indicators, which are inherently numeric. The challenge is to translate the qualitative evidence into systematically comparable quantitative data when evaluating institutional progress towards the Paris goals. Indicators with high quantifiability can be clearly defined (i.e., requiring minimum interpretation). Nevertheless, this does not mean that qualitative indicators are inconsequential, since they serve as preliminary examinations of local contexts before the collection of quantitative data, and they may be better tools for understanding processes and mechanisms. In this section, we evaluate the definitional clarity and the data availability of each indicator based on the material discussed in Section 2, and we summarize the correlation between each indicator and domestic mitigation progress.

The data availability of each indicator is examined based on two considerations: (1) current data availability and (2) the potential to increase data availability if current data availability is moderate or low. Evaluation criteria are listed in Table 7. Based on the reviewed literature and listed data sources of each indicator, a summary of the overall assessment on links to the progress, indicator clarity, current data availability and potential to increase data availability is presented in Figure 2. Note that indicator clarity and correlation to progress are based on the judgement of the authors.

Indicator clarity	Current data availability	Potential to increase data availability	Links to the progress
High: The degree to which the indicator can be differently interpreted is very low	High: Existing valid, accurate and reliable large-N datasets	High: Existing sources of big data (e.g., social media, official document datasets)	Positive: The indicator and progress move in the same direction
	Moderate: Existing large-N datasets with less validity, accuracy or reliability	Moderate: Data can be collected from national/cross-national scales (e.g., conducting new national or cross-national surveys)	
Low: The indicator has multiple, debatable interpretations	Low: No existing datasets	Low: Data mostly collected from small-N qualitative sources (e.g., interviews)	Uncertain: The correlation between indicator and progress can be both ways

Table 7. Evaluation criteria.

Political economy dimensions of the global stocktakeFigure 2. **Summary of key findings.** Understanding how actors can achieve success in diverse political contexts is a critical next step in delivering action toward global climate goals. This figure presents a framework for identifying areas of current strength as well as needs for additional refinement of indicators, data, and analysis toward supporting increased action.

4. CONCLUDING PERSPECTIVES

This working paper provides researchers and policy-makers with a framework for assessing country-level, political economy progress on climate mitigation. However, it is not our intention to develop a general theory. Our intention is more practical and immediate - to spur the analytical community to more comprehensively track progress on the critical societal dimensions of climate action.

The framework presented here can be viewed through two lenses. First, it helps to identify potentially profitable directions for future research on the political economy of climate change and is therefore useful for expanding the scope for stocktaking. Second, the framework can serve as a topic guide for domestic climate mitigation rooted in different schools and theoretical perspectives of political science. It provides different analytical angles across scales, and it addresses both actors and institutions.

This assessment in this paper highlights many data availability limitations that need to be overcome to assess relevant dimensions and their associated indicators. We acknowledge that creating high-quality quantitative data on qualitative variables has historically been difficult, but better assessment of these variables will be critical for understanding how we can get on a pathway toward our shared climate goals.

