

## Article

# Institutional Drivers of Voluntary Carbon Reduction Target Setting—Evidence from Poland and Hungary

Anna Doś<sup>1,\*</sup>, Joanna Błach<sup>1,\*</sup>, Małgorzata Lipowicz<sup>1</sup>, Francesco Pattarin<sup>2</sup> and Elisa Flori<sup>2</sup>

<sup>1</sup> Department of Corporate Finance and Insurance, University of Economics in Katowice, 40-287 Katowice, Poland

<sup>2</sup> Dipartimento di Economia “Marco Biagi”, Università degli Studi di Modena e Reggio Emilia, 41125 Modena, Italy

\* Correspondence: anna.dos@uekat.pl (A.D.); joanna.blach@uekat.pl (J.B.)

**Abstract:** Governments worldwide have launched climate policies to mitigate greenhouse gas emissions (GHG). These policies aim to enhance businesses to be active actors in the process of decarbonisation. Therefore, the main objective of this paper is to identify the drivers of voluntary corporate decarbonisation illustrated by climate target-setting practices. In particular, this paper aims at diagnosing whether European Union (EU)-wide and country-level policies foster material corporate commitment to mitigating the carbon footprint in two countries that are exceptionally heavily dependent on fossil fuels: Poland and Hungary, which are characterised by a specific political-economic situation. This analysis focuses on policies related to the EU sustainable finance initiative that enhances companies to voluntarily reduce their GHG emissions: (1) sustainable financial sector, (2) corporate disclosure, and (3) corporate governance policy. At the country level, the national policies for state-owned enterprises (SOEs) are analysed. The empirical research is conducted based on the financial and economic data for a group of Polish and Hungarian publicly listed companies exposed to these regulations. The exposure to certain policies is approximated through selected corporate characteristics. Logistic regression analysis is applied to firm-level data gathered from Refinitive and corporate reports. The dataset covers the period 2014 to 2021, with 214 data-points. The response variable is a binary indicator of whether a company sets emission targets. The empirical research proved that state ownership, belonging to the financial sector, and performance-oriented corporate governance factors have a significantly negative impact on the probability of a company setting target emissions. On the other hand, the company’s size and leverage have a strong positive impact on the probability of setting emission targets. Also, it was confirmed that after 2020 the frequency of corporate target-setting in Poland and Hungary increased. Additionally, it was observed that Polish firms are more willing to set climate targets than Hungarian ones. Therefore, from the analysed policies, only the corporate sustainability disclosure policy proved to have a positive impact on the practices of setting climate targets in Polish and Hungarian firms. The policies related to the sustainable financial sector and to state-owned enterprises proved to have a negative impact on the probability of setting climate targets, while for the corporate governance policy, the results are mixed. In this vein, it was shown that, by a majority, policies to stimulate voluntary corporate commitment to decarbonisation are counter-effective in countries characterised by exceptional fossil fuel dependence and particular institutional features. The original value of this study stems from the applied methodology focusing on a mix of policies addressing the deep decarbonisation process in the specific country settings. The presented research contributes to an on-going debate on the drivers of voluntary corporate decarbonisation, in particular the impact that policy mixes framed under the sustainable finance agenda may have on material commitments to GHG emission reduction targets. In this context, the main findings are important for policymakers who are responsible for creating and implementing policy measures devoted to the deep decarbonisation process. It is recommended that policymakers should consider national specificities while designing policies for a Europe-wide net-zero transition and account for potential tensions arising from different goals as they may have impact on the effectiveness of the decarbonisation process. Future research may focus on the verifi-



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cation of the observed relationships between variables on a larger sample of the European firms to identify the key drivers of deep corporate decarbonisation.

