A comparative analysis of green financial policy output in OECD countries

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Abstract
The mitigation of dangerous climate change requires massive investments in low-carbon technologies. Accordingly, the redirection of finance flows is a key objective of the Paris Agreement, and countries have started to enact policies to influence financial actors to this end. However, transparency on such policies is low, and it is hardly possible to compare policy activity internationally. To fill this gap, here we present a comparative analysis of green financial policy output in OECD countries from 2001 to 2019, based on a newly compiled inventory of 136 policies from 29 countries and the European Union. We show that policy output accelerated rapidly since the Paris Agreement, with countries implementing 3.3 policies on average using various governing resources. Key instruments include carbon disclosure requirements, low-carbon investment policies for public funds, and green state investment banks. However, there are huge differences in policy output between countries, and some countries that host important financial centers have implemented few policies to date. On the basis of our results, we develop a research agenda to deepen the understanding of this important but little-studied area of climate policies.

1. Introduction
In the Paris Agreement, more than 190 countries have committed to limiting global warming to well below 2 °C. However, policy action falls dramatically short in delivering on this commitment (Masson-Delmotte et al. 2018). Effective climate policies need to induce a rapid transition to new low-carbon technologies, including in the energy, transport, and building sectors (Edenhofer et al. 2011, Williams et al. 2012, Luderer et al. 2018). A fundamental challenge in this transition is the large investment need (IPCC 2014, Peake and Ekins 2017, Polzin 2017, Zhou et al. 2019), which often requires more long-term types of finance as compared to the short-term finance currently dominating global capital markets (Mazzucato and Semieniuk 2017, Steffen 2018). Accordingly, the important role of finance has long been acknowledged in international climate policy, and in 2015, it took center stage at the Climate Change Conference COP 21. As indicated in the central Art. 2.1c of the Paris Agreement, parties are committed to ‘making finance flows consistent with a pathway toward low greenhouse gas emissions and climate-resilient development’ (UNFCCC 2015).

To date, climate policy scholarship on finance typically focuses on climate finance for developing countries (Donner et al. 2016, Bowen et al. 2017, Matsuo and Schmidt 2017, Egli et al. 2019). However, redirecting finance flows is also highly important in industrialized countries (World Resources Institute 2018, Ameli et al. 2019, Gençsü et al. 2020). Financial actors, including investors, banks, and insurers, play a crucial role in determining the availability and cost of capital for high-carbon and low-carbon technologies. Therefore, changing the behavior of financial actors is considered a key element in reaching a Paris-compatible pathway (Campiglio 2016, Ameli et al. 2019, Ewers et al. 2019, Otto et al. 2020, UNEP Finance Initiative 2020). Referring to their commitments in the Paris Agreement, several countries in recent years have enacted policies addressing financial actors to redirect finance flows (‘green financial policies’); this is a policy innovation as compared to
classical environmental policies\(^1\). Examples for such policies include introducing green labels for financial products, enacting carbon disclosure requirements, and establishing green state investment banks. However, despite the growing output of green financial policies, the transparency on policy activity in this area is low. From an international perspective, it is hardly possible to compare the policy activities of different countries, which would be the starting point for a ratcheting-up of policies in this important area. Despite the broad agreement that redirecting finance flows is a key ingredient of climate change mitigation policies, a systematic assessment of green financial policies seems to have fallen through the cracks of academic policy analysis to date. Comparative studies in the domain of climate and environmental policies typically consider policies that directly address polluting sectors (e.g. energy or transport) but not policies addressing the financial sector with the aim of changing finance flows to other sectors. Whereas previous research underlined the need to consider policy interaction across sectors and policy domains, the respective literature on policy integration (Lafferty and Howden 2003, Nordbeck and Steurer 2016, Tosun and Lang 2017) and policy mixes (Kern and Howlett 2009, Rogge and Reichardt 2016, Schmidt and Sewerin 2019) hardly covers financial policies. Over the last years, a growing literature in finance addresses potential repercussions of climate change for financial stability (considering physical and transition risks, and systemic implications) (see Battiston et al 2017, 2021, Hong et al 2020, Monasterolo 2020, Semieniuk et al 2021). Few of these studies focus on policies, and those that do typically analyze the potential effect of specific policy instruments (e.g. Lamperti et al 2021), not the policy output as such\(^2\). To the best of our knowledge, financial sector policies with the aim of influencing polluting sectors have not been included into comparative climate or environmental policy analysis (Goyal 2017, Cox et al 2019). Consequently, little is known about whether countries actively use policy tools to redirect finance flows. Recently, non-governmental organizations have suggested tracking country performance toward ‘financing the transition from brown to green’ (Climate Transparency 2017) and assessed ‘Paris-aligned financial market regulation’ in five countries and the on EU-level (3fP-Tracker 2019b), but a broader analysis of policy output over time and across countries is missing.

To fill this gap, here we aim to answer the following research question: Which green financial policies are used for aligning finance flows with the Paris Agreement, and how do countries differ in their policy output in this regard? To this end, we present a comparative analysis of policy output in OECD countries and EU policies until 2019 based on a newly compiled inventory of 136 green financial policies. Applying Hood’s (1983) taxonomy of policies along governing resources employed and the established measure of policy density, we explore policy output before and after the Paris Agreement and compare countries in that regard. On the basis of our exploratory results, we finally develop a research agenda to deepen the understanding of this important but little-studied area of climate policies.

2. Defining green financial policies

The financial sector, that is, the part of an economy consisting of firms and institutions that provide financial services, is an important part of developed economies. It performs crucial services to the real economy (i.e. to non-financial sectors), including financial intermediation between savers and borrowers, the pricing and allocation of risks, and the provision of liquidity (Merton and Bodie 1995). If it performs well, the financial sector shall lead to an efficient allocation of financial resources—an important prerequisite of growth and prosperity. Accordingly, policymakers have long been concerned with ensuring the functioning of the sector through financial policies, a common definition of which refers to ‘policies related to the regulation, supervision, and oversight of the financial and payment systems, including markets and institutions, with the view to promoting financial stability, market efficiency, and client-asset and consumer protection’ (IMF 2000, OECD 2002). Such general financial policies do not specifically address climate change-related or environmental objectives.

The importance of the financial sector for climate change mitigation stems not only from the need to reallocate capital in accordance with a fundamental transition of economies but also from the nature of many low-carbon technologies. For example, renewable energy technologies are more capital-intensive than the established high-carbon solutions (Schmidt 2014, Egli et al 2018), which leads to large investment needs for the low-carbon transition (IPCC 2014, Peake and Ekins 2017, Polzin 2017, Parousos et al 2019). For a 2 °C pathway, models have estimated a global annual investment requirement of 2–4 trillion USD\(^0\) until 2050 in the energy sector alone (McCollum et al 2018); current investment levels are only a fraction of this amount (Frankfurt School-UNEP Centre 2019). In addition, low-carbon investments can be particularly susceptible

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\(^1\) From a theoretical point of view, addressing also the financial sector (and not just polluting sectors) by climate and environmental policies is justified by the existence of market failures in the financial sector that hinder investors/lenders/underwriters to appropriately respond to changing price signals (e.g. information asymmetries, lack of long-term liquidity, and innovation externalities within the financial sector) (Campiglio 2016, Mazzucato and Semieniuk 2017).