REFERENCES

- Allen, P., Pilar, M., Walsh-Bailey, C., Hooley, C., Mazzucca, S., Lewis, C.C., Mettert, K.D., Dorsey, C.N., Purtle, J., Kepper, M.M.2020. Quantitative measures of health policy implementation determinants and outcomes: a systematic review. *Implementation Science* 15, 1-17.
- Averchenkova, A., Bassi, S. 2016 Beyond the targets: assessing the political credibility of pledges for the Paris Agreement Grantham Research Institute on Climate Change and the Environment.
- Bali, A.S., Capano, G., Ramesh, M. 2019 Anticipating and designing for policy effectiveness. Taylor & Francis.
- Ban Rohring, E.J., Akerlof, K.L.2020. Perceptions of social consensus at the regional level relate to prioritization and support of climate policy in Maryland, USA. *Regional Environmental Change* 20, 1-13.
- Beck, T., Clarke, G., Groff, A., Keefer, P., Walsh, P.2001. New tools in comparative political economy: The database of political institutions. *the world bank economic review* 15, 165-176.
- Bernauer, T.2013. Climate change politics. *Annual Review of Political Science* 16, 421-448.
- Bernstein, S., Hoffmann, M.2018. The politics of decarbonization and the catalytic impact of subnational climate experiments. *Policy Sciences* 51, 189-211.
- Boin, A., Lodge, M.2016. Designing resilient institutions for transboundary crisis management: A time for public administration. *Public Administration* 94, 289-298.
- Brulle, R.J., Carmichael, J., Jenkins, J.C.2012. Shifting public opinion on climate change: an empirical assessment of factors influencing concern over climate change in the US, 2002–2010. *Climatic Change* 114, 169-188.
- Cheyns, E.2011. Multi-stakeholder initiatives for sustainable agriculture: limits of the ‘inclusiveness’ paradigm. *Governing through standards: Origins, drivers and limits*, 318-354.
- Clarke, L., Hultman, N. 2021 Mitigation Information and the Independent Global Stocktake. Center for Global Sustainability, College Park, Maryland.
- Deryugina, T., Shurukov, O.2016. The effect of information provision on public consensus about climate change. *PLoS one* 11, e0151469.
- Dubash, N.K.2013a. The politics of climate change in India: narratives of equity and cobenefits. *Wiley Interdisciplinary Reviews: Climate Change* 4, 191-201.
- Dubash, N.K., Hagemann, M., Höhne, N., Upadhyaya, P.2013b. Developments in national climate change mitigation legislation and strategy. *Climate Policy* 13, 649-664.
- Dubash, N.K., Pillai, A.V., Flachsland, C., Harrison, K., Hochstetler, K., Lockwood, M., MacNeil, R., Mildenberger, M., Paterson, M., Teng, F., 2021a. National climate institutions complement targets and policies. *Science* 374, 690-693.
- Dubash, N.K., 2021b. Varieties of climate governance: the emergence and functioning of climate institutions. *Environmental Politics* 30, 1-25.
- Dür, A.2008. Measuring interest group influence in the EU: A note on methodology. *European Union Politics* 9, 559-576.
- Dye, T.R.1992. Understanding public policy [by] Thomas R. Dye.
- Funk, C., Kennedy, B. 2020 How Americans see climate change and the environment in 7 charts. Pew Research Center. <https://www.pewresearch.org/fact-tank/2020/04/21/how-americans-see-climate-change-and-the-environment-in-7-charts/>
- Gara, K.O., Kalfagianni, A., Raymer, C. 2020 Policy coherence between the EU climate regime and the global sustainable development agenda-Deliverable 5.2. Reinvent
- Geels, F.W.2014. Regime resistance against low-carbon transitions: introducing politics and power into the multi-level perspective. *Theory, culture & society* 31, 21-40.
- Giordano, R., Pluchinotta, I., Pagano, A., Scricciu, A., Nanu, F.2020. Enhancing nature-based solutions acceptance through stakeholders' engagement in co-benefits identification and trade-offs analysis. *Science of the Total Environment* 713, 136552.
- Giorgio, C., Sd, C., Afzal, M., Ahmed, F., Codjia, L., Gedik, G.2015. Analysis of the commitments made by national governments of 57 countries at the Third Global Forum on human resources for health. World Health Organization.
- Halady, I.R., Rao, P.H.2010. Does awareness to climate change lead to behavioral change? *International Journal of Climate Change Strategies and Management*.
- Hale, T.2018. The role of sub-state and non-state actors in international climate processes. Londres: Chatham House.