**Keywords:** sustainable finance; institutions; emission targets; corporate sustainability reporting; corporate governance

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## 1. Introduction

The impacts of global climate change have already manifested and are challenging the ability of societies to thrive. Governments worldwide have launched climate policies to mitigate greenhouse gas emissions (GHG) in order to slow down climate change processes. The European Union (EU) has implemented the most ambitious package of measures aiming to make Europe the world's first climate-neutral continent [1]. However, it has stressed that decarbonisation cannot be achieved with a single instrument. A broader mix of policies which interact to influence climate actions in public and private sectors is required [2,3].

One particular challenge is to design policies to channel voluntary private investment towards the transition to a climate-neutral economy. Business and its practices used to be viewed as an obstacle in achieving sustainable development. However, correctly designed policies can turn business into a solution. The UN Global Compact Strategy 2021–2023 [4] underlines that accountable companies are the key actors in achieving the Sustainable Development Goals (SDGs) and the ambitions of the Paris Agreement. Corporations have the resources and authority to make significant steps towards greenhouse gas emission reduction [5]. In addition, corporations have a common interest in responding to the risk of climate change [6]. Yet many are reluctant to reduce GHG emissions voluntarily. Instead, they choose to “greenwash” by promoting false or immaterial solutions to the climate crisis that distract and delay material actions [7,8]. Thus, policies stimulating corporate decarbonisation need to be constantly evaluated. Efficient policies are especially important in fossil fuel-dependent countries [9].

This study is designed to understand which EU policies framed under the sustainable finance agenda aimed at voluntary corporate decarbonisation can bring about material results for Poland and Hungary in terms of corporations setting carbon reduction goals. The distinctive feature of these two countries is that, unlike other CEE countries (such as: Slovakia, Czech Republic, Slovenia), Poland and Hungary not only rely physically upon fossil fuel resources, but they also derive significant public and private financial resources from fossil fuels [10]. This double—physical and financial—dependency on fossil fuels exposes the two countries to the risk of becoming laggards in the transition towards a low-carbon Europe. Additionally, Poland and Hungary are regarded as two illiberal countries in the region [11] and they display similar voting patterns on EU Energy legislative acts in the EU Council as explained by [12]. These specific conditions make Poland and Hungary exceptional and unique subjects of study on corporate voluntary decarbonisation decisions.

The main objective of this paper is to identify drivers of voluntary corporate decarbonisation illustrated by climate target-setting practices. In particular, it aims to diagnose whether EU-wide and domestic (national) policies foster material corporate commitments to mitigating corporate carbon footprints in Poland and Hungary. The analysis is focused on policies related to the EU sustainable finance initiative that are aimed at enhancing companies to voluntarily reduce their GHG emissions, namely, (1) the sustainable financial sector policy, (2) the corporate disclosure policy, and (3) the corporate governance policy, as these policies are central elements of the European Green Deal [13–16]. Additionally, the Polish and Hungarian government (national) policies for state-owned enterprises (SOEs) are analysed in order to grasp possible contradictions among EU-wide and domestic policies. As suggested by [17], the UN 2030 goals are binding at the EU level, but national policies and plans show the member states' responsibility for achieving common goals.

The research hypotheses are developed around the effects of the mentioned policies on voluntary corporate commitment to decarbonisation; as suggested by [15,18,19], sustainable finance can drive the decarbonisation of the economy.

