

Global Lessons from Climate Change Legislation and Litigation

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Abstract

There is no country in the world that does not have at least one law or policy dealing with climate change. The most prolific countries have well over 20, and globally there are 1,800 such laws. Some of them are executive orders or policies issued by governments, others are legislative acts passed by parliament. The judiciary has been involved in 1,500 court cases that concern climate change (over 1,100 of which in the US). We use *Climate Change Laws of the World* (CCLW), a publicly accessible database, to analyze patterns and trends in climate change legislation and litigation over the past 30 years. The data reveal that global legislative activity peaked around 2009-14, well before the Paris Agreement. Accounting for effectiveness in implementation and the length of time laws have been in place, the UK and South Korea are the most comprehensive legislators among G20 countries and Spain within the OECD. Climate change legislation is less of a partisan issue than is commonly assumed: the number of climate laws passed by governments of the left, center and right is roughly proportional to their time in office. We also find that legislative activity decreases in times of economic difficulty. Where courts have got involved, judges outside the US have ruled in favor of enhanced climate protection in about half of the cases (US judges are more inclined to rule against climate protection).

1. Introduction

The international climate change architecture commits nations to accelerate their actions on climate change. Under the Paris Agreement, countries are obliged to ratchet up their Nationally Determined Contributions (NDCs) to the Paris process in 2020. According to climate scientists, current emission reduction commitments are likely to result in a global mean temperature rise of around 3°C by 2100, rather than the “well below 2°C” envisaged under Paris (Rogelj et al. 2016).

We observe that national climate action is accelerating. Between 1990 and 1999, only 110 laws and significant policies were passed that directly or indirectly addressed climate change. Between 2010 and 2019 the flow of new laws had grown tenfold to about 1,100 laws and policies. The total stock of climate change laws and policies worldwide now stands at 1,800 and continues to grow.

Our awareness of those initiatives is improving at the same time. In 2013, climate change legislation was tracked in just 33 countries (Townshend et al. 2013). By 2015 the number had risen to 66 countries (Fankhauser et al. 2015a, b). Today coverage is global at the level of nation states. In the course of the data gathering, understanding also grew about the breadth of actions that are relevant to climate change, which brought additional laws into the count. This was the case especially for adaptation laws, where the delineation with related activities, such as disaster risk management, is necessarily fuzzy.

Climate legislation is an essential part of climate change governance, as successful action against climate change requires a legal basis. Emissions pledges are not credible unless the targets, and the measures enacted to achieve them, are rooted in law. Although climate laws and

policies vary greatly in scope and ambition (that is, at the intensive margin), their growing number (the extensive margin) is an important indicator of countries' ambition on climate change.

In addition to the laws, edicts and policies passed by executive and legislative bodies, we are observing an increasing participation by the judiciary in the governance of climate change. About 1,500 climate change-related court cases have so far been identified worldwide, three quarters of which in the United States.

The relationship between climate legislation and litigation is still unclear (Setzer and Vanhala 2019), but broadly the two appear to serve complementary functions. The judiciary is implementing government policy prescriptions, interpreting climate legislation and filling enforcement gaps. While “regulation through litigation” can compensate for deficits in the volume or quality of legislation, the judiciary is also mobilized in countries with progressive climate change legislation. In fact, legal mobilization for climate change—using the courts and legal techniques as an instrument for obtaining wider collective objectives—often occurs combination with other forms of mobilization, such as legislative activity, but also political pressure and grassroots activism (Setzer and Vanhala, 2019).

One of the best tools for tracking global trends in climate change policy, legislation and litigation is *Climate Change Laws of the World* (CCLW), a searchable, publicly accessible database created and maintained by the Grantham Research Institute on Climate Change and the Environment at the London School of Economics.^{1 2} The database is a joint initiative with the Sabin Centre for Climate Change Law at Columbia Law School. At the end of 2019 it featured 1,800 climate laws in 198 jurisdictions, alongside 355 court cases in 36 jurisdictions.³ The aim is

to provide transparency about the actions of individual countries in addressing global climate change, the ultimate collective action problem.

This paper uses CCLW to analyze patterns and trends in national climate change legislation and litigation over the past 30 years. It provides an overview of what countries are already doing—and what countries that are not yet doing it could potentially do—to implement the objectives of the Paris Agreement. We look at the contribution of governments (the executive), parliaments (the legislature) and courts (the judiciary).

Our interest is in high-level patterns. We do not aspire to provide detailed case studies or carefully identified statistical relationships. There is an emerging literature that is aiming to do this (cited below). We restrict ourselves to a few simple statistics and correlations. The data reveal that global legislative activity peaked before the Paris Agreement in around 2009–14. We find that climate change legislation is in most countries a bipartisan concern and that legislative activity decreases in times of economic difficulty. The UK and South Korea are the most comprehensive legislators among the G20, and Spain is the most comprehensive legislator within the OECD. Where courts have got involved, judges outside the US have ruled in favor of enhanced climate protection in about half of the cases.

The next section briefly introduces the CCLW database, including its history, scope, shortcomings and a few descriptive statistics. Section 3 discusses some key findings that may be gleaned from the data. Section 4 concludes.

2. The *Climate Change Laws of the World* Database

2.1 Background

The *Climate Change Laws of the World* database has been compiled over a decade with the help of international partners such as the Inter-Parliamentary Union (IPU), the global organization of national parliaments, and the Global Legislators Organization for a Balanced Environment (GLOBE), an international legislators' forum. The impetus for the initiative was a desire to document national climate action following the 2009 Copenhagen summit and debunk the myth that each country was acting alone (Townshend et al. 2011). Over the years, reporting grew from a handful of major emitters to global coverage. Collaboration with the Sabin Center on Climate Change Law at Columbia Law School from 2015 onward (when the database acquired its current name) allowed the extension of the database from climate change legislation to climate change litigation.

Data are collected in real time from official sources such as government websites, parliamentary records and court documents. There is an internal protocol to ensure new entries conform with CCLW's definition and interpretation of what constitutes climate change legislation and litigation. Most entries contain a link to the actual text of the law or the filing and court decision.

This is the first academic synthesis of the main patterns and trends that the CCLW data reveal. So far, the data have mostly served to assess global progress in adopting climate policies (Dubash et al. 2013; Iacobuta et al. 2018; Townshend et al. 2013), understand the political economy of passing climate laws (Fankhauser et al. 2015a, b), identify good practice in climate change governance (Averchenkova et al. 2017; Jordan *et al.* 2018) and assess the environmental impact of climate legislation (Eskander and Fankhauser 2020). The litigation data have been

used to assess trends in climate litigation (Burger et al. 2017; Setzer and Bangalore 2017; Wilensky 2015) and to analyze particular aspects of climate litigation, such as litigation in the financial sector (Solana 2020) and in the Global South (Peel and Lin 2019; Setzer and Benjamin 2019).

2.2 Climate change legislation

The main part of the CCLW database concerns climate change legislation. The legislation database aspires to be a globally comprehensive record of legislation activities in 198 jurisdictions (197 countries and territories, plus the European Union as a block). It adopts a broad definition of climate legislation, including legislative acts, executive orders and policies of equivalent importance. Legislative acts, passed by parliaments, account for about 40 percent of entries and executive orders and policies, issued by governments, for about 60 percent (see Table 1). For simplicity, we refer to all these interventions as “laws”.

The laws included in CCLW either specifically refer to climate change or promote the sectoral measures required to reduce emissions and increase climate resilience. As such, the database covers the full range of interventions that is relevant to climate change, including:

- overarching policies like carbon pricing schemes (e.g., New Zealand’s *Climate Change Response (Emissions Trading) Amendment*),
- energy sector policies (e.g., Germany’s *Renewable Energy Sources Act*),
- transport interventions (e.g., Brazil’s *Mandatory Biodiesel Requirements*),
- forestry interventions as relate to climate (e.g., the Democratic Republic of Congo’s *Law on Protection of the Nature*), and
- adaptation interventions (e.g., Japan’s *Climate Change Adaptation Act*).

A particularly important category is strategic framework laws, which aim to create a unifying institutional structure to reduce greenhouse gas emissions or address physical climate risks, or often both. An instructive example is the UK *Climate Change Act* of 2008, which (i) sets a legally binding long-term mitigation goal (since strengthened to net-zero by 2050), (ii) legislates intermediary short-term targets (or carbon budgets), (iii) creates an independent advisory body (the Committee on Climate Change), (iv) establishes a continual process of adaptation planning, and (v) mandates regular government reporting on progress (Averchenkova et al. 2020; Muinzer 2018).⁴ Many of these features have been replicated in other framework laws, for example Mexico's *General Law on Climate Change* 2012,⁵ New Zealand's *Climate Change Response (Zero Carbon) Amendment Bill* 2019,⁶ and the climate change acts of several European countries (Nash and Steurer 2019). South Korea's *Framework Act on Low-Carbon Growth* 2010 stands out because it couches climate action in a wider green growth narrative, combining environmental with industrial policy.⁷

However, the majority of climate laws concern sector-specific interventions, in particular on energy. About 60 percent of laws contain provisions on energy supply, such as the promotion of renewable energy, and / or energy demand, such as industrial or residential energy efficiency. Interventions on transport and forestry are less frequent. About a third of all laws concern climate resilience and adaptation to climate risks. CCLW now also covers disaster risk management, that is, laws concerned with the impacts of current climate variability, rather than future climate change.