- Hardy, L.J., Wertheim, P., Bohan, K., Quezada, J.C., Henley, E.2013. A model for evaluating the activities of a coalition-based policy action group: the case of Hermosa Vida. *Health Promotion Practice* 14, 514-523.
- Heede, R.2014. Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854–2010. *Climatic Change* 122, 229-241.
- Heikkila, T., Villamayor-Tomas, S., Garrick, D. 2018 Bringing polycentric systems into focus for environmental governance.
- Heikkila, T., Weible, C.M.2018. A semiautomated approach to analyzing polycentricity. *Environmental policy and governance* 28, 308-318.
- Henisz, W.J., Zelner, B.A.2006. Interest groups, veto points, and electricity infrastructure deployment. *International Organization* 60, 263-286.
- Hochstetler, K.2021. Political economies of energy transition: wind and solar power in Brazil and South Africa. Cambridge University Press, 4.
- Hultman, N.E., Clarke, L., Frisch, C., Kennedy, K., McJeon, H., Cyrs, T., Hansel, P., Bodnar, P., Manion, M., Edwards, M.R.2020. Fusing subnational with national climate action is central to decarbonization: the case of the United States. *Nature communications* 11, 1-10.
- Höhne, N., Fekete, H., den Elzen, M.G., Hof, A.F., Kuramochi, T.2018. Assessing the ambition of post-2020 climate targets: a comprehensive framework. *Climate Policy* 18, 425-441.
- Höhne, N.E., Braun, N., Fekete, H., Larkin, J., Elzen, M., Roelfsema, M., van't Hof, A., Böttcher, H. 2012 Greenhouse gas emission reduction proposals and national climate policies of major economies: Policy Brief. Netherlands Environmental Assessment Agency, Bilthoven and ECOFYS, Utrecht.
- Immergut, E.M.1990. Institutions, veto points, and policy results: A comparative analysis of health care. *Journal of Public policy* 10, 391-416.
- Jacob, K., King, P., Mangalagiu, D., Rodríguez-Labajos, B.2019. Approach to Assessment of Policy Effectiveness (Chapter 10), *Global Environment Outlook (GEO-6): Healthy Planet, Healthy People*. UNEP.
- Jordan, A.J., Huitema, D., Hildén, M., Van Asselt, H., Rayner, T.J., Schoenefeld, J.J., Tosun, J., Forster, J., Boasson, E.L.2015. Emergence of polycentric climate governance and its future prospects. *Nature Climate Change* 5, 977-982.
- Junk, W.M.2020. Synergies in lobbying? Conceptualising and measuring lobbying coalitions to study interest group strategies, access, and influence. *Interest Groups & Advocacy* 9, 21-37
- Kammermann, L., Dermont, C.2018. How beliefs of the political elite and citizens on climate change influence support for Swiss energy transition policy. *Energy research & social science* 43, 48-60.
- Karlsson, M., Alfredsson, E., Westling, N.2020. Climate policy co-benefits: a review. *Climate Policy* 20, 292-316.
- Keohane, R.O., Victor, D.G.2011. The regime complex for climate change. *Perspectives on politics*, 7-23.
- Klüver, H.2009. Measuring interest group influence using quantitative text analysis. *European Union Politics* 10, 535-549.
- Kousser, T., Tranter, B.2018. The influence of political leaders on climate change attitudes. *Global Environmental Change* 50, 100-109.
- Köhler, J., Geels, F., Kern, F., Onsongo, E., Wieczorek, A.2017. A research agenda for the Sustainability Transitions Research Network. Sustainability Transitions Research Network (STRN), Sustainable Consumption Institute, University of Manchester: Manchester, UK.
- Lee, T.M., Markowitz, E.M., Howe, P.D., Ko, C.-Y., Leiserowitz, A.A.2015. Predictors of public climate change awareness and risk perception around the world. *Nature Climate Change* 5, 1014-1020.
- Leiserowitz, A.2006. Climate change risk perception and policy preferences: The role of affect, imagery, and values. *Climatic Change* 77, 45-72.
- Levin, K., Rich, D., Bonduki, Y., Comstock, M., Tirpak, D., Mcgray, H., Noble, I., Mogelgaard, K., Waskow, D. 2015 Designing and preparing intended nationally determined contributions (INDCs), World Resources Institute: Washington, DC, USA.
- Lowe, T., Brown, K., Dessai, S., de França Doria, M., Haynes, K., Vincent, K.2006. Does tomorrow ever come? Disaster narrative and public perceptions of climate change. *Public understanding of science* 15, 435-457.
- Madden, N.J.2014. Green means stop: veto players and their impact on climate-change policy outputs. *Environmental Politics* 23, 570-589.
- Mahoney, J., Thelen, K.2009. Explaining institutional change: Ambiguity, agency, and power. Cambridge University Press.