This study provides novel insights into the literature on decarbonisation in fossil fuel regions for two reasons. First, voluntary actions by private actors are needed to safeguard the coherence of socio-economic progress towards net-zero. In this way, this study contributes to the literature on decarbonisation and social cohesion. Second, the focus on setting emission reduction goals provides a forward-looking perspective on decarbonisation. This research also contributes to an on-going debate on the drivers of voluntary corporate decarbonisation in which institutional, organisational, and individual-level factors are discussed [20]. The previous literature on the institutional drivers of corporate decarbonisation has advanced knowledge on the role of culture [21,22]. However, culture cannot be changed quickly while corporate decarbonisation needs to be materially accelerated today. This study contributes to novel insights on the effect of policies, which are feasible factors of corporate decarbonisation. So far, studies have focused separately on corporate disclosure regulation, or on regulation focused on the financial sector or on the sustainable corporate governance initiative [18,23–25]. This study is the first to examine if and how each of the three types of policies can bring about desired effects. In this vein, the study provides insights into the detailed efficiency of the policy mix framed under the sustainable finance agenda. To achieve this, a group of companies that were exposed to the regulations were analysed, and which regulations the companies responded to by setting carbon targets were examined. The exposure to certain policies was approximated through selected corporate characteristics. Finally, the attention was focused on Poland and Hungary, where decarbonisation is a particularly demanding process. There are only a few studies exploring factors of corporate decarbonisation in Poland and in Hungary. These studies take single-country and single-industry perspectives and thus provide a narrow view [26–28]. There are also studies focusing on the selected issues of the decarbonisation process, e.g., presenting the perspective of households [29], analysing particular solutions (e.g., hydrogen strategy) [30], or underlining the importance of political factors [12]. The originality of this study stems from the comprehensive analysis covering two countries of unique political-economic situations (Poland and Hungary), companies from different sectors (financial firms and non-financial ones), and various climate-related policies defined at the EU level as well as the national level.

This study adds to the ever-growing field of research on corporate GHG emissions, especially to the literature that analyses which factors contribute to a company's decision to disclose corporate GHG emissions, e.g., [31,32]. Special attention is paid to a particular type of disclosure: the announcement of a specific CO<sub>2</sub> reduction target. The findings reveal that the particular situation of Poland and Hungary alternates the effects of the majority of policies aimed at enhancing voluntary corporate decarbonisation. The implications for policymakers include a recommendation to account for national specificities while designing policies for a Europe-wide net-zero transition. The policymakers should account for tensions arising from different goals (environmental goals, economic goals, social goals) and for possibilities that the tensions would alter policy results in certain areas. Managerial implications are related to corporate governance. This study reveals that shareholders aiming at greening their portfolio need to account for corporate governance mechanisms that have diverse carbon effects depending on the national institutional environment.

The remainder of this paper is organized as follows. Section 2 briefly discusses the relevant literature and formulates the empirical prediction related to research hypotheses. Section 3 presents the applied research method explaining the multistage research process, sample selection, and variable description. Section 4 reports the model specification and the major findings of the empirical analysis. Section 5 presents a discussion of the results, while Section 6 provides research implications and policy implications. Finally, Section 7 concludes the study.

## 2. Literature Review and Hypotheses Development

### 2.1. Decarbonisation Process in Poland and Hungary

The climate crisis is a global problem [33] addressed in the United Nations Agenda 2030 for Sustainable Development, including 17 Sustainable Development Goals (SDGs) and 169 related targets [34]. One of these goals—SDG 13 Climate Action—aims to implement the United Nations Framework Convention on Climate Change’s pledge to a climate-neutral world. The climate neutrality of the European Union is postulated by the European Green Deal [1] together with the European Climate Law [35] and the Climate Adaptation Strategy adopted in 2021 [36], following the Paris Agreement goals.

The main goal is to reduce net greenhouse gas emissions (in this CO<sub>2</sub>) by at least 55% by 2050. The EU Commission’s action plan on financing sustainable growth [37] presents works related to the implementation of sustainability standards, ESG risk management frameworks, and transparency in sustainability reporting. The global decarbonisation process may be enhanced by a mix of a few measures [38,39], including (1) economic instruments (e.g., carbon taxes, GHG emissions trading, fossil fuel taxes, tax credits, grants, and subsidies), (2) regulatory instruments (e.g., emission performance standards, energy efficiency standards, renewable portfolio standards), and (3) other instruments (e.g., corporate carbon reporting, information programs, voluntary agreements, infrastructure).