\(^2\) An exception being analyses of central bank mandates (Dikau and Volz 2021), and macro prudential policies (D’Orazio and Popoyan 2019).
to adverse changes in general financing conditions (Schmidt et al 2019b, Steffen et al 2020a). Given these challenges, many scholars have argued that public policy needs to play a role in changing the behavior of financial actors toward a low-carbon pathway (Ameli and Kammen 2012, Campiglio et al 2018, Polzin et al 2018, Ameli et al 2019, Otto et al 2020, Steffen et al 2020b). In recent years, policymakers have accordingly implemented financial policies with the specific aim of not only enabling general financial market efficiency, but also to ‘green the financial sector.’ These policies are what we call green financial policies. Along the lines of Art. 2c of the Paris agreement, we define them as follows:

Green financial policies are public policies addressing the financial sector with the aim of making finance flows consistent with the commitments of the Paris Agreement.

Following this definition, we focus on policies that address the financial sector, thus excluding policies that directly address other sectors, such as subsidies, grants, and subsidized loans (also referred to as ‘soft loans’) taken from the public purse for investments in the energy sector, for example3.

By focusing on policies that aim to make finance flows consistent with the commitments of the Paris Agreement, we consider climate change-related policy goals, but not other societal goals, which are sometimes subsumed under the broader term ‘sustainable finance’ (e.g. social goals).

3. Methodology and data

We proceed in four steps that are inspired by comparative analyses of climate policy output (Schaffrin et al 2015): defining the scope of analysis, compiling an inventory of relevant policies, applying a taxonomy classifying all policies in the inventory, and comparing policy output in different countries4.

3.1. Scope of analysis

We consider policies that have been enacted in OECD countries until the end of 2019. We limit our analysis to this group of industrialized countries because the financial sector in developing countries typically faces additional challenges, and because national financial policy is often less relevant than foreign direct investment and the activities of development finance institutions (Granoff et al 2016, Steffen and Schmidt 2020). We consider national-level policies and policies at the EU level but exclude subnational activities, which typically play a smaller role in the area of finance (but remain an area for further research).

3.2. Compilation of policy inventory

The inventory is compiled by systematically cross-checking relevant entries from three policy databases, namely the UNEP Green Finance Measures Database (UN Environment Programme 2019), the International Energy Agency’s Policies Database (IEA 2020), and the Green Bond Policy Data Set (Climate Bonds Initiative 2019). The compilation process and resulting inventory are provided in the appendix. In sum, the inventory includes 136 green financial policies from 29 different countries and the EU. Although we cannot claim exhaustiveness, the chosen approach ensures a high coverage of relevant policies, and thus allows for a meaningful analysis of policy output over time and across countries, as presented below.

3.3. Classification of policies in taxonomy

We classify policies along the governing resources employed (Hood 1983, Hood and Margetts 2007). This well-established taxonomy aims to distill the ‘toolkit’ available to governments by abstracting from the long list of potential policy objectives and instead use basic governing resources as the structuring element: trafficking information (using the nodality of government to draw in and dispense information), exercising authority (using the power to legally determine), employing treasury (using the ability to tax and spend), and leveraging government organization (using the ability to directly act on markets) (Hood and Margetts 2007). The taxonomy proved very useful for analyzing policies in various domains because of the limited number of clearly differentiated categories that are not sector-specific at the same time (Howlett 2019). Therefore, it is well suited for analyzing an unstudied policy domain like green financial policies. Referring to the description of policies in our source databases, the legal text of policies and, in some cases, additional archival information such as press reports, we classify all policies according to the governing resources3; and also describe the specific policy instruments employed.

3.4. Comparative analysis of policy output

Using quantitative measures of policy activity is an established approach for comparative policy analysis (see the review in Schaffrin et al (2015)). Here, we use policy density, a measure that counts the number of policies in a specific domain, such as climate.

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3 Such policies are classical fiscal instruments targeting the energy sector and are therefore included in extant policy analyses. In this letter, we do however consider the provision of government loan guarantees and other innovative financing schemes for new green technologies or business models if aimed at facilitating lending or investment by financial actors.

4 Further details on methodology and data are provided in the appendix.

5 In a few cases where a single policy employs two governing resources, the more important resource for achieving the policy objective is coded as the ‘primary governing resource’ and the other as the ‘secondary governing resource.’ Where applicable, the analyses below refer to the ‘primary governing resource.’
policy. Policy density is broadly used for measuring policy output over time and between countries (Albrecht and Arts 2005, Knill et al. 2010, Schaffrin et al. 2014) and appropriate for our initial comparative analysis. Besides density, the literature also proposed more elaborate measures that weigh policies based on expert evaluations or theoretical considerations (Schaffrin et al. 2015). As a detailed weighting goes beyond the scope of this paper, we consider the differences in policy stringency stemming from the choices of governing resources employed. Using information typically implies a lower level of manipulation compared with using authority, treasury, or organization (compare Howlett 2000). Therefore, we consider not only the density of all policies but also the density of non-information (i.e. more substantial) policies, and qualitatively discuss the stringency of different non-information policy instruments.

While our analysis is exploratory, we also use a cross-country regression analysis not to test hypotheses but to gain an initial understanding of how green financial policy output relates to the general climate policy output and economic factors. With policy density as a nonnegative count-dependent variable, we fit a negative binomial regression model (Long and Freese 2006). All regressions include year fixed effects, besides the explanatory variables at the country level. See appendix for details.

4. Results

4.1. Green financial policies over time

As a starting point, we consider policy output across all OECD countries. Figure 1 shows the cumulated total number of policies over time divided by the governing resources employed. Until about 2009, few policies had been in place. These early policies mostly used either authority or treasury (for green loan guarantees). Between 2010 and 2014, the number of policies increased, driven by new policies using authority and organization. In this period, climate-related disclosure requirements were introduced in many countries, and several countries decided to establish dedicated green state investment banks. The rapid growth in green financial policies started in 2015, the year of the Paris Agreement, which elevated the redirection of financing flows as one of the three long-term climate policy goals besides mitigation and adaptation (UNFCCC 2015, Art. 2.1c). The momentum of addressing the financial sector started to build up during the negotiation of the Agreement (Ministère des Finances et des Comptes Publics 2015), and policy output accelerated rapidly since then. This is illustrated by a compound annual growth rate of about 24%, as compared to 16% until 2014 (compare figure 1). Between 2015 and 2019, the number of policies more than doubled, with many new policies drawing on government authority and organization and increasingly utilizing the information nodality of public actors. Only the number of policies that use primarily treasury resources remained limited, which is not surprising as climate policies using taxation or subsidies typically address polluting sectors directly, not the financial sector6.