- Mallory, T.G.2016. Fisheries subsidies in China: Quantitative and qualitative assessment of policy coherence and effectiveness. *Marine Policy* 68, 74-82.
- Marquart-Pyatt, S.T., Shwom, R.L., Dietz, T., Dunlap, R.E., Kaplowitz, S.A., McCright, A.M., Zahran, S.2011. Understanding public opinion on climate change: a call for research. *Environment: Science and Policy for Sustainable Development* 53, 38-42.
- Meckling, J., Kelsey, N., Biber, E., Zysman, J.2015. Winning coalitions for climate policy. *Science* 349, 1170-1171.
- Mewhirter, J., Lubell, M., Berardo, R.2018. Institutional externalities and actor performance in polycentric governance systems. *Environmental policy and governance* 28, 295-307.
- Mildenberger, M.2021. The development of climate institutions in the United States. *Environmental Politics*, 1-22.
- Mitchell, R., Rothman, S.2006. Creating Large N Databases from Qualitative Information: Lessons from International Environmental Agreements.
- Morel, R., Shishlov, I.2014. Ex-post evaluation of the Kyoto Protocol: four key lessons for the 2015 Paris Agreement. *Climate Report* no. 44.
- Nachmany, M., Fankhauser, S., Davidová, J., Kingsmill, N., Landesman, T., Roppongi, H., Schleifer, P., Setzer, J., Sharman, A., Singleton, C.S.2015. The 2015 global climate legislation study: a review of climate change legislation in 99 countries: summary for policy-makers.
- Nicholson-Crotty, S., Carley, S.2016. Effectiveness, implementation, and policy diffusion: Or “Can we make that work for us?”. *State Politics & Policy Quarterly* 16, 78-97.
- O’reilly, R.F.2005. Veto points, veto players, and international trade policy. *Comparative Political Studies* 38, 652-675.
- OECD 2016 Better Policies for Sustainable Development 2016: A New Framework for Policy Coherence. OECD Publishing, Paris.
- Ostrom, E.2012. Nested externalities and polycentric institutions: must we wait for global solutions to climate change before taking actions at other scales? *Economic theory* 49, 353-369.
- Pradhan, N.S., Su, Y., Fu, Y., Zhang, L., Yang, Y.2017. Analyzing the effectiveness of policy implementation at the local level: a case study of management of the 2009–2010 Drought in Yunnan Province, China. *International Journal of Disaster Risk Science* 8, 64-77.
- Proctor, E., Silmère, H., Raghavan, R., Hovmand, P., Aarons, G., Bunger, A., Griffey, R., Hensley, M.2011. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Administration and policy in mental health and mental health services research* 38, 65-76.
- Pugliese, A., Ray, J., 2009. Awareness of Climate Change and Threat Vary by Region. Gallup. <https://news.gallup.com/poll/124652/awareness-climate-change-threat-vary-region.aspx>.
- Rennkamp, B., Haunss, S., Wongsa, K., Ortega, A., Casamadrid, E.2017. Competing coalitions: The politics of renewable energy and fossil fuels in Mexico, South Africa and Thailand. *Energy research & social science* 34, 214-223.
- Rodrik, D.2008. Second-best institutions. *American Economic Review* 98, 100-104.
- Roelfsema, M., van Soest, H.L., Harmsen, M., van Vuuren, D.P., Bertram, C., den Elzen, M., Höhne, N., Iacobuta, G., Krey, V., Kriegler, E.2020. Taking stock of national climate policies to evaluate implementation of the Paris Agreement. *Nature communications* 11, 1-12.
- Sadler, B.1996. Environmental Assessment in a Changing World. Evaluating practice to improve performance-final report.
- Setterfield, L., Murray, L. 2020 Research into public attitudes to climate change policy and a green recovery. Ipsos MORI Scotland.
- Shehata, A., Hopmann, D.N.2012. Framing climate change: A study of US and Swedish press coverage of global warming. *Journalism studies* 13, 175-192.
- Stadelmann-Steffen, I.2011. Citizens as veto players: climate change policy and the constraints of direct democracy. *Environmental Politics* 20, 485-507.
- Somanathan, E., Sterner, T., Sugiyama, T., Chimanikire, D., Dubash, N.K., Essandoh-Yeddu, J.K., Fifita, S., Goulder, L., Jaffe, A., Labandeira, X.2014. National and sub-national policies and institutions.
- The world in 2050 initiative 2018 Transformations to achieve the Sustainable Development Goals. International Institute for the Applied Systems Analysis (IIASA).
- Thürk, M., Hellström, J., Döring, H.2021. Institutional constraints on cabinet formation: Veto points and party system dynamics. *European Journal of Political Research* 60, 295-316.