Insert Table 1 here (Descriptive legislation statistics)

2.3 *Climate change litigation*

The litigation database within CCLW is different from the legislation database in that it does not aspire to be comprehensive in its geographic coverage or in the number of cases it contains.

CCLW adopts a broad definition of litigation in terms of actors (governmental and non-governmental), jurisdictional levels (local, regional, national and international) and the profile of the case (climate as central or peripheral). Included in the database are lawsuits brought before administrative, judicial and other investigatory bodies that raise issues of law or fact regarding the science of climate change and climate change mitigation and adaptation efforts (Markell and Ruhl 2012; Burger et al. 2017). The case files contain keywords such as climate change, global warming, global change, greenhouse gas, GHGs, and sea level rise. Cases that make only passing reference to the fact of climate change, its causes or its effects are excluded if they do not address in direct or meaningful fashion the laws, policies or actions that compel, support or facilitate climate mitigation or adaptation. Cases that seek incidentally to accomplish (or prevent) climate change policy goals without reference to climate change issues are not included (Burger et al. 2017). Thus, for example, the database does not include cases in which the parties seek to limit air pollution from coal-fired power plants but do not directly raise issues of fact or law pertaining to climate change.

The identification of climate change litigation also involves characterizing the centrality of climate change issues to the case (Peel and Osofsky 2015; Bouwer 2018). Climate change can range from being a *central* issue in a case, to *peripheral*, that is, litigation that was brought in part over climate change issues but focuses on other grounds (for example, disputes over the siting of wind farms or about subsidies for renewable energy). Litigation that is *not explicitly* tied

to climate change arguments but is within the context of climate change (for instance, disputes relating to insurance and risk, or intellectual property rights) has been underappreciated by the literature, but has important strategic, policy and governance implications because it could implicitly impact on accessibility of finance or new technologies to support climate change (Bouwer 2018).

The vast majority of climate change litigation cases (1,154) has been filed in the United States, and these are contained in a separate database. The material difference between US and non-US cases makes cross-country analysis and the comparison of US and non-US trends impracticable. We focus our analysis on the 355 cases that have been filed in 36 non-US jurisdictions (as of end-2019). The majority of them are in Australia (96 cases) and in the European Union (57 cases). The database also includes 18 cases that have been brought before supranational tribunals such as the UN Human Rights Committee, the Inter-American Commission on Human Rights, and the Inter-American Court on Human Rights. (See Appendix Table A4 for details).

Over 80 percent of the non-US cases have been brought against governments, and typically the plaintiff is either a private company or a non-governmental organization (NGO). Lawsuits against private defendants are still relatively rare (Table 2; see also Wilensky 2015). Most cases are routine and concern the application, interpretation and enforcement of laws such as planning law or the operation of emissions trading schemes (Markell and Ruhl 2012; Bouwer 2018).

Climate change is at the core of the legal argument in less than 40 per cent of cases (138 out of 355). A smaller number of these lawsuits can be described as strategic cases. The delineation is not firm, but these are high-profile claims brought either against governments,

where plaintiffs seek increased mitigation ambition, or against large emitters, where plaintiffs seek compensation for damages caused by, or costs incurred due to, climate change. Their aim is to advance policy outcomes and to drive behavioral shifts by key actors (Peel and Osofsky 2015). Table 3 contains summaries of three landmark cases (*Urgenda Foundation v. State of the Netherlands*; *Leghari v Federation of Pakistan*; and the *Carbon Majors Inquiry*), which received considerable media attention and have inspired similar cases in other jurisdictions.

Insert Table 2 here (Descriptive litigation statistics)

Insert Table 3 here (Strategic litigation cases)

2.4 Limitations

While CCLW is arguably the most comprehensive database of its kind, it has some limitations. In terms of legislation data, an important issue is that the database is silent about the quality of different laws. Stringent and comprehensive framework laws like the UK *Climate Change Act*, which has been praised for its innovative features (Averchenkova et al. 2020; Muinzer 2018), are treated in the same way as unsuccessful laws such as Indonesia's various attempts to combat deforestation.

The delineation of what does and does not constitute a climate change law can be difficult. Although CCLW errs on the side of inclusion, by restricting the collection to certain categories of climate-related laws and policies, the dataset presents an incomplete picture of regulatory efforts relating to climate change (Scotford and Minas 2019). The issue is perhaps most pertinent in the areas of adaptation and land-use change, but similar definitional issues also affect the litigation database.

The legislation database focuses on national climate policy, which means initiatives at the sub-national level and by non-state actors are not covered. State, province and city-led initiatives are particularly significant in countries with federal structures or where national engagement with climate change has been intermittent, such as Australia, Brazil, Canada and the United States. In each of these countries, climate policy at sub-national level is fairly advanced and often ahead of the national discourse.

Conversely, in EU member states a focus on national climate policy would ignore the important role of the European Union in national climate policy. The EU has passed 33 climate laws, including legislation to set up an EU-wide emissions trading scheme and establish ambitious targets on renewable energy, which are legally binding for its member states. Fortunately, there is a relatively easy fix to this bias, which is to add all EU laws to the tally of member states (Eskander and Fankhauser 2020).

A potential problem for time series or panel data analysis is that when laws are amended the database only records the latest version, thus omitting earlier activities. Legal provisions are often tightened over time (as for example Switzerland did when revising its *CO2 Act* in 2013), but there are also cases of reversal (such as the repeal of Canada's *Kyoto Implementation Act* in 2012 and Australia's *Clean Energy Act* in 2014). In each case, these events supersede earlier database entries.

The litigation dataset has its own limitations. Perhaps the most important one concerns data collection. While the CCLW dataset is the largest one compiled to date, it cannot be deemed representative or comprehensive. Rather, the dataset consists of cases from a limited number of countries, dictated by data accessibility and language considerations. The case list heavily relies on partners of the data providers and on media reports, predominantly in English—ultimately

meaning we cannot be sure of the full extent of unidentified litigation cases. Moreover, due to different regulation and litigation cultures, the database is highly uneven, with the majority of the cases attributable to a few jurisdictions. Finally, the CCLW dataset does not include litigation in the US, where the majority of cases has been brought and where, due to relative advantages in procuring information about the cases, the data is closer to being comprehensive.

3. Insights

3.1 *The peak in climate change legislation predates the Paris Agreement*

Practically all climate change laws have been passed over the last 30 years (Figure 1). In 1990, there were only 35 laws with relevance to climate change worldwide (Table 1 above). As there was little awareness of the climate issue at that time, most of these laws had related objectives such as energy efficiency (e.g. Costa Rica's *Energy Law* 1990). Other early laws had wider environmental objectives that were later applied to climate change. For example, the US *Clean Air Act* 1963 is concerned with air pollution, but after a 2007 ruling by the Supreme Court (*Massachusetts vs Environmental Protection Agency*), the Obama administration used it as the legal basis to regulate greenhouse gas emissions.

Insert Figure 1 here (Climate change legislation over time)

By the mid-1990s the number of climate laws began to rise. Prominent early examples are Sweden's *Carbon Tax Act* 1991 and Japan's *Act on Promotion of Global Warming Counter Measures* 1998. Law making reached a peak in the period 2009-14, when over 120 new laws were passed each year. During this heyday, significant framework laws were passed for example in the UK (2008), South Korea (2010) and Mexico (2012). The European Union's *2020 Climate and Energy Package* with its 20-20-20 targets (for emissions, renewable energy and energy

efficiency) was also passed in this period. In the United States, a law of similar standing, the *American Clean Energy and Securities Act 2009*, known as the Waxman-Markey Bill after its sponsors, was approved by the House of Representatives, but not tabled in the Senate. After 2014, legislative activity began to tail off.

The 2009-14 peak was supported by increased activity in developing countries, sometimes with the support of development agencies. Many of these interventions concerned adaptation, which was a bigger legislative focus than in the industrialized world. Most of them were policy documents, such as Ethiopia's *Climate-resilient Green Growth Strategy 2011*. Legislative acts passed by parliament are much rarer (Table 1 above), although there are notable exceptions such as Kenya's *Climate Change Act* of 2016.

Climate change litigation cases peaked at around the same time, although the rise was more sudden, with very few cases before the mid-2000s (Figure 2). Litigation was spearheaded in industrialized countries (EU and OECD member states, including the US), with a much slower ramp up of cases elsewhere.