To provide more details on the policies that have been introduced in OECD countries, table 1 summarizes the policy instruments. Concerning their information nodality, governments use it both as a detector to collect information (e.g. through surveys

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6 Note that green state investment banks, which are primarily organization policies, often also have a treasury component (even if they primarily re-finance on the capital market (Geddes et al. 2018)).
Table 1. Overview of green financial policy instruments (summarizing the rationales and policy instruments of 136 policies in OECD countries).

| Governing resource | Policy rationale | Policy instruments that are part of policy inventory |
|-------------------|-----------------|---------------------------------------------------|
| **Information**   | Collect information and generate knowledge | • Government study/survey/consultation  
|                   | Provide general guidance and specific tools related to green finance | • Government-convened expert panel/research initiative/exchange forum  
| **Authority**     | Provide regulatory framework for green finance products | • Government label for green finance products/actors  
|                   | Improve disclosure of climate-related information from companies in general | • Voluntary guidelines/recommendations related to green finance  
|                   | Improve disclosure of climate-related information from fund managers and other financial actors | • Public green finance strategy/program  
| **Treasury**      | Using public funds to establish new green financial products | • Guidelines for green bonds  
|                   | Using public funds to de-risk green financing | • Guidelines for other green finance products/indices  
| **Organization**  | Leverage general financial market activity of public authorities | • Special legal entities/setups for green finance  
|                   | Engage in dedicated financial market activity specifically for low-carbon goals | • Disclosure requirements concerning climate/ESG for corporates  

Government studies and expert panels are typical policy instruments in newly emerging policy areas. For green finance, they started mainly after the Paris Agreement and have been widely used since then. Although information policies typically imply a low level of market manipulation, they can serve as a first step before implementing more stringent measures that are informed by these surveys or panels.

Government authority is used in a range of policy instruments, often aiming at improving the disclosure of climate-related information by financial actors so that climate considerations can be taken into account for investment decisions (compare Monasterolo et al. 2017), though it is contested whether increased transparency can be expected to change investor behavior in a meaningful way (Ameli et al. 2019). Figure 2(a) illustrates that the most common policy instrument is disclosure requirements for listed companies, with climate being one aspect covered by broader ESG (environmental, social and corporate governance) reporting requirements in many cases. Concerning funds and financial actors, there are numerous policies, most of which are not very stringent as they only require a disclosure whether climate aspects are considered for portfolio decisions at all (and only if they are, to describe in which way)—a notable exception being recent regulations in France on the climate impact of investment portfolios. A third set of policies uses authority to regulate not broad asset classes in general but green financial products in particular, including to prevent ‘greenwashing’ through products that appear to consider climate aspects but do not. Besides helping to develop a market for green financial products, these policies also have a view of consumer protection, which is a classical goal of...
financial regulation. Finally, since 2016 some policies also directly regulate the climate-related risk management of financial actors.

Government treasury is used for loan guarantees to de-risk low-carbon financing, although such instruments are used only in a handful of countries. Further, a few policies provide subsidies for the origination of low-carbon financial products. Most of these policies have been in place for quite some time (figure 2(b)). Notably, no green financial sector taxation policy has been introduced until 2019.

Conversely, government organization is used by many countries for green finance purposes. On one

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Note that in this work, we study OECD countries, and loan guarantees play a bigger role in developing countries (Steffen et al 2020b).
hand, governments build on financial market activities that public actors need to undertake anyway and adapt these activities to reflect climate objectives, for example, by conducting the investment of central banks or government pension funds according to a climate-aligned investment policy, or by issuing parts of sovereign bonds as ‘green bonds’ (which come with conditions about the use of proceeds) (Tolliver et al. 2019), the latter seeing a large uptake since 2018 (figure 2(c)). On the other hand, governments also engage in new, dedicated financial market activities to provide green financial services that private players do not (yet) offer, to develop expertise and standards, and thus to build a green financial industry in their countries (compare Geddes et al. 2018). In some cases, existing state investment banks are used to this end. In other cases, new so-called ‘green state investment banks’ have been established. In sum, the overview shows that many different green financial policy instruments have been implemented over the last decade using the entire range of governing resources available.

### 4.2 Country comparison

Although the number of green financial policies has increased greatly since the Paris Agreement, there is wide variation among countries. Figure 3 shows the policy density by country. On average, OECD countries (excluding the EU level) have 3.3 policies in place by the end of 2019, ranging between 0 and 18. France has the highest density with 18 policies, followed by the United Kingdom with 12 policies and several other countries with more than five policies (Australia, Canada, Germany, Italy, Japan, Netherlands, and the United States). By contrast, a number of mostly Eastern European countries, including the Czech Republic, Estonia, Hungary, Slovak Republic, and Slovenia, do not have a single green financial policy. Beyond the national level, there has been significant policy activity at the EU level, much of it following the EU Sustainable Finance Action Plan that was adopted in March 2018 (European Commission 2018). By the end of 2019, there are about as many policies at the EU level as in the most active country (France), and these policies add to the regulatory density in all EU member states. However, many country-level policies go beyond EU requirements, and thus policy densities cannot be simply added up.

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8 The newly established institutions are the Clean Energy Finance Corporation (Australia), the Green Fund (Japan), InvestNL (Netherlands), and the Green Investment Bank (United Kingdom). The latter was privatized in 2017 (now operating as Green Investment Group), though mechanisms are in place to maintain its green purpose in the future, so we keep the policy in the inventory post 2017.
Table 2. Exploratory regression results green financial policies and country context.

|                      | (1) No. of all LowCarbFinPol | (2) No. of all LowCarbFinPol | (3) No. of non-info LowCarbFinPol | (4) No. of non-info LowCarbFinPol |
|----------------------|------------------------------|------------------------------|----------------------------------|----------------------------------|
| **General climate policy density** | 0.216*                      | 0.183*                       | 0.209*                           | 0.190*                           |
| **GDP share from financial sector** | -0.0833                     |                              |                                  |                                  |
| **GDP per capita**   |                              | 0.0361*                      | 0.0245*                          |                                  |
| **Year 2011**        | -0.0102                      | -0.0208                      | -0.00535                         | -0.0128                          |
| **2012**             | 0.0884                       | 0.0888                       | 0.0741                           | 0.0729                           |
| **2013**             | 0.189                        | 0.176                        | 0.196                            | 0.186                            |
| **2014**             | 0.279*                       | 0.245*                       | 0.204                            | 0.182                            |
| **2015**             | 0.477*                       | 0.405*                       | 0.338*                           | 0.288*                           |
| **2016**             | 0.625*                       | 0.526*                       | 0.402*                           | 0.333*                           |
| **2017**             | 0.730*                       | 0.602*                       | 0.429*                           | 0.336*                           |
| **2018**             | 0.948*                       | 0.793*                       | 0.668*                           | 0.557*                           |
| **2019**             | 1.138*                       | 0.978*                       | 0.815*                           | 0.701*                           |
| **Constant**         | -0.844*                      | -1.735*                      | -0.968*                          | -1.338*                          |
| **Pseudo R2**        | 0.114                        | 0.138                        | 0.114                            | 0.125                            |
| **Observations**     | 360                          | 360                          | 360                              | 360                              |

2010 as basis year. * * * * p < 0.01, * * * p < 0.05, * p < 0.1. See appendix for standard errors (robust, clustered at country level).