- Tranter, B.2011. Political divisions over climate change and environmental issues in Australia. *Environmental Politics* 20, 78-96.
- Tyson, A., Kennedy, B. 2020 Two-Thirds of Americans Think Government Should Do More on Climate. Pew Research Center. <https://www.pewresearch.org/science/2020/06/23/two-thirds-of-americans-think-government-should-do-more-on-climate/>
- UN.2021 “Climate Commitments Not On Track to Meet Paris Agreement Goals” as NDC Synthesis Report is Published. <https://unfccc.int/news/climate-commitments-not-on-track-to-meet-paris-agreement-goals-as-ndc-synthesis-report-is-published>
- UNDP, University of Oxford 2021 Peoples’ climate vote results.
- UNFCCC.2021 NDC Registry. <https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx>
- Ürge-Vorsatz, D., Herrero, S.T., Dubash, N.K., Lecocq, F.2014. Measuring the co-benefits of climate change mitigation. *Annual Review of Environment and Resources* 39, 549-582.
- Van Den Hoek, J., Ozdogan, M., Burnicki, A., Zhu, A.-X.2014. Evaluating forest policy implementation effectiveness with a cross-scale remote sensing analysis in a priority conservation area of Southwest China. *Applied Geography* 47, 177-189.
- Victor, D.G.2011. Global warming gridlock: creating more effective strategies for protecting the planet. Cambridge University Press.
- Victor, D.G., Akimoto, K., Kaya, Y., Yamaguchi, M., Cullenward, D., Hepburn, C.2017. Prove Paris was more than paper promises. *Nature News* 548, 25.
- Wang, B., Zhou, Q., 2020. Climate change in the Chinese mind: An overview of public perceptions at macro and micro levels. *Wiley Interdisciplinary Reviews: Climate Change* 11, e639.
- Woodruff, C.Measuring institutions. *International handbook on the economics of corruption* 1, 105-127.
- Worker, J. 2017 National climate change governance: Topic guide. GSDRC, University of Birmingham, Birmingham, UK.
- Worker, J., Palmer, N. 2020 A Guide to Assessing the Political Economy of Domestic Climate Change Governance. Working Paper. Washington, DC: World Resources Institute. doi. org/10.46830
- Yackee, J.W., Yackee, S.W.2006. A bias towards business? Assessing interest group influence on the US bureaucracy. *The Journal of Politics* 68, 128-139.