Along with carbon taxes, one of the policies that has gained importance is the use of climate targets as a specific environmental management practice. They can be set by nations, regions, cities, institutions, and corporations [40,41]. For reporting purposes, there are three defined scopes of emissions: scope 1 represents the firm’s direct carbon emissions, scope 2 covers indirect carbon emissions associated with the purchase of electricity and energy, and scope 3 includes direct emissions that occur upstream and downstream of a company’s supply chain. These three sources cover the entire supply chain, including the extraction, production, and transportation of purchased raw materials, goods, and fuel [40]. In 2020, 163 companies from the Fortune Global 500 publicly reported setting at least one climate target. The number of S&P companies disclosing sustainability reports increased from 20% in 2011 to 90% in 2019 [42]. Therefore, the importance of climate targets is continuously growing, attracting the attention of policymakers and the public.

Non-financial targets, including climate targets, are promoted by global initiatives, such as Science-Based Targets (SBT) [43]. As discussed in the literature, emission targets can vary between symbolic and substantive targets or between science-based and non-science based. The science-based targets mean setting reductions required to keep global temperatures to 1.5 °C above pre-industrial temperatures [44]. Currently (in May 2023), over 5000 companies world-wide participate in the SBT initiative, with close to 2700 firms having science-based targets (for scope 1 and 2) and 1840 firms having net-zero commitments [43]. However, there are still many firms operating without any emission targets or even a general emission policy.

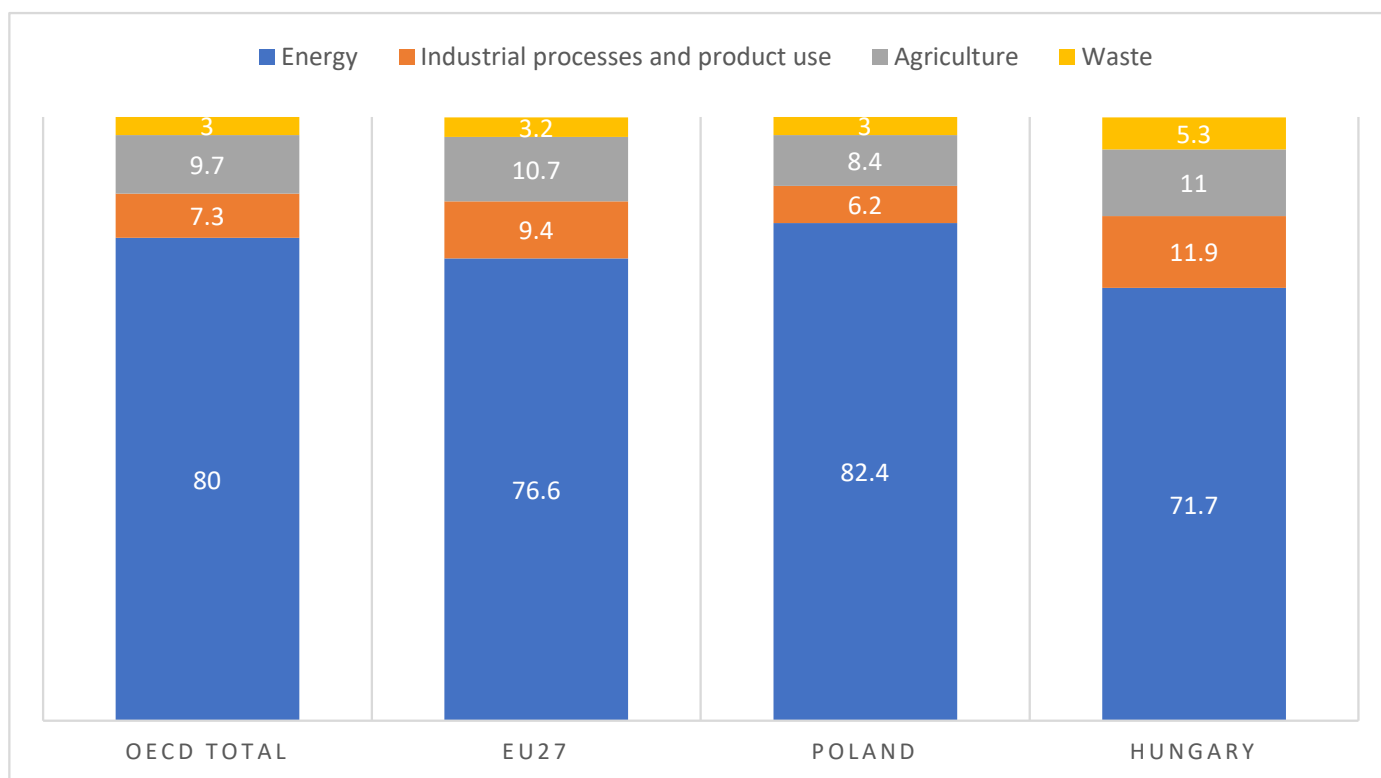
As presented in the 2022 European Sustainable Development Report, GHG emissions have been falling in recent years. The largest decrease was observed in 2020 due to the COVID-19 pandemic and related lockdown measures, which significantly reduced fossil fuel consumption. The European Union reduced its net GHG emissions by almost 14% between 2015 and 2020 [45]. However, Russia’s invasion of Ukraine in February 2022 has created a new set of energy security challenges in Europe. Many countries increased domestic coal and gas production to maintain energy safety and increase energy independence. Despite this, further actions aimed at faster GHG emission reductions are required and are regarded as major challenges, both at the level of the entire European Union and at the national level, including Poland and Hungary as unique economies due to their double dependency on fossil fuels and specific political environments [11]. As presented in Table 1, the indicators illustrating GHG emissions in Poland are above the average results for EU27 countries (see Table 1). For GHG emission intensities per unit of GDP, it is even higher than the average results for all OECD countries.