With respect to governing resources, the density of information policies correlates with the density of non-information policies (r = 79%). All countries that have information policies also have policies using authority/treasury/organization except for Israel, and the geographies with many information policies also have a high density of more substantive policies (e.g. France, United Kingdom, and the EU). Countries that have three or more policies typically use several governing resources, with authority being always part of the mix. Another observation is that a number of countries have exactly one organization policy (and no other policies). Typically, these are either sovereign green bond issuances or climate investment policies for public funds. Therefore, leveraging existing financial market activities of public actors seems to be a starting point for green financial policy output for some countries.

To further analyze country differences, we finally relate the green financial policy output to general climate policy context and the economic context. Figure 4 illustrates the correlation between key variables, and table 2 shows exploratory regression results.

First, the temporal pattern with a rapidly increasing policy output after the Paris Agreement remains clearly visible besides the contextual variables, with year fixed effects having statistically significant positive coefficients since 2015 and increasing coefficients over time (table 2, columns 1–4). Second, there is a clear relationship between low-carbon financial policies and the general climate policy density in a country, with a correlation of 53% and significant coefficients across regression specifications. That is, low-carbon policies are enacted in countries that also have a high climate policy output concerning other sectors, such as energy. Third, in terms of the economic environment, there is a positive (but weaker) link between low-carbon financial policy density and GDP per capita (figure 4 and
Table 2, columns 2 and 4). Fourth, a natural question concerns the importance of the financial sector in a country. On one hand, one could imagine that in case of a large financial sector, the regulatory density of financial activities is high, including many low-carbon financial policies. On the other hand, it may also be the case that financial sector interest groups are more powerful in more heavily financialized countries and exercise their influence to prevent regulation. During 2010–2019, the share of the financial sector in total value added was the largest in Luxembourg (26.9%), followed by Switzerland (9.9%), Australia (8.9%), Ireland (8.3%), Netherlands (8.1%), and the United Kingdom (7.4%); the other end of the spectrum was taken by Lithuania (2.2%) (OECD 2020). Whereas some finance-heavy countries exhibited a comparably high policy density (e.g. Australia, Netherlands, and United Kingdom, see figure 2), important financial centers such as Ireland and Switzerland only implemented a few policies by the end of 2019. On the basis of our data, we observe a weakly significant (at 10% level) negative relationship between the GDP share from the financial sector and the density of non-information (i.e. more substantive) low-carbon financial policies (table 2, column 4), but the coefficient is insignificant when information policies are also considered (column 2). It could be the case that information policies have a less direct effect on financial actors, and therefore interest groups object to them less, but such mechanisms cannot be revealed from the present data. In sum, these results are a first exploratory step in analyzing green financial policies. Further research is required for a deeper understanding of the drivers and effects of policy activity in the field, as discussed below.

5. Discussion and future research agenda

The stocktaking of green financial policies until 2019 clearly shows an increased momentum of policy output after the Paris Agreement, suggesting some effort of OECD countries to bring finance flows in accordance with Art 2.1c commitments. However, similar to other climate policy areas, there are large differences in the ambitions of countries (as measured by their policy density). While we consider this first comparative analysis as a starting point for more detailed studies, the present results should also be of direct interest to various stakeholders.

For policymakers, the inventory and categorization of policies can help evaluate the available options for redirecting finance flows consistent with the Paris Agreement. Green financial policies are a policy innovation for many countries, but our analysis emphasizes that a versatile toolbox has already been implemented in OECD countries, encouraging policymakers to use the various governing resources available. A greater transparency in green financial policies employed internationally can facilitate policy learning from the experience of others (Meseguer 2005) in the area.

For non-governmental organizations and climate policy advocates, the transparency created can help to hold accountable the countries that are laggards in green financial policy action. Delivering on the ‘Forgotten Goal of the Paris Agreement’ (World Resources Institute 2018) of aligning finance flows in OECD countries in no way competes with providing climate finance to developing countries, as both are required to achieve a pathway of economic prosperity within the boundaries of the Paris Agreement. Specifically, advocates can engage with financial centers that are important for global financial markets but have only a few green financial policies in place.

For researchers, much work is still required to increase the understanding of green financial policies in the political cycle. Here, we present a research agenda structured along policy input, policy output, and policy outcome (figure 5).

First, future research can explain how various inputs into the policy process lead to differences in policy output, as shown in this article. The Paris Agreement, as an external shock causing policy change (Sabatier 1993), can explain the temporal pattern observed but not the differences between countries. Future research should explore to what extent political input factors, such as party politics, interest group activity, or institutional settings, can explain these country differences. Concerning the first factor, the positions of ruling political parties likely play a role (Schmidt et al 2019a). A recent analysis of the politics behind the establishment of green state investment banks has suggested that political positions with respect to this policy instrument are similar to political positions with respect to other
climate policy areas (Geddes et al 2020). However, further research is needed to determine whether this finding holds for other green financial policy instruments. Aside from party politics, interest groups also shape climate policies (Stokes 2020). While there is growing research on the role of business actors in climate politics (Meckling 2011, Stokes 2020), the specific role of the financial industry remains elusive, and needs to be understood given the weakly negative relationship between financial sector size and green financial policy density. Concerning institutional settings, for instance the type of market economy could matter (Četković and Buzogány 2016, Meckling and Jenner 2016).

Second, more detailed analyses of the policy output are needed. Going further beyond policy density, future research should consider the design of green financial policies. For example, the design parameters affecting the stringency of policies should be analyzed to gain an understanding of which policies are symbolic or truly impactful (compare Schaffrin et al 2014). Examples for such parameters include the scope of policies, and the integration in broader climate policy mixes (Schaffrin et al 2015, Schmidt and Sewerin 2019). Moreover, the contribution of policies in one country to policy diffusion internationally is worth analyzing, as previous research has shown such a link for climate policies in other areas (Fankhauser et al 2016). Also, extending the analysis to non-OECD countries would be valuable.

Third, the policy outcome, that is, the question of how effective green financial policies are in achieving their objectives, needs to be addressed. A few past studies analyzed outcomes for specific policies, such as policies fostering cleantech venture capital provision (Migendt et al 2017), and green state investment banks (Mazzucato and Penna 2016, Geddes et al 2018, Deleidi et al 2019, Geddes and Schmidt 2020). Future research that covers the entire breadth of green financial policies, and that finds ways to quantify the effect of these policies in different settings, would be highly valuable. This research should also take into account recent advances in the finance literature concerning climate risk and financial stability (see introduction), as there is certainly an overlap in policy instruments that serve to increase financial stability, and to bring finance flows in accordance with the Paris Agreement.