Insert Figure 2 here (Climate change litigation over time)

It is difficult to discern an impact of external factors, such as the international climate negotiations, on national climate legislation or litigation. Fankhauser *et al.* (2015b) found a statistically significant difference in legislative activity between Annex 1 (industrialized) and non-Annex 1 (developing) countries in the aftermath of the Kyoto Protocol, which imposed binding obligations on the former. However, the effect was temporary and relatively small.

The impact of the Paris Agreement appears equally limited. The peak in legislative activity clearly pre-dates the Agreement, which was signed in December 2015. Only about 230

climate-relevant laws were passed in the subsequent four years, which is less than half the annual rate than during the peak years.

The more significant impact of the Paris Agreement was perhaps on the ambition of new laws (the intensive margin), rather than their number (the extensive margin). Several countries, including Sweden (2017), France (2019), New Zealand (2019) and the UK (2019) have passed acts to put into law an economy-wide net-zero emissions target (that is, a balance between emissions and their removal from the atmosphere) in line with the Paris objectives. However, analysis has shown that very few of the emissions pledges contained in countries' NDCs are matched by legislated national emissions targets (Nachmany and Mangan 2018). The legislative implementation of the Paris Agreement is still far from complete.

3.2 Spain, the UK and South Korea are the most comprehensive legislators

Every country in the world now has at least one climate law, as defined by CCLW, and in some jurisdictions the number is well over 20 (Figure 3a). The median country has passed eight climate change laws and policies (Table 1).

Insert Figure 3 here (Map of climate legislation and litigation by countries)

The number of climate laws a country has passed tells us something about the interest of its law makers in climate change. However, it is not a perfect indicator of climate action. Simply counting the number of laws ignores the considerable heterogeneity that exists in countries' legislative approaches to climate change (Averchenkova et al. 2017). What is covered in one overarching piece of legislation in one country may require several separate interventions in another. China, for example, only has 8 climate change laws, but this includes powerful provisions incorporated in the 12th and 13th *Five Year Plan*. In comparison, Brazil has 28 recorded climate change laws, including 8 interventions trying to halt deforestation. In Europe,

Sweden has 11 climate change laws, compared with 20 laws in the UK. Yet both countries are seen as leaders in the fight against climate change.

Bearing this caveat in mind, we calculate three statistics that we believe are informative about countries' determination to act on climate change. The first indicator is the number of laws that were on the statute book (or more accurately, in the CCLW database) by the end of 2019. The second indicator accounts for government effectiveness. The presumption is that laws passed by effective governments are more likely to be implemented, and therefore have a higher real-world impact, than those passed by ineffectual governments. Our effectiveness indicator is the Rule of Law variable from the Worldwide Governance Indicators by Kaufman et al. (2010). The variable captures "perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the court" (Kaufman et al. 2010).⁸

The third indicator factors in the date when a law was passed, by calculating the number of law-years in a country. For example, the UK *Climate Change Act*, which was passed in 2008 has a weight of 12. The presumption is that laws that were passed early on have had a longer and therefore bigger impact on climate policy. Law-years are again weighted by the level of government effectiveness to account for differences in implementation.

Table 4 reports the top and bottom five performers among three (overlapping) sets of countries, the G20 group of leading economies, the member states of the Organization for Economic Cooperation and Development (OECD), and the member states of the European Union during the period of interest. The full set of results can be found in Appendix Table A1.

The three indicators lead to very consistent results, with rank correlations of 0.88 or more between them. However, for individual countries there can be interesting deviations, related to

the effectiveness with which laws are implemented. European countries like Spain, Italy and the UK are among the most prolific legislators, with over 20 laws each (not counting EU-level laws, which also apply to member states). Spain and the UK, and to a lesser extent Italy also score well in the other two indicators, as European countries tend to have relatively effective governments and many of their climate laws are several years old. However, government effectiveness makes a difference in Brazil and Indonesia. Both countries are in the top-five G20 countries in terms of number of laws, but controlling for government effectiveness and law-years, the best G20 performers are the UK and South Korea.

Insert Table 4 here (Country-law statistics)

3.3 Climate legislation is less of a partisan issue than commonly assumed

A striking feature of the climate change debate, particularly in anglophone countries like Australia, Canada and the United States, is the strong party-political divide. There is evidence that left-of-center governments are generally more inclined to legislate on the environment (Neumayer 2003), but the issue appears particularly pronounced for climate change, where we observe a notable undercurrent of climate skepticism on the political right (McCright and Dunlap 2011a, b; and Painter and Ashe 2012). However, the effect of party politics on environmental policy is complex (Carter *et al.* 2018), and it has also been suggested that that right-wing climate skepticism may primarily be an Anglo-Saxon phenomenon (Fankhauser et al. 2015a). There may also be a gender dimension (Mavisakalyan and Tarverdi 2019).

To shed more light on this debate we look at climate change legislation in the democratic countries of the sample, defined as countries with a democracy score of 6 or more in the Polity IV dataset (a standard measure of democratic quality).⁹ For each of these countries we calculate

the fraction of climate change laws that was passed by administrations of a particular political orientation (right, left or center), divided by the share of years they have been in power.

Algebraically, the indicator for partisanship P has the form:

$$P_i = \frac{L_i / L_{tot}}{Y_i / Y_{tot}} \quad (1)$$

where, L denotes number of laws passed, Y denotes years in power and subscript i denotes political orientation, $i = \{left, right, center\}$. Data on party-political orientation was taken from the World Bank's Database of Political Institutions (DPI).¹⁰

The indicator has a straightforward interpretation: A score greater than one suggests that governments of political persuasion i are disproportionately inclined to pass climate change legislation. Their share of climate laws is greater than their relative time in power. A score less than one suggests a comparative reluctance to legislate on climate change.

Figure 4 shows the distribution of scores across the 99 democratic countries we considered, split by legislative acts (passed by parliament) and executive orders (issued by governments). For the country-level results of combined (parliamentary and executive) activity see Appendix Table A2. We would expect the distribution for the right-wing index to be to the left of one (i.e., most countries score less than one) and those for left and center parties to be to the right of one. However, this is not what we find. For most distributions we cannot reject the hypothesis that their mean is equal to one (Table 5). In industrialized countries (OECD and European Union members), and for all countries in the case of legislative acts, there is no statistical evidence that the number of climate laws passed by governments of the left, center and right is not proportional to their time in office. Only in the case of executive orders issued by

governments outside the OECD / EU does the political right appear to be less inclined to act on climate change.

Although we do not control for confounding factors, this suggests that the task of passing climate change legislation is less of a partisan issue than the public debate in countries like the Australia, Canada and United States would make us believe.

Of course, indicators like equation (1) mask important political dynamics, and the left-right divide does not always mirror a divide on environmental matters (Carter 2018; Carter et al. 2018). The UK, for example, has a low right-wing party score of 0.6 (Appendix Table A2), but climate policy has mostly transcended party lines. The opposition Conservatives supported many of the laws put forward by Labour governments, most notably the *Climate Change Act* 2008. The US score of 1.3 reflects the fact that the legislative and executive are often controlled by different parties. President Obama's flagship *Clean Power Plan*, for example, was an executive order passed in 2015, when Congress was in Republican hands.

Insert Figure 4 here (Histogram of political orientation scores)

Insert Table 5 here (Statistical tests of political orientation)

3.4 Climate legislation slows during difficult economic times

Climate change requires persistent policy intervention over decades and as such it should cut across the business cycle. Nevertheless, there is a question about countries' determination to pursue climate policy in difficult economic times.

There are two sides to the argument. On the one hand, concern for the environment may have less political traction during a recession, when issues like growth and employment take center stage. Kahn and Kotchen (2010) found that interest in the environment tends to wane in

difficult economic times. On the other hand, green investment—or a “green deal”—can be an effective fiscal stimulus, as argued by Barbier (2010) and Zenghelis (2012). In the aftermath of the 2008 financial crisis, governments in Europe and elsewhere saw climate investment as a promising way to kick start an ailing economy (Bowen and Stern 2010). The same call is now being made with respect to the Covid-19 recovery (Hepburn et al 2020).

CCLW can help to shed some light on the link between climate legislation and the business cycle (see Doda 2014 for a related application). We use Hodrick-Prescott decomposition to calculate the cyclical component of GDP and identify the periods during 1990 to 2017 when national economies were performing above trend ($HP > 0$) and below trend ($HP < 0$).¹¹ Using the same structure as equation (1), we then calculate the share of climate laws passed while the economy is underperforming, divided by the fraction of years when this was the case.

Countries where legislative activity slowed down in difficult economic times will have a score of less than one, while countries that sought to implement green deal-style policies may have a score greater than one. Figure 5 displays the distribution of scores across countries (the full results reproduced in Appendix table A3). The scores are skewed slightly to the left, suggesting a majority of countries legislates less in difficult economic times. This is confirmed by statistical tests (Table 6).