In conclusion, the comparative analysis of green financial policy output in this letter shows that significant policy activity to redirect finance flows has been conducted since the Paris Agreement in 2015, although with major country differences and with limited transparency in policy stringency and effects. Building on our initial results, future analysis can help green financial policies to become a key ingredient of effective climate policy mixes, to deliver the fundamental economic transitions needed for climate change mitigation.

Data availability statement

The data that support the findings of this study are available upon reasonable request from the authors.

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Appendix

A.1. Further details on methodology and data

Scope of analysis

Talking about ‘policies’, in this analysis we refer to instruments of public policy, following the (broad) classical definition of policy being ‘what government chooses to do or not to do’ (Dye 1972). National-level policies are the primary focus of our analysis. In addition, we also include EU level policies, as the EU is an important policy actor in the area of finance given its authorities in the European legal architecture. As briefly discussed in the results section, the EU level policies interrelate with some national-level policies of EU member states, primarily with respect to one policy (Directive on Non-Financial Reporting) that had to be implemented via legislative changes in many member states. A detailed analysis of policy output interactions internationally is beyond the scope of this letter and part of our future research agenda (see section 5).

Compilation of inventory

The inventory is compiled primarily based on three policy databases. We start with the most exhaustive database currently available, the Green Finance Measures Database, which was published by the United Nations Environment Program (UNEP) and the Green Growth Knowledge Partnership (a network of international organizations) in December 2019 (UN Environment Programme 2019). The database includes information on policy and regulatory measures by public authorities that address ‘green finance’, which is understood as ‘financing of investments that provide environmental benefits in
the context of environmentally sustainable development’ (GGKP 2019, p 2) and is the result of various country analyses for UNEP and the G20 finance ministers and of UNEP desk research over the course of 2019. The database includes 256 entries for OECD countries, which we manually check concerning their fit with our definition of green financial policies. When in doubt, we consult the original policy text and/or additional documents (in 64 cases). In the process, we also correct data for three entries that include a wrong implementation date. About half of the entries are discarded. Reasons to discard entries include the policy having no direct link to climate change concerns (e.g. policies addressing good governance in general, matters of human rights, or regulating charities), the policy not directly addressing the financial sector (e.g. policies defining national energy strategies, enacting subsidies for renewable energy, or establishing national greenhouse gas accounting systems), the policy being at a subnational level, or the entry not being implemented by public authorities (e.g. initiatives by trade associations). After excluding entries referring to minor updates to earlier policies, we obtain a dataset of 119 policies.

To achieve an inventory as exhaustive as possible, we enrich this dataset by comparing it with two other databases that also cover relevant policies. First, the International Energy Agency’s (IEA) Policies Database, which provides information on 5000+ energy policies related to renewables, energy efficiency, climate change, and carbon capture and storage, includes 167 policies classified as ‘Loan/debt finance’ (the only relevant category in this database) as of February 2020 (IEA 2020). For entries that fit our definition, we check if they are included in our inventory, which is the case for all policies except 9, which we add to the dataset. Second, we consider the Green Bond Policy Data Set, which is maintained by the non-governmental organization Climate Bond Initiative and includes information on 104 policies, ‘which have been developed to expand the green bond market on a global level’ (Climate Bonds Initiative 2019). This step adds five policies that have not been covered in our inventory. Finally, we cross-check the dataset with two relevant reports from non-governmental organizations (Climate Transparency 2017, 3fP-Tracker 2019a). Among all the policies discussed in the reports, 18 policies are part of our inventory, and only three missing policies (all from 2019, so probably too recent to be included in the other databases) are added to the dataset.

In sum, the resulting inventory includes 136 green financial policies from 29 different countries and the EU. This inventory is provided in the appendix. Although we cannot claim exhaustiveness, the chosen approach ensures a high coverage of relevant policies, as illustrated by the addition of only a few entries in the comparison with each additional data source. It thus allows for a meaningful analysis of policy output over time and across countries, as presented in this analysis.

Regression analysis
The regression includes 360 country-year observations from 2010 on. The EU level has been excluded. The explanatory variables at the country level have been chosen to measure important contextual factors. The general climate policy density is measured by counting the number of all policies related to renewables, energy efficiency, climate change, and carbon capture and storage in different countries in a given year (IEA 2020) (a total of 3677 policies in our sample) and then by normalizing the values using the standard deviation from the average value (Freudenberg 2003). Further, we consider the gross domestic product (GDP) per capita (1,000 USD2015 purchasing power parity) and the share of ‘finance and insurance activity in total value added’ (%) both from OECD (2020). To account for further correlation of observations from the same country in different years (beyond the general time effect captured by the year fixed effects), standard errors are clustered at the country level. Descriptive statistics are provided in table A1 below.

A.2. Further results
To further analyze country differences, figure A1 breaks down the density of non-information policies over time. It highlights that the high momentum of policy output in recent years is driven by two effects. First, most countries that had several green financial
policies for some time already increased the number of policies after the Paris Agreement, including France, Germany, Italy, and Japan, and the EU level. A notable exception is the United States, which successively increased the number of policies until 2015 but then stopped under the Trump Administration (which also decided to withdraw from the Paris Agreement). Second, many countries that have not been active before began to enact non-information policies, although this typically happened only in 2018 or 2019, adding to the increasing momentum in recent years.

Descriptive statistics and further details on the regression results are provided in tables A1 and A2.
Table A2. Regression table including standard errors.

|                  | (1)          | (2)          | (3)          | (4)          |
|------------------|--------------|--------------|--------------|--------------|
|                  | No. of all   | No. of all   | No. of non-inf | No. of non-inf |
|                  | LowCarbFinPol| LowCarbFinPol| LowCarbFinPol| LowCarbFinPol|
| General climate  |              |              |              |              |
| policy density   | 0.216 * *    | 0.183 * *    | 0.209 * *    | 0.190 * *    |
|                  | (0.0931)     | (0.0887)     | (0.0882)     | (0.0870)     |
| GDP share from   |              |              |              |              |
| financial sector |              |              |              |              |
|                  |              |              |              |              |
| GDP per capita   |              |              |              |              |
|                  | 0.0361 * *   | 0.0245 *     |              |              |
|                  | (0.0160)     |              |              |              |
| 2011 year        | −0.0102      | −0.0208      | −0.00535     | −0.0128      |
|                  | (0.0363)     | (0.0409)     | (0.0428)     | (0.0462)     |
| 2012 year        | 0.0884       | 0.0888       | 0.0741       | 0.0729       |
|                  | (0.0766)     | (0.0757)     | (0.0810)     | (0.0798)     |
| 2013 year        | 0.189        | 0.176        | 0.196        | 0.186        |
|                  | (0.118)      | (0.115)      | (0.124)      | (0.121)      |
| 2014 year        | 0.279 *      | 0.245 *      | 0.204        | 0.182        |
|                  | (0.138)      | (0.137)      | (0.137)      | (0.135)      |
| 2015 year        | 0.477 * *    | 0.405 * *    | 0.338 *      | 0.288 *      |
|                  | (0.143)      | (0.145)      | (0.156)      | (0.159)      |
| 2016 year        | 0.625 * *    | 0.526 * *    | 0.402 *      | 0.333 *      |
|                  | (0.163)      | (0.165)      | (0.178)      | (0.180)      |
| 2017 year        | 0.730 * *    | 0.602 * *    | 0.429 *      | 0.336 *      |
|                  | (0.169)      | (0.173)      | (0.168)      | (0.169)      |
| 2018 year        | 0.948 * *    | 0.793 * *    | 0.668 * *    | 0.557 * *    |
|                  | (0.173)      | (0.181)      | (0.177)      | (0.179)      |
| 2019 year        | 1.138 * *    | 0.978 * *    | 0.815 * *    | 0.701 * *    |
|                  | (0.171)      | (0.185)      | (0.184)      | (0.188)      |
| Constant         | −0.844 * *   | −1.735 * *   | −0.968 * *   | −1.338 * *   |
|                  | (0.324)      | (0.453)      | (0.329)      | (0.444)      |
| Pseudo R2        | 0.1144       | 0.1376       | 0.1135       | 0.1253       |
| Observations     | 360          | 360          | 360          | 360          |

Robust standard errors in parentheses, clustered at country level. * * * p < 0.01, * * p < 0.05, * p < 0.1.
### A.3. Inventory of policies

| Country  | Year   | Policy name                                      | Governing resource | Description of policy instrument                                                                 |
|----------|--------|--------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------|
| Australia | 1999   | Renewable Energy Equity Fund                     | Organization       | Establishment of other financial actors (e.g. accelerators, public-private funds)               |
| Australia | 2001   | Financial Services Reform Act/ Ethical Disclosure Requirements | Authority         | Disclosure requirement whether and how climate/ESG considered in/ portfolio                     |
| Australia | 2012   | Clean Energy Finance/Corporation                 | Organization       | Establishment of dedicated green state investment bank                                          |
| Australia | 2001   | Financial Services Reform Act/ Ethical Disclosure Requirements | Authority         | Guidelines for other green finance products/indices                                              |
| Australia | 2019   | APRA Climate Change Survey                       | Information        | Government study/survey/consultation                                                             |
| Austria  | 2005   | Pension Fund Act                                 | Authority          | Guidelines for other green finance products/indices                                              |
| Austria  | 2010   | Eco-label for Sustainable Investment Funds       | Information        | Government label for green finance products/actors                                              |
| Austria  | 2019   | Austrian Green finance focus group               | Information        | Government-convened expert panel/research initiative                                             |
| Belgium  | 2003   | Law on Supplementary Pensions                   | Authority          | Disclosure requirement whether and how climate/ESG considered in/ portfolio                     |
| Belgium  | 2004   | Law on Collective/Investment Portfolio Management | Authority          | Disclosure requirement whether and how climate/ESG considered in/ portfolio                     |
| Belgium  | 2018   | Belgium Green Bond                               | Organization       | Sovereign green bond issuance                                                                  |
| Belgium  | 2019   | NBB Climate Risk/Survey                          | Information        | Government study/survey/consultation                                                             |
| Canada   | 2010   | National Instrument on Continuous Disclosure Obligations | Authority          | Disclosure requirements/concerning climate/ESG for corporates/listed stocks                    |
| Canada   | 2016   | CAPSA Pension Plan/Governance Guidelines         | Authority          | Specific regulations on climate risk management                                                  |
| Canada   | 2018   | CSA Review of Issuers’ Disclosure of Climate-Related Risks and Financial Impacts | Information        | Government study/survey/consultation                                                             |
| Canada   | 2019   | BoC Research Initiative on Climate-related Risks | Information        | Government-convened expert panel/research initiative                                             |
| Canada   | 2019   | CSA Guidance on Reporting of Climate-related Risks | Authority          | Regulatory guidance on disclosure concerning climate/ESG for corporates/listed stocks           |
| Canada   | 2019   | Federal Government’s Expert Panel on Sustainable Finance | Information        | Government-convened expert panel/research initiative                                             |
| Chile    | 2019   | Chile Green Bond                                 | Organization       | Sovereign green bond issuance                                                                  |
| Denmark  | 2012   | Financial Statements Act Amendment               | Authority          | Disclosure requirements/concerning climate/ESG for corporates/listed stocks                    |
| EU       | 2013   | EIB Energy Lending Guidelines                    | Organization       | Green programs at existing state investment bank                                                |

(Continued.)
| Country  | Year | Policy name                                                                 | Governing resource  | Description of policy instrument                                                                 |
|----------|------|-----------------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------|
| EU       | 2013 | Energy Efficiency Financial Institutions Group                           | Information         | Government-convened expert panel/research initiative                                              |
| EU       | 2014 | Directive on Non-Financial Reporting                                  | Authority           | Disclosure requirements concerning climate/ESG for corporates/listed stocks                      |
| EU       | 2015 | Natural Capital Financing Facility                                   | Treasury            | Loan guarantees for immature technologies/solutions                                              |
| EU       | 2015 | Report on Resource Efficiency and Fiduciary Duties of Investors               | Information         | Government study/survey/consultation                                                               |
| EU       | 2016 | Consultation on Long-Term and Sustainable Investments                     | Information         | Government study/survey/consultation                                                               |
| EU       | 2016 | European Systemic Risk Board Study                                      | Information         | Government study/survey/consultation                                                               |
| EU       | 2016 | High Level Expert Group on Sustainable Finance                           | Information         | Government-convened expert panel/research initiative                                              |
| EU       | 2016 | Institutions for Occupational Retirement Provision Regulation              | Authority           | Specific regulations on climate risk management                                                   |
| EU       | 2018 | Action Plan on Financing Sustainable Growth                             | Information         | Public green finance strategy/program                                                               |
| EU       | 2018 | Climate Transition Benchmark and EU Paris-aligned Benchmark Guidelines    | Authority           | Guidelines for other green finance products/indices                                               |
| EU       | 2019 | EIOPA Stress Test of Institutions for Occupational Retirement Provision | Information         | Government study/survey/consultation                                                               |
| EU       | 2019 | ESMA Disclosure Requirements for Credit Ratings                          | Authority           | Disclosure requirement whether and how climate/ESG considered in portfolio                        |
| EU       | 2019 | Guidelines on Reporting Climate-Related Information                      | Authority           | Regulatory guidance on disclosure concerning climate/ESG for corporates/listed stocks            |
| EU       | 2019 | Regulation on a Pan-European Personal Pension Product PEPP                | Authority           | Specific regulations on climate risk management                                                   |
| EU       | 2019 | Regulation on Sustainability-Related Disclosures in the Financial Services Sector | Authority           | Disclosure requirement on climate/ESG impact of portfolio                                         |
| EU       | 2019 | Technical Expert Group on Sustainable Finance                           | Information         | Government-convened expert panel/research initiative                                              |
| Finland  | 2016 | Finnish Accounting Act Amendment                                         | Authority           | Disclosure requirements concerning climate/ESG for corporates/listed stocks                      |
| Finland  | 2018 | BoF Responsible Investments Standards                                    | Organization        | Investment policy of central bank                                                                  |
| France   | 2001 | Act on Employee Savings                                                  | Authority           | Disclosure requirement whether and how climate/ESG considered in portfolio                        |
| France   | 2001 | FOGIME Loan Guarantee Fund                                               | Treasury            | Loan guarantees for immature technologies/solutions                                               |