We conclude that the business cycle has had a material impact on the pace of climate change legislation, notwithstanding the fact that the peak in climate legislation coincided with the aftermath of the 2008 financial crisis (Figure 1). This raises questions about the likelihood of ratcheting up NDCs in accordance with the Paris Agreement, as the next round of NDC reviews will likely occur during a global recession, caused by Covid-19.

Insert Figure 5 here (Histogram of business cycle scores)

Insert Table 6 here (Statistical tests of business cycle scores)

3.5 Non-US judges tend to rule in favor of climate action

The role of the judiciary in climate change governance does not just depend on the number of cases brought, but also on their outcomes. We are therefore interested in the extent to which judges rule against or in favor of tighter climate action. CCLW contains this information for most cases where a ruling has been issued.

The way judges rule is particularly material in the case of strategic court cases (such as those in Table 3), which play an important supporting role in ensuring the national implementation of international emission-reduction commitments and the alignment of national laws with the Paris Agreements (Peel and Osofsky 2015; Setzer and Vanhala 2019). However, we are interested in the broader role of courts beyond just high-profile cases.

To inform this issue, court rulings have been classified as either strengthening climate action or weakening climate action. The distinction is similar to another classification found in the literature, which splits court cases into “pro” and “anti” regulatory suits, depending on the aims of the plaintiffs (Markell and Ruhl 2012; Hilson 2012). “Pro” (also known as “favorable”) cases are brought with the objective of increasing regulation or liability associated with climate change; and “anti” (also known as “con” or “hindering”) cases aim to decrease regulation or liability (Wilensky 2015). However, here we are interested in the ruling of the judge, rather than the objective of the plaintiff.

In the United States, an earlier analysis of cases brought between 1990 and 2016 found that outcomes favored anti-regulatory litigants compared with pro-regulatory litigants by a ratio of 1.4 to 1 (McCormick et al. 2018). We re-examined 534 of these cases and found that judges

ruled in favor of more climate regulation in 225 (42%) of them (Table 7). Examined by topic, pro-regulation litigants have tended to win renewable energy and energy efficiency cases, but frequently lost coal-fired power plant cases (McCormick et al. 2018). This win ratio seems to have been enough to shape some policy outcomes. According to Osofsky (2012) climate litigation has brought about credible steps to increase the share of renewable energy in the US electricity mix.

Outside the United States, judges appear more inclined to support climate action. There are 355 non-US court cases where a judgement has been reached and the climate change outcome has been assessed. Among these, the ruling has been supportive of climate change action in 187 cases, or about half of the time (Table 7). The number is slightly lower than in Setzer and Byrnes (2019), who found that judges favored pro-regulatory litigants over anti-regulatory litigants by a ratio of 1.6 to 1. In Australia, the country with the highest number of cases outside the US, these court rulings have apparently been instrumental in forcing administrative decision-makers to consider climate change impacts in the approval of certain large-scale projects (Preston 2011; Peel 2011; Hughes 2019).

Insert Table 7 here (Judicial rulings)

4. Conclusions

This paper uses *Climate Change Laws of the World* (CCLW), a publicly accessible, searchable database hosted by the Grantham Research Institute on Climate Change at the London School of Economics, to identify trends in climate change legislation and litigation over the past 30 years.

CCLW documents the explosion of national climate change legislation over this period, although global action on climate change still falls short of what the Paris Agreement requires. By the end of 2019, the database contained 1,800 climate change laws and policies of similar status worldwide, compared with 35 laws in 1990 and 145 laws in 1999. Only about 40 percent of these laws are legislative acts passed by parliaments. The remainder are executive orders, decrees or significant policies issued by governments.

The judiciary got involved in 1,500 court cases in which climate change was a concern, three quarters of which in the US. In about half of the non-US cases for which there is a ruling, the judges strengthened or upheld climate change concerns. Earlier (pre-2017) evidence for the US suggests that the odds of a pro-climate outcome are lower in the United States.

There is no country in the world that does not have at least one law or policy dealing with climate change, and the most prolific countries have well over 20 such laws. Accounting for government effectiveness and the length of time a law has been in effect, Spain, the UK and South Korea are the most comprehensive legislators on climate change.

Global legislative activity peaked in the period 2009-14, when jurisdictions like the EU, Mexico, South Korea and the UK passed their flagship framework laws on climate change. While unable to ascertain causality, the fact that climate legislation peaked before the 2015 Paris Agreement suggests that a push in national climate legislation could have facilitated the Paris Agreement, rather than the other way round.

The Paris Agreement has probably influenced national climate legislation more with respect to the ambition of climate laws, rather than their number. Following Paris, several countries—most notably, France, New Zealand, Sweden and the UK—have adopted binding net-

zero emissions targets that are consistent with the Paris objectives. However, most of the emissions pledges contained in NDCs have yet to be translated into legislated targets.

Without going into careful statistical identification, the data reveal some interesting and perhaps surprising patterns. We find that climate change legislation is much less of a partisan issue worldwide than the debate in countries like the Australia, Canada and United States would suggest. In industrialized countries (OECD plus European Union members), the number of climate laws passed by governments of the left, center and right is proportional to their time in office. Only in democracies outside this group is the political right less inclined to legislate on climate change.

We further find that legislative activity fluctuates with the business cycle and slows down in times of economic difficulty. This is despite the fact that the peak in climate change legislation coincided with the aftermath of the 2008 global financial crisis. It suggests that the pace of climate action may decline in the aftermath of the coronavirus pandemic.

CCLW has so far mainly been aimed at policy audiences, where it has helped to build trust among international policy makers and support legislators in drafting their own climate laws. It is only now starting to be utilized in academic research. Initial applications have used the data to assess global progress in adopting climate policies, understand the political economy of passing climate laws, identify good practice in climate change governance, assess the environmental impact of climate legislation, and identify general trends in climate litigation. It is hoped that this paper will stimulate other scholars to use the data in their own research.

Appendix

Insert Tables A1, A2, A3, and A4 here

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Endnotes

¹ *Climate Change Laws of the World* can be accessed at <https://climate-laws.org>.

² There are other databases, which focus on particular policy processes, sectors or subsets of countries. The Climate Policy database project (<http://climatepolicydatabase.org>) gathers information on which countries are implementing good-practice policies or policies to reduce

carbon emissions. The International Energy Agency (IEA) Policies and Measures Database (<https://www.iea.org/policies>) provides access to information on past, existing or planned government policies and measures to reduce GHG emissions, improve energy efficiency and support the development and deployment of renewables and other clean energy technologies. ClimateWatch (<https://www.climatewatchdata.org>) tracks progress with Nationally Determined Contributions (NDCs) to the Paris Agreement.

³ Information on climate change litigation in the United States is contained in a separate database maintained by the Sabin Centre. The data can be accessed at <http://climatecasechart.com/us-climate-change-litigation/>. The database is maintained in collaboration with the law firm Arnold & Porter, to which the Sabin Center has close links.

⁴ Full text and summary available at: <https://climate-laws.org/cclow/geographies/united-kingdom/laws/climate-change-act-34405aa9-396e-4a78-a662-20cad9696365>.

⁵ Full text and summary available at: <https://climate-laws.org/cclow/geographies/mexico/laws/general-law-on-climate-change>. For challenges in implementing the law, see Averchencova and Guzman Luna (2018).

⁶ Full text and summary available at: <https://climate-laws.org/cclow/geographies/new-zealand/laws/climate-change-response-act-2002-as-amended-by-the-climate-change-response-zero-carbon-amendment-act>.

⁷ Full text and summary available at: <https://climate-laws.org/cclow/geographies/south-korea/laws/framework-act-on-low-carbon-green-growth-regulated-by-enforcement-decree-of-the-framework-act-on-low-carbon-green-growth>.

⁸ The Worldwide Governance Indicators are collected by the World Bank and available on <https://info.worldbank.org/governance/wgi/>. The indicators reflect the views of a large number of enterprises, citizens, and experts on different aspects of governance, including *inter alia* the rule of law. The original scale was converted into a [0,1] range as follows: $g_i = \frac{g_i^{orig} - g^{min}}{g^{max} - g^{min}}$.

⁹ Polity IV is an annual, cross-national time-series which assesses democratic and autocratic patterns of authority and regime changes in all independent countries. The data are available on <https://www.systemicpeace.org/inscrdata.html>

¹⁰ DPI contains data on institutional and electoral factors, such as checks and balances, tenure and stability of the government, party affiliations and ideology, among others. The data are available on <https://datacatalog.worldbank.org/dataset/wps2283-database-political-institutions>.

¹¹ The Hodrick-Prescott filter (after Hodrick and Prescott 1997) is a common decomposition method used in macroeconomics. It is calculated in statistical packages like STATA (using the command “tsfilter hp”).

Table 1: Descriptive statistics on climate change legislation

	All countries [N=198]	OECD-EU countries [N=42]	Other countries [N=156]
Total number of laws			
Total	1,800	605 (33.6% of all laws)	1,195 (66.4%)
Pre-1990	35	24 (68.6%)	9 (31.4%)
1990-1999	110	38 (34.6%)	72 (65.4%)
2000-2009	554	203 (36.6%)	351 (63.4%)
2010-2019	1,101	340 (30.9%)	771 (69.1%)
Laws by topic (1990-2019)			
Framework laws	238	85 (35.7%)	153 (64.3%)
Laws addressing GHG emissions (mitigation laws)	1,620	549 (33.9%)	1,071 (66.1%)
Mitigation laws focused on energy (energy laws)	1,055	395 (37.4%)	660 (62.6%)
Laws addressing climate resilience (adaptation laws)	641	143 (22.3%)	498 (77.7%)
Laws by type (1990-2019)			
Executive orders or policies	1,023	244 (23.9%)	799 (76.1%)
Legislative acts	742	337 (45.4%)	405 (54.6%)
Number of laws by country (1990-2019)			
Mean	8.9	13.8	7.6
Standard deviation	6.3	7.5	5.2
Median	8	12	6
Minimum	1	1	1
Maximum	38	38	28

Notes: All data from *Climate Change Laws of the World*. Some laws deal with multiple issues, hence the higher totals for “laws by topic”.

Table 2: Descriptive statistics on climate change litigation

	All jurisdictions (excl US) [N=36]	OECD-EU (excl. US) [N=21]	Other jurisdictions [N=15]	US
Total number of cases				
Total	355	300 (85%)	55 (15%)	1,154
Pre-1990	0	0	0	2
1990-1999	4	4	0	5
2000-2009	117	109	8	231
2010-2019	234	187	47	916
Number of climate-centric cases				
Total	138	103 (75%)	35 (25%)	
1990-1999	0	0	0	
2000-2009	28	25	3	
2010-2019	110	78	32	
Number of cases by jurisdiction (1990-2019)				
Mean	9.9	14.3	3.7	
Standard deviation	20.1	25.3	4.7	
Median	2	2	2	
Minimum	1	1	1	
Maximum	96	96	18	
Court cases by type (1990-2019)				
Plaintiff=Public; Defendant=Public	48	32	16	59

Plaintiff=Public; Defendant=Private	17	14	3	27
Plaintiff=Public; Defendant=NGO	10	9	1	8
Plaintiff=Private; Defendant=Public	117	116	1	90
Plaintiff=Private; Defendant=Private	6	6	0	3
Plaintiff=Private; Defendant=NGO	10	10	0	7
Plaintiff=NGO; Defendant=Public	141	107	34	563
Plaintiff=NGO; Defendant=Private	24	19	5	65
Plaintiff=NGO; Defendant=NGO	4	4	0	16

Table 2 notes: Cases by type involves the following three parties: Public (federal, state/local and tribal government and different departments of the governments), Private (corporations and businesses) and NGO (non-profit organizations and individuals). There were multiple types of plaintiffs in 10 cases, whereas 12 cases had multiple types of defendants. Data for the US come from McCormick *et al.* (2018) who studied 838 cases between 1990-2016. The totals under “Court cases by type” therefore differ from the total numbers reported at the top of the table. This list includes cases with international and regional jurisdictions, with EU-jurisdiction cases included in total EU cases.

Source: Authors based on *Climate Change Laws of the World*, Sabin Center data and McCormick *et al.* (2018).

Table 3: Prominent strategic litigation cases

Case	Year started	Plaintiff	Defendant	Summary and status
<i>Urgenda Foundation v. State of the Netherlands</i>	2013	Dutch environmental group, the Urgenda Foundation, and 900 Dutch citizens	State of the Netherlands	The first case to argue successfully for the adoption of stricter emissions reduction targets by a government. In December 2019, the Dutch Supreme Court upheld earlier rulings, which required the Netherlands to reduce its emissions by at least 25 percent on 1990 levels by 2020. Even before the final decision by the Supreme Court, the case triggered substantial changes in government policy, including the adoption of the <i>Climate Act</i> 2019 and the decision to phase out coal-fired power generation by 2030 (Verschuuren 2019; Jodoin <i>et al.</i> 2018). The case motivated a wave of Urgenda-inspired climate change litigation across the world.
<i>Leghari v Federation of Pakistan</i>	2015	Ashgar Leghari	Federation of Pakistan	An appellate court in Pakistan granted the claims of Ashgar Leghari, a Pakistani farmer, who had sued the national government for failure to implement the National Climate

Case	Year started	Plaintiff	Defendant	Summary and status
				Change Policy of 2012 and the Framework for Implementation of Climate Change Policy (2014-2030). The court, citing domestic and international legal principles, determined that "the delay and lethargy of the State in implementing the Framework offend the fundamental rights of the citizens."
<i>Carbon Majors Inquiry</i>	2015	Greenpeace Southeast Asia, Philippine Rural Reconstruction Movement and 12 NGOs, 20 individuals, and 1,288 Filipinos (signatories of a petition)	50 investor-owned Carbon Majors (largest producers of crude oil, natural gas, coal and cement)	A group of plaintiffs led by Greenpeace Southeast Asia filed a petition asking the Philippines Commission on Human Rights to investigate “the human rights implications of climate change and ocean acidification and the resulting rights violations in the Philippines”, and “whether the investor-owned Carbon Majors have breached their responsibilities to respect the rights of the Filipino people.” The Commission found that fossil fuel companies have a clear moral responsibility, and the onus falls on individual countries to pass strong legislation and establish legal liability in their courts. The Commission further found that

Case	Year started	Plaintiff	Defendant	Summary and status
				existing civil law in the Philippines provided grounds for action, and that it may be possible to hold companies criminally accountable where they have been clearly proved to have engaged in acts of obstruction and willful obfuscation.

Table 3 Source: Authors based on *Climate Change Laws of the World*.

Table 4: Legislative activity by countries

A. G-20 Countries

Ranking	Laws		Quality-adjusted laws		Lifetime quality-adjusted laws	
	ISO Code	Number	ISO Code	Number	ISO Code	Number
1	BRA	28	GBR	16.85	GBR	209.68
2	ITA	24	AUS	15.41	KOR	204.77
3	IDN	22	KOR	15.25	ITA	184.01
4	KOR	22	DEU	15.03	DEU	163.00
5	GBR	20	JPN	15.01	AUS	138.48
15	CAN	10	IND	5.14	ZAF	58.17
16	IND	10	RUS	4.09	RUS	40.94
17	MEX	10	MEX	3.97	MEX	28.81
18	CHN	8	CHN	3.25	CHN	26.08
19	SAU	3	SAU	1.61	SAU	13.45

Table 4 continued

B. OECD Countries

Ranking	Laws		Quality-adjusted laws		Lifetime quality-adjusted laws	
	ISO Code	Number	ISO Code	Number	ISO Code	Number
1	ESP	38	ESP	27.20	ESP	234.21
2	CHL	26	CHL	19.65	GBR	209.68
3	ITA	24	GBR	16.85	KOR	204.77
4	KOR	22	AUS	15.41	NOR	186.10
5	GBR	20	KOR	15.25	ITA	184.01
31	CZE	9	ISL	5.93	ISL	57.91
32	ISL	7	SVN	4.92	SVN	43.58
33	SVN	7	MEX	3.97	MEX	28.81
34	EST	3	EST	2.23	EST	17.81
35	LTU	2	LTU	1.34	LTU	10.34

Table 4 concluded

C. EU countries

Ranking	Laws		Quality-adjusted laws		Lifetime quality-adjusted laws	
	ISO Code	Number	ISO Code	Number	ISO Code	Number
1	ESP	38	ESP	27.20	ESP	234.21
2	ITA	24	GBR	16.85	GBR	209.68
3	GBR	20	DEU	15.03	ITA	184.01
4	DEU	18	IRL	14.95	DEU	163.00
5	IRL	18	ITA	14.57	DNK	139.93
24	SVN	7	SVN	4.92	SVN	43.58
25	EST	3	EST	2.23	EST	17.81
26	LTU	2	LTU	1.34	LVA	11.42
27	LVA	2	LVA	1.31	LTU	10.34
28	CYP	1	CYP	0.71	CYP	4.92

Table 4 Notes: Data on climate laws and policies come from Climate Change Laws of the World. See Appendix Table A.1 for the full list of countries and detailed statistics. Quality-adjusted laws are derived by multiplying each law by the Rule of Law score of Kaufman *et al.* (2010) in the year it was passed. Life-time quality adjusted laws are calculated as the number of years a law has been in force, multiplied by the rule-of-law score in each year. All calculations are done over the period 1990-2019.