(Continued.)
| Country  | Year  | Policy name                                                                 | Governing resource | Description of policy instrument                                                                 |
|---------|-------|----------------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------|
| France  | 2001  | New Economic Regulations Act                                                | Authority           | Disclosure requirements concerning climate/ESG for corporates/listed stocks                      |
| France  | 2002  | SOFERGIE Framework                                                         | Authority           | Special legal entities/setups for green finance                                                  |
| France  | 2007  | Livret de Développement Durable                                             | Treasury            | Subsidies for innovative green loan offerings                                                    |
| France  | 2015  | Canfin-Grandjean Commission                                                | Information         | Government-convened expert panel/research initiative                                              |
| France  | 2015  | Energy Transition Law                                                       | Authority           | Disclosure requirement on climate/ESG impact of portfolio                                         |
| France  | 2015  | TEEC Energy and Ecological Transition for the Climate Label                 | Information         | Government label for green finance products/actors                                               |
| France  | 2016  | Socially Responsible Investment Label                                       | Information         | Government label for green finance products/actors                                               |
| France  | 2017  | Declaration of extra-financial performance of companies                     | Authority           | Disclosure requirements concerning climate/ESG for corporates/listed stocks                      |
| France  | 2017  | France Green Bond                                                           | Organization        | Sovereign green bond issuance                                                                    |
| France  | 2017  | French Strategy for Green Finance                                           | Information         | Public green finance strategy/program                                                              |
| France  | 2017  | Report on climate-related risks in the banking sector                       | Information         | Government study/survey/consultation                                                               |
| France  | 2018  | BdF Responsible Investment Charter                                          | Organization        | Investment policy of central bank                                                                |
| France  | 2018  | BdF Responsible Investment Report                                           | Information         | Government study/survey/consultation                                                               |
| France  | 2019  | ACPR Climate Risk Survey                                                    | Information         | Government study/survey/consultation                                                               |
| France  | 2019  | Financial Stability Review                                                  | Information         | Government study/survey/consultation                                                               |
| France  | 2019  | Law on Climate and Energy                                                   | Authority           | Disclosure requirement on climate/ESG impact of portfolio                                         |
| Germany | 2009  | KfW Renewable Energies Programme                                            | Organization        | Green programs at existing state investment bank                                                  |
| Germany | 2015  | Act on the Supervision of Insurance Undertakings                            | Authority           | Disclosure requirement whether and how climate/ESG considered in portfolio                       |
| Germany | 2016  | Amendment to Commercial Code                                                | Authority           | Disclosure requirements concerning climate/ESG for corporates/listed stocks                      |
| Germany | 2016  | Climate Change and Financial Markets Report                                 | Information         | Government study/survey/consultation                                                               |
| Germany | 2019  | BaFin Guidance Notice on Dealing with Sustainability Risks                 | Authority           | Specific regulations on climate risk management                                                   |
| Germany | 2019  | BaFin Perspectives Special Study on Sustainability Issues                   | Information         | Government study/survey/consultation                                                               |
| Germany | 2019  | Sustainable Finance Advisory Board                                          | Information         | Government-convened expert panel/research initiative                                              |
| Greece  | 2006  | Law of Environmental and Social Reporting                                   | Authority           | Disclosure requirements concerning climate/ESG for corporates/listed stocks                      |
| Country     | Year  | Policy name                                                                 | Governing resource | Description of policy instrument                                                                 |
|------------|-------|------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------|
| Ireland    | 2018  | Irish Sovereign Green Bonds                                                  | Organization       | Sovereign green bond issuance                                                                   |
| Ireland    | 2019  | Strategy for the Development of Ireland’s International Financial Services Sector to 2025 | Information        | Public green finance strategy/program                                                               |
| Israel     | 2014  | Environmental Impact Index                                                   | Information        | Government study/survey/consultation                                                                |
| Italy      | 2005  | Regulation of Supplementary Pension Schemes                                  | Authority          | Disclosure requirement whether and how climate/ESG considered in portfolio                       |
| Italy      | 2010  | IVASS Regulation for ESG-labelled insurance                                  | Authority          | Disclosure requirement whether and how climate/ESG considered in portfolio                       |
| Italy      | 2015  | Corporate Governance Code                                                    | Authority          | Disclosure requirements concerning climate/ESG for corporates/listed stocks                      |
| Italy      | 2016  | National Dialogue on Sustainable Finance                                     | Information        | Government-convened expert panel/research initiative                                               |
| Italy      | 2018  | IVASS Regulation Laying Down Provisions On the System of Governance          | Authority          | Specific regulations on climate risk management                                                    |
| Italy      | 2019  | Central Bank Investment Policy                                               | Organization       | Investment policy of central bank                                                                  |
| Japan      | 2004  | Environmentally Rated Loan Program                                           | Treasury           | Subsidies for innovative green loan offerings                                                      |
| Japan      | 2012  | Principles for Financial Action Towards a Sustainable Society                | Information        | Government-convened expert panel/research initiative                                               |
| Japan      | 2013  | Green Fund                                                                  | Organization       | Establishment of dedicated green state investment bank                                             |
| Japan      | 2017  | ESG Working Group                                                           | Information        | Government-convened expert panel/research initiative                                               |
| Japan      | 2017  | Green Bond Guidelines                                                        | Authority          | Guidelines for green bonds                                                                          |
| Japan      | 2018  | Environmental Reporting Guidelines                                           | Authority          | Disclosure requirements concerning climate/ESG for corporates/listed stocks                      |
| Japan      | 2018  | Green Finance Network                                                        | Information        | Government-convened expert panel/research initiative                                               |
| Japan      | 2018  | Subsidies to Support Green Bond Issuance                                     | Treasury           | Subsidy for private green bond issuance                                                            |
| Lithuania  | 2018  | Green Bond Framework                                                         | Organization       | Sovereign green bond issuance                                                                      |
| Luxembourg | 2008  | Energy Efficient Partner Label                                                | Information        | Government label for green finance products/actors                                                  |
| Luxembourg | 2015  | Climate Finance Task Force                                                   | Information        | Government-convened expert panel/research initiative                                               |
| Luxembourg | 2018  | Legal Framework for Green Covered Bonds                                      | Authority          | Guidelines for green bonds                                                                          |
| Luxembourg | 2018  | Climate Finance Accelerator                                                  | Organization       | Establishment of other financial actors (e.g. accelerators, public-private funds)                  |
| Mexico     | 2018  | Investment Guidelines for Retirement Funds Administrators                    | Organization       | Investment policy of public funds (e.g. government pension funds)                                 |
| Netherlands| 2014  | CSR Strategy of De Nederlandsche Bank                                        | Information        | Public green finance strategy/program                                                               |
| Netherlands| 2014  | National Energy Savings Fund                                                  | Organization       | Establishment of other financial actors (e.g. accelerators, public-private funds)                  |