Table 5: Statistical tests of political orientation

Null Hypothesis	Alt. Hypo.	Legislative Acts			Executive Orders		
		All countries	OECD-EU countries	Other countries	All countries	OECD-EU countries	Other countries
One-sample t test							
Left-wing score = 1	< 1	Not rejected	Not rejected	Not rejected	Not rejected	Rejected	Not rejected
	≠ 1	Not rejected	Not rejected	Not rejected	Not rejected	Rejected	Rejected
	> 1	Not rejected	Not rejected	Not rejected	Not rejected	Not rejected	Rejected
Center score = 1	< 1	Not rejected	Not rejected	Not rejected	Not rejected	Not rejected	Not rejected
	≠ 1	Not rejected	Not rejected	Not rejected	Not rejected	Not rejected	Not rejected
	> 1	Not rejected	Not rejected	Not rejected	Rejected	Not rejected	Not rejected
Right-wing score = 1	< 1	Not rejected	Not rejected	Not rejected	Rejected	Not rejected	Rejected
	≠ 1	Not rejected	Not rejected	Not rejected	Rejected	Not rejected	Rejected
	> 1	Not rejected	Not rejected	Not rejected	Not rejected	Not rejected	Not rejected
Two-sample Wilcoxon rank-sum (Mann-Whitney) test							
Left-wing score: OECD-EU countries = Other countries	≠	Not rejected			Rejected		
Center score: OECD-EU countries = Other countries	≠	Not rejected			Not rejected		
Right-wing score: OECD-EU countries = Other countries	≠	Not rejected			Rejected		

Notes. Data on climate laws and policies come from *Climate Change Laws of the World*. Data on political orientation come from the World Bank's *Database of Political Institutions*. All calculations are done over the period 1990-2017.

Table 6: Statistical tests of business cycle effects

Null Hypothesis	Alternative Hypothesis	Decision		
		All countries	OECD-EU countries	Other countries
One-sample t test				
Economic crisis = 1	< 1	Rejected	Rejected	Rejected
	≠ 1	Rejected	Rejected	Rejected
	> 1	Not rejected	Not rejected	Not rejected
Two-sample Wilcoxon rank-sum (Mann-Whitney) test				
OECD-EU countries= Other countries	≠		Rejected	

Notes: Data on climate laws and policies come from *Climate Change Laws of the World* database. Data on business cycles are calculated from real GDP data from the World Development Indicators database. All calculations are done over the period 1990-2017 for 169 countries.

Table 7: Pro-climate rulings by the judiciary

Time period	Non-US cases			US cases
	All non-US [N=36]	OECD-EU [N=21]	Non-OECD/EU [N=15]	
Total cases with a ruling	355	300	55	534
Cases with a pro-climate ruling	187 (53%)	153 (51%)	34 (62%)	225 (42%)
Pro-climate cases over time				
1990-1999	0	0	0	
2000-2009	68	62	6	
2010-2019	119	91	28	

Notes: Outside the US, a court ruling has been issued in 355 cases between 1990 and 2019. These are contained in *Climate Change Laws of the World*. For the US we re-examined 534 court rulings during 1990-2016 from McCormick *et al* (2018); here a ruling is pro-climate if judges supported a “pro-regulation” plaintiff or ruled against an “anti-regulation” plaintiff.

Source: Authors based on *Climate Change Laws of the World* and McCormick *et al.* (2018). For results by country see Appendix Table A4.

Appendix tables

Table A1: Legislative activity by countries

Country Name	ISO Code	G20	OECD	EU	Number of climate laws		
					Number	Quality-adjusted number	Lifetime Quality-adjusted number
Afghanistan	AFG	0	0	0	9	1.47	12.03
Angola	AGO	0	0	0	21	5.55	31.98
Albania	ALB	0	0	0	3	1.17	10.36
United Arab Emirates	ARE	0	0	0	6	3.78	20.88
Argentina	ARG	1	0	0	17	7.09	72.17
Armenia	ARM	0	0	0	8	3.33	47.92
Antigua and Barbuda	ATG	0	0	0	5	3.23	21.16
Australia	AUS	1	1	0	18	15.41	138.48
Austria	AUT	0	1	1	9	7.87	99.38
Azerbaijan	AZE	0	0	0	4	1.39	13.97
Burundi	BDI	0	0	0	4	1.08	8.16
Belgium	BEL	0	1	1	11	8.53	105.21
Benin	BEN	0	0	0	3	1.17	9.34
Burkina Faso	BFA	0	0	0	12	4.82	35.74
Bangladesh	BGD	0	0	0	10	3.30	31.55

Country Name	ISO Code	G20	OECD	EU	Number of climate laws		
					Number	Quality-adjusted number	Lifetime Quality-adjusted number
Bulgaria	BGR	0	0	1	11	5.24	66.73
Bahrain	BHR	0	0	0	2	1.18	15.25
Bahamas, The	BHS	0	0	0	4	2.67	25.22
Bosnia and Herzegovina	BIH	0	0	0	1	0.46	1.27
Belarus	BLR	0	0	0	15	4.30	57.70
Belize	BLZ	0	0	0	3	1.19	10.81
Bolivia	BOL	0	0	0	16	5.00	53.87
Brazil	BRA	1	0	0	28	12.86	117.33
Barbados	BRB	0	0	0	4	2.91	30.56
Brunei Darussalam	BRN	0	0	0	4	2.45	15.90
Bhutan	BTN	0	0	0	8	4.46	45.17
Botswana	BWA	0	0	0	5	3.11	34.96
Central African Republic	CAF	0	0	0	2	0.43	4.95
Canada	CAN	1	1	0	10	8.52	91.32
Switzerland	CHE	0	1	0	9	7.86	102.59
Chile	CHL	0	1	0	26	19.65	172.26
China	CHN	1	0	0	8	3.25	26.08
Co'te d'Ivoire	CIV	0	0	0	14	4.62	26.82
Cameroon	CMR	0	0	0	5	1.41	13.33

Country Name	ISO Code	G20	OECD	EU	Number of climate laws		
					Number	Quality-adjusted number	Lifetime Quality-adjusted number
Congo	COG	0	0	0	7	1.78	21.10
Cook Islands	COK	0	0	0	4	1.25	11.79
Colombia	COL	0	0	0	23	9.88	62.92
Comoros	COM	0	0	0	1	0.32	1.80
Cabo Verde	CPV	0	0	0	7	4.23	40.21
Costa Rica	CRI	0	0	0	24	14.40	116.34
Cuba	CUB	0	0	0	9	3.36	46.91
Cyprus	CYP	0	0	1	1	0.71	4.92
Czech Republic	CZE	0	1	1	9	6.09	78.76
Germany	DEU	1	1	1	18	15.03	163.00
Djibouti	DJI	0	0	0	8	2.65	28.08
Dominica	DMA	0	0	0	5	3.10	26.58
Denmark	DNK	0	1	1	12	10.70	139.93
Dominican Republic	DOM	0	0	0	10	3.82	43.95
Algeria	DZA	0	0	0	13	4.63	54.79
Ecuador	ECU	0	0	0	13	3.88	28.00
Egypt	EGY	0	0	0	6	2.42	20.15
Eritrea	ERI	0	0	0	2	0.48	9.13
Spain	ESP	0	1	1	38	27.20	234.21

Country Name	ISO Code	G20	OECD	EU	Number of climate laws		
					Number	Quality-adjusted number	Lifetime Quality-adjusted number
Estonia	EST	0	1	1	3	2.23	17.81
Ethiopia	ETH	0	0	0	13	4.54	64.95
Finland	FIN	0	1	1	12	10.76	95.86
Fiji	FJI	0	0	0	5	2.22	22.73
France	FRA	1	1	1	15	11.84	77.17
Micronesia	FSM	0	0	0	4	1.96	14.37
Gabon	GAB	0	0	0	7	2.81	25.73
United Kingdom	GBR	1	1	1	20	16.85	209.68
Georgia	GEO	0	0	0	2	1.13	3.88
Ghana	GHA	0	0	0	9	4.41	60.59
Guinea	GIN	0	0	0	3	0.76	9.60
Gambia	GMB	0	0	0	6	2.38	25.48
Guinea-Bissau	GNB	0	0	0	2	0.48	4.08
Equatorial Guinea	GNQ	0	0	0	1	0.21	1.11
Greece	GRC	0	1	1	14	8.75	101.63
Grenada	GRD	0	0	0	6	3.17	33.68
Guatemala	GTM	0	0	0	8	2.34	22.26
Guyana	GUY	0	0	0	3	1.22	10.11
Honduras	HND	0	0	0	9	2.86	32.53

Country Name	ISO Code	G20	OECD	EU	Number of climate laws		
					Number	Quality-adjusted number	Lifetime Quality-adjusted number
Croatia	HRV	0	0	1	15	8.18	66.52
Haiti	HTI	0	0	0	2	0.44	3.40
Hungary	HUN	0	1	1	11	7.24	76.95
Indonesia	IDN	1	0	0	22	8.51	75.77
India	IND	1	0	0	10	5.14	64.64
Ireland	IRL	0	1	1	18	14.95	125.94
Iran	IRN	0	0	0	10	3.26	45.52
Iraq	IRQ	0	0	0	1	0.16	1.99
Iceland	ISL	0	1	0	7	5.93	57.91
Israel	ISR	0	1	0	17	11.68	156.05
Italy	ITA	1	1	1	24	14.57	184.01
Jamaica	JAM	0	0	0	4	1.73	19.09
Jordan	JOR	0	0	0	3	1.72	18.04
Japan	JPN	1	1	0	19	15.01	118.29
Kazakhstan	KAZ	0	0	0	11	3.57	55.53
Kenya	KEN	0	0	0	14	5.11	32.87
Kyrgyzstan	KGZ	0	0	0	7	1.97	21.48
Cambodia	KHM	0	0	0	6	1.65	17.46
Kiribati	KIR	0	0	0	11	5.93	57.65

Country Name	ISO Code	G20	OECD	EU	Number of climate laws		
					Number	Quality-adjusted number	Lifetime Quality-adjusted number
Saint Kitts and Nevis	KNA	0	0	0	4	2.44	18.88
South Korea	KOR	1	1	0	22	15.25	204.77
Lao PDR	LAO	0	0	0	5	1.55	13.83
Lebanon	LBN	0	0	0	4	1.35	7.28
Liberia	LBR	0	0	0	8	2.12	21.85
Libya	LBY	0	0	0	2	0.54	5.16
Saint Lucia	LCA	0	0	0	5	3.24	32.02
Liechtenstein	LIE	0	0	0	6	4.78	51.09
Sri Lanka	LKA	0	0	0	8	4.04	46.33
Lesotho	LSO	0	0	0	5	2.30	24.59
Lithuania	LTU	0	1	1	2	1.34	10.34
Luxembourg	LUX	0	1	1	12	10.27	73.37
Latvia	LVA	0	0	1	2	1.31	11.42
Morocco	MAR	0	0	0	14	6.55	48.20
Monaco	MCO	0	0	0	2	1.38	8.14
Moldova	MDA	0	0	0	6	2.57	27.53
Madagascar	MDG	0	0	0	10	3.52	26.35
Maldives	MDV	0	0	0	7	3.06	35.33
Mexico	MEX	1	1	0	10	3.97	28.81

Country Name	ISO Code	G20	OECD	EU	Number of climate laws		
					Number	Quality-adjusted number	Lifetime Quality-adjusted number
Marshall Islands	MHL	0	0	0	5	2.41	13.25
Macedonia, FYR	MKD	0	0	0	6	2.73	23.57
Mali	MLI	0	0	0	25	9.44	74.51
Malta	MLT	0	0	1	8	6.10	48.38
Myanmar	MMR	0	0	0	7	1.64	10.35
Montenegro	MNE	0	0	0	4	1.96	16.73
Mongolia	MNG	0	0	0	12	5.57	59.91
Mozambique	MOZ	0	0	0	11	4.08	41.16
Mauritania	MRT	0	0	0	3	1.06	14.08
Mauritius	MUS	0	0	0	6	4.02	29.45
Malawi	MWI	0	0	0	11	4.98	50.79
Malaysia	MYS	0	0	0	6	3.56	43.27
Namibia	NAM	0	0	0	11	6.03	56.27
Niger	NER	0	0	0	4	1.50	27.67
Nigeria	NGA	0	0	0	5	1.47	10.28
Nicaragua	NIC	0	0	0	11	3.95	48.24
Niue	NIU	0	0	0	8	2.75	24.30
Netherlands	NLD	0	1	1	16	13.82	131.05
Norway	NOR	0	1	0	17	15.22	186.10

Country Name	ISO Code	G20	OECD	EU	Number of climate laws		
					Number	Quality-adjusted number	Lifetime Quality-adjusted number
Nepal	NPL	0	0	0	5	1.67	22.70
Nauru	NRU	0	0	0	4	1.77	18.61
New Zealand	NZL	0	1	0	10	8.75	101.82
Oman	OMN	0	0	0	4	2.36	19.61
Pakistan	PAK	0	0	0	11	3.78	28.66
Panama	PAN	0	0	0	10	4.83	49.56
Peru	PER	0	0	0	16	6.22	56.19
Philippines	PHL	0	0	0	16	6.73	88.86
Palau	PLW	0	0	0	8	5.08	57.22
Papua New Guinea	PNG	0	0	0	10	3.37	25.05
Poland	POL	0	1	1	12	7.49	79.69
Korea, North	PRK	0	0	0	4	0.95	12.06
Portugal	PRT	0	1	1	15	10.78	101.29
Paraguay	PRY	0	0	0	12	3.98	45.47
Qatar	QAT	0	0	0	2	1.24	18.83
Russia	RUS	1	0	0	12	4.09	40.94
Rwanda	RWA	0	0	0	8	3.30	32.94
Saudi Arabia	SAU	1	0	0	3	1.61	13.45
Sudan	SDN	0	0	0	1	0.23	3.14

Country Name	ISO Code	G20	OECD	EU	Number of climate laws		
					Number	Quality-adjusted number	Lifetime Quality-adjusted number
Senegal	SEN	0	0	0	17	7.59	80.31
Singapore	SGP	0	0	0	9	7.42	84.86
Solomon Islands	SLB	0	0	0	6	2.38	18.94
Sierra Leone	SLE	0	0	0	8	2.54	21.96
El Salvador	SLV	0	0	0	8	2.93	30.66
San Marino	SMR	0	0	0	3	2.06	18.32
Serbia	SRB	0	0	0	5	2.21	15.15
South Sudan	SSD	0	0	0	2	0.26	1.54
Sao Tome and Principe	STP	0	0	0	2	0.69	5.58
Suriname	SUR	0	0	0	3	1.39	10.98
Slovakia	SVK	0	1	1	17	10.30	103.58
Slovenia	SVN	0	1	1	7	4.92	43.58
Sweden	SWE	0	1	1	11	9.80	108.61
Swaziland	SWZ	0	0	0	4	1.58	19.89
Seychelles	SYC	0	0	0	7	3.64	26.11
Syrian Arab Republic	SYR	0	0	0	4	1.20	9.77
Chad	TCD	0	0	0	3	0.72	3.88
Togo	TGO	0	0	0	14	4.68	42.32
Thailand	THA	0	0	0	10	4.71	50.84

Country Name	ISO Code	G20	OECD	EU	Number of climate laws		
					Number	Quality-adjusted number	Lifetime Quality-adjusted number
Tajikistan	TJK	0	0	0	7	1.72	26.44
Turkmenistan	TKM	0	0	0	1	0.22	1.65
Tonga	TON	0	0	0	6	3.04	28.81
Trinidad and Tobago	TTO	0	0	0	6	2.92	37.79
Tunisia	TUN	0	0	0	4	1.99	19.58
Turkey	TUR	1	1	0	14	7.13	67.31
Tuvalu	TUV	0	0	0	8	5.35	56.71
Taiwan	TWN	0	0	0	5	3.48	27.78
Tanzania	TZA	0	0	0	14	5.80	48.16
Uganda	UGA	0	0	0	6	2.56	30.54
Ukraine	UKR	0	0	0	13	4.18	63.17
Uruguay	URY	0	0	0	17	10.71	96.72
United States of America	USA	1	1	0	11	9.03	102.86
Uzbekistan	UZB	0	0	0	6	1.50	16.99
Saint Vincent and the Grenadines	VCT	0	0	0	3	1.97	14.80
Venezuela	VEN	0	0	0	4	0.69	7.76
Vietnam	VNM	0	0	0	15	6.09	58.11
Vanuatu	VUT	0	0	0	7	3.96	34.29

Country Name	ISO Code	G20	OECD	EU	Number of climate laws		
					Number	Quality-adjusted number	Lifetime Quality-adjusted number
Samoa	WSM	0	0	0	9	5.85	56.28
Yemen	YEM	0	0	0	6	1.56	20.45
South Africa	ZAF	1	0	0	12	6.23	58.17
Zambia	ZMB	0	0	0	15	6.42	52.84
Zimbabwe	ZWE	0	0	0	9	1.68	14.45

Table A1 Notes: Data on climate laws and policies come from *Climate Change Laws of the World*. Quality-adjusted laws are derived by multiplying each law by the Rule of Law score (Kaufman et al 2010) in the year it was passed. Life-time quality adjusted laws are calculated as the number of years a law has been in force, multiplied by the Rule of Law score in each year. All calculations are done over the period 1990-2019.