(Continued.)
### Table A3. (Continued.)

| Country   | Year  | Policy name                                      | Governing resource | Description of policy instrument                                                                 |
|-----------|-------|-------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------|
| Netherlands | 2015  | Pensions Act                                    | Authority          | Disclosure requirement whether and how climate/ESG considered in portfolio                       |
| Netherlands | 2016  | Sustainable Finance Platform                     | Information        | Government-convened expert panel/research initiative                                            |
| Netherlands | 2017  | Assessment of Climate-Related Risks for the Dutch Financial Sector | Information | Government study/survey/consultation                                                             |
| Netherlands | 2019  | InvestNL                                         | Organization       | Establishment of dedicated green state investment bank                                          |
| Netherlands | 2019  | Sovereign Green Bond                             | Organization       | Sovereign green bond issuance                                                                  |
| New Zealand | 2018  | Reserve Bank Climate Change Strategy             | Organization       | Investment policy of central bank                                                                |
| Norway     | 2013  | Act amending the Accounting Act                  | Authority          | Disclosure requirements concerning climate/ESG for corporates/listed stocks                     |
| Norway     | 2015  | Principles for Responsible Investment Management | Organization       | Investment policy of central bank                                                                |
| Norway     | 2016  | Guidelines for Observation and Exclusion          | Organization       | Investment policy of public funds (e.g. government pension funds)                                |
| Poland     | 2016  | Sovereign Green Bond                             | Organization       | Sovereign green bond issuance                                                                  |
| Portugal   | 2010  | Financial Reporting Accounting Standard          | Authority          | Disclosure requirements concerning climate/ESG for corporates/listed stocks                     |
| Korea      | 2012  | Financial Services Commission’s Green Posting System | Authority     | Disclosure requirements concerning climate/ESG for corporates/listed stocks                     |
| Korea      | 2015  | National Pension Service Act                     | Organization       | Investment policy of public funds (e.g. government pension funds)                                |
| Korea      | 2019  | Green Bond Guidelines                            | Authority          | Guidelines for green bonds                                                                     |
| Spain      | 2002  | ICO-IDAE Financing Line                          | Organization       | Green programs at existing state investment bank                                               |
| Spain      | 2002  | Rules for the Recognition, Valuation             | Authority          | Disclosure requirements concerning climate/ESG for corporates/listed stocks                     |
| Sweden     | 2001  | Amendment to Pension Insurance Fund Act          | Organization       | Investment policy of public funds (e.g. government pension funds)                                |
| Sweden     | 2014  | Committee directive on a review of the fund      | Information        | Government-convened expert panel/research initiative                                            |
| Sweden     | 2016  | Assessment of Climate Change and Financial Stability | Information     | Government study/survey/consultation                                                             |
| Sweden     | 2016  | Inquiry how to promote green bond market         | Information        | Government study/survey/consultation                                                             |
| Sweden     | 2018  | Survey sustainability-related risks              | Information        | Government study/survey/consultation                                                             |
| Switzerland | 2013  | Technology Fund                                  | Treasury           | Loan guarantees for immature technologies/solutions                                             |
| Switzerland | 2017  | Pilot tests to analyze the climate alignment of financial portfolios | Information | Government study/survey/consultation                                                             |

(Continued.)
Table A3. (Continued.)

| Country         | Year | Policy name                                      | Governing resource | Description of policy instrument                                                                 |
|-----------------|------|--------------------------------------------------|--------------------|---------------------------------------------------------------------------------------------------|
| Turkey          | 2003 | Corporate Governance Principles                  | Authority          | Disclosure requirements concerning climate/ESG for corporates/listed stocks                       |
| Turkey          | 2019 | Regulations relating to the credit transactions of banks | Authority          | Specific regulations on climate risk management                                                   |
| United Kingdom  | 2000 | Amendment to Pensions Act                         | Authority          | Disclosure requirement whether and how climate/ESG considered in portfolio                        |
| United Kingdom  | 2011 | Green Investment Bank                             | Organization       | Establishment of dedicated green state investment bank                                           |
| United Kingdom  | 2013 | Amendment to the Companies Act                    | Authority          | Disclosure requirements concerning climate/ESG for corporates/listed stocks                       |
| United Kingdom  | 2015 | Impact of Climate Change on the Insurance Sector  | Information        | Government study/survey/consultation                                                              |
| United Kingdom  | 2017 | Green Finance Task Force                          | Information        | Government-convened expert panel/research initiative                                              |
| United Kingdom  | 2018 | Climate Financial Risk Forum                      | Information        | Government-convened expert panel/research initiative                                              |
| United Kingdom  | 2018 | Review of the Impact of Climate Change on the Banking Sector | Information | Government study/survey/consultation                                                              |
| United Kingdom  | 2019 | Framework for Assessing Financial Impacts of Physical Climate Change | Information | Guidelines/recommendations related to green finance                                               |
| United Kingdom  | 2019 | General Insurance Stress Tests                    | Information        | Government study/survey/consultation                                                              |
| United Kingdom  | 2019 | Green Finance Strategy                            | Information        | Public green finance strategy/program                                                              |
| United Kingdom  | 2019 | Investment Guidance for Trustees of Defined Contributions | Authority      | Disclosure requirement whether and how climate/ESG considered in portfolio                        |
| United Kingdom  | 2019 | PRA Supervisory Statement                         | Authority          | Specific regulations on climate risk management                                                   |
| United States   | 2005 | Property-Assessed Clean Energy (PACE) Programs    | Treasury           | Subsidies for innovative green loan offerings                                                      |
| United States   | 2006 | Energy Policy Act                                 | Treasury           | Loan guarantees for immature technologies/solutions                                               |
| United States   | 2010 | Guidance Regarding Disclosures Related to Climate Change | Authority      | Regulatory guidance on disclosure concerning climate/ESG for corporates/listed stocks             |
| United States   | 2010 | Insurer Climate Risk Disclosure Survey            | Information        | Government study/survey/consultation                                                              |
| United States   | 2013 | National Impact Initiative                        | Organization       | Establishment of other financial actors (e.g. accelerators, public-private funds)                |
| United States   | 2014 | Warehouse for Energy Efficiency Loans             | Organization       | Establishment of other financial actors (e.g. accelerators, public-private funds)                |
| United States   | 2015 | Bulletin on ESG                                   | Authority          | Guidelines for other green finance products/indices                                               |
| United States   | 2015 | Revisions to Financial Condition Examiners Handbook | Information | Guidelines/recommendations related to green finance                                               |
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