Table A2: Climate laws and political orientation

ISO code	Right-wing score	Left-wing score	Center score	ISO code	Right-wing score	Left-wing score	Center score
ALB	0.718	1.244		KGZ	1.000		
ARG	0.800	1.400	0.000	KOR	1.193		0.742
AUS	0.659	1.394		LBN	1.067		0.000
AUT	0.444	1.185		LKA		1.455	0.000
BEL	0.884	1.852		LSO		1.000	
BFA	0.000	0.000	7.500	LUX			1.000
BGR	1.111	0.000		LVA	1.636		0.000
BHS	0.467		1.615	MDA	0.000	0.902	1.533
BLZ	1.000			MDV	1.000		
BOL	0.700	1.422	0.250	MEX	0.778		1.167
BRA	0.000	1.077	4.308	MKD		1.000	
BRB	1.500	0.500		MLI			1.000
BWA	1.000			MLT	0.795	1.750	
CAN	1.197	0.830		MWI	1.000		
CHL		0.971	1.071	NAM		1.000	
COL	3.250		0.000	NGA	0.900	1.800	
COM			1.000	NIC	0.971	1.012	
CPV		1.333	0.750	NLD	1.263	0.444	

CRI	0.117	1.663		NOR	1.140	0.878	
CYP	0.000	4.800		NPL		1.000	
CZE	0.500	1.250		NZL	0.194	2.450	
DEU	1.111	0.667		PAK	0.000	1.333	
DNK	1.313	0.583		PAN	1.000		
DOM	0.000	1.400	1.318	PER	0.170	2.036	0.622
ECU		1.000		PHL		0.000	1.045
ESP	1.314	0.686		POL	1.643	0.348	1.533
FIN	1.867	0.333	1.021	PRT	0.828	1.149	
FRA	1.091	0.909		PRY	1.116	0.467	
GBR	0.560	1.508		ROU	0.000	2.500	0.000
GHA	0.617	1.215		RUS			1.000
GNB		1.000		SEN	1.917	0.000	
GRC	0.701	1.205		SLE		1.000	
GRD	0.519	1.867		SLV	0.525	2.188	
GTM	0.600	3.000		SVK		1.000	
GUY		1.000		SVN	0.000	0.863	1.533
HND	1.000			SWE	1.620	0.599	
HRV	0.568	0.600	2.880	TTO	0.622	1.436	
HUN	1.157	0.898		TUN		0.758	2.778
IND	1.037	0.982		UKR		0.833	1.042
IRL	1.556		0.737	URY	0.110	2.027	

ISL	1.438		0.000	USA	1.273	0.795
ISR	0.961	1.235		VUT	0.917	1.048
ITA	1.165	0.971	0.809	ZAF	0.000	1.217
JAM	2.800	0.609		ZMB		1.000
JPN	1.111	0.000				

Table A2 Notes: Data on climate laws and policies come from *Climate Change Laws of the World*. Data on political orientation come from the World Bank's *Database of Political Institutions*. All calculations are done over the period 1990-2017.

Table A3: Climate laws and business cycle

ISO Code	Score	ISO Code	Score	ISO Code	Score	ISO Code	Score
BIH	0	ISL	0.533	PHL	0.750	MYS	0.933
COM	0	JPN	0.538	SGP	0.750	SWZ	0.933
GNB	0	SLV	0.538	NOR	0.760	VEN	0.933
KGZ	0	TUR	0.538	BHR	0.778	ZAF	0.955
KWT	0	LUX	0.545	ERI	0.778	MNG	0.972
LBR	0	MOZ	0.545	LBN	0.778	BWA	0.988
LBY	0	MAR	0.574	MEX	0.778	AZE	1.000
LTU	0	SVK	0.581	KAZ	0.783	IRN	1.000
SSD	0	BLZ	0.583	MDV	0.800	NER	1.000
TKM	0	EST	0.583	SVN	0.800	SLE	1.000
TLS	0	MRT	0.583	ZWE	0.800	TJK	1.000
TUN	0	PAK	0.599	FJI	0.800	FRA	1.018
CZE	0.207	THA	0.600	NGA	0.800	LAO	1.018
MLI	0.240	AGO	0.614	NPL	0.800	NAM	1.018
VNM	0.249	ARE	0.622	NZL	0.808	MKD	1.050
ESP	0.267	ECU	0.622	BRN	0.824	OMN	1.077
YEM	0.275	FIN	0.622	LVA	0.824	RWA	1.077
GAB	0.286	GIN	0.622	NLD	0.824	SLB	1.077
RUS	0.292	SUR	0.622	ROU	0.824	UKR	1.089

TTO	0.311	KOR	0.636	URY	0.824	GTM	1.094
USA	0.318	AFG	0.655	IND	0.830	CMR	1.120
CIV	0.333	BOL	0.656	DNK	0.848	COG	1.143
BLR	0.339	MLT	0.656	MMR	0.848	CPV	1.143
PNG	0.346	TUV	0.656	MWI	0.848	ARM	1.167
BFA	0.359	TZA	0.663	SAU	0.848	BEN	1.167
KEN	0.359	GRC	0.667	IRL	0.857	BHS	1.167
HUN	0.364	GHA	0.667	ATG	0.862	LKA	1.167
AUS	0.380	GRD	0.667	COD	0.862	BGD	1.200
IDN	0.381	HRV	0.688	NIC	0.862	ALB	1.244
LSO	0.400	ITA	0.696	ETH	0.862	TCD	1.244
TGO	0.424	DOM	0.700	PRT	0.862	BEL	1.292
UZB	0.424	UGA	0.718	BDI	0.875	MUS	1.292
CHL	0.449	BRA	0.718	BTN	0.875	BRB	1.400
DZA	0.462	AUT	0.732	EGY	0.875	GUY	1.436
ISR	0.471	CHE	0.732	POL	0.875	VUT	1.436
COL	0.500	MDG	0.737	PRY	0.897	SDN	1.750
CRI	0.500	QAT	0.737	HND	0.915	CYP	1.867
GBR	0.500	PAN	0.747	CAF	0.933	JAM	1.867
ARG	0.509	PER	0.747	CHN	0.933	JOR	1.867
SWE	0.509	ZMB	0.747	GMB	0.933	GEO	2.000
DEU	0.519	BGR	0.749	KHM	0.933	GNQ	2.000

CAN	0.519	SEN	0.749	MDA	0.933	IRQ	2.333
						HTI	2.545

Table A3 Notes: Data on climate laws and policies come from *Climate Change Laws of the World*. Data on business cycles are calculated from real GDP data from the *World Development Indicators* database. All calculations are done over the period 1990-2017.

Table A.4: Number of climate litigation cases by jurisdiction

ISO Code	Total Number	Cases with a pro-environment decision	ISO Code	Total Number	Cases with a pro-environment decision
ARG	1	0	IRL	3	2
AUS	96	56	JPN	3	0
AUT	1	1	KEN	1	1
BEL	1	0	LUX	1	0
BRA	6	4	MEX	1	1
CAN	20	7	NGA	1	1
CHE	2	1	NLD	2	1
CHL	2	0	NOR	1	0
COL	2	2	NZL	17	6
CZE	1	0	PAK	4	2
DEU	5	2	PER	1	0
ECU	1	1	PHL	2	1
ESP	13	5	POL	2	0
EUU	57	37	SWE	1	0
FRA	11	6	UGA	1	0
GBR	60	28	UKR	2	1
IDN	1	8	USA	1,154	n/a
IND	10	0	ZAF	4	2
INT	18	11			

Notes: This list includes the European Union (EUU) and International (INT) cases.

Chapter 2: Shaik Eskander et al.

Figure 1: Climate change legislation over time

Source: Authors based on Climate Change Laws of the World.

Figure 2: Climate change litigation over time

Source: Authors based on Climate Change Laws of the World and Sabin Center data.

Figure 3: Climate legislation and litigation by country

Source: Authors based on Climate Change Laws of the World.

Figure 4: Climate laws and political orientation

Notes: Countries with a democracy score of 6 or more in the Polity IV dataset only. Data on political orientation is taken from the World Bank dataset of political institutions (DPI).

Orientation scores greater than one suggest political parties of that orientation are disproportionately inclined to pass climate laws, relative to their time in power. Median (Mean) right-wing scores for all, OECD-EU and other countries are 0.961 (0.891), 1.111 (0.923) and 0.8 (0.813); whereas the respective left-wing scores are 1.0 (1.141), 0.909 (1.118) and 1.012 (1.160), and center-government scores are 1.0 (1.234), 1.0 (0.961) and 1.0 (1.431).

Figure 5: Climate laws and economic crises

Source: Author's own calculations, using World Bank GDP data and Hodrick-Prescott decomposition. Countries with scores less than one are less inclined to pass climate laws in difficult economic times.