**Table 1.** GHG emissions in Poland and Hungary (latest year available).

GHG Emissions	OECD	EU27	Poland	Hungary
GHG emission intensities per unit of GDP (tonnes of CO <sub>2</sub> eq. per 1000 USD 2015 PPP)	0.241	0.181	0.309	0.190
GHG emission intensities per capita (tonnes of CO <sub>2</sub> eq. per capita)	10.356	7.553	9.916	6.087
CO <sub>2</sub> emission from fuel combustion (tonnes CO <sub>2</sub> per capita)	8.308	5.423	7.585	4.684

Source: [46].

In Poland, GHG emissions come from the energy sector (over 82% of total GHG emissions, which is above the average level for EU27 and all OECD countries), agriculture (8.4%), and industry (6.25%), while in Hungary, the energy sector is responsible for 71.7% of total GHG emissions, industry for 11.9%, and agriculture for 11% of emissions. However, over 5% of GHG emissions in Hungary are produced by waste, which is above the average for EU27 and total OECD countries, indicating a significant problem that should be solved by the Hungarian government (see Figure 1).

**Figure 1.** GHG emissions by source (sector shares (%) of total GHG emissions—latest year available). Source: [46].

It is reported that among International Energy Agency (IEA) member countries in 2020, Poland used the highest share of coal in energy production and electricity generation, and the second-highest share in heat production. This result places Poland second among IEA member countries for CO<sub>2</sub> intensity for energy supply and fourth for CO<sub>2</sub> intensity for GDP [47]. According to OECD [48], Poland is the fifth most carbon-intensive economy in the OECD. As presented in Table 2, over 73% of electricity in Poland is produced by using coal, peat, or oil shale.

**Table 2.** Energy mix in electricity production (latest year available).

Shares in Total Electricity Production (%)	OECD	EU27	Poland	Hungary
Coal, peat, oil shale	22.5	17.0	73.8	12.2
Oil	1.7	1.8	1.0	0
Natural gas	29.7	19.9	9.0	25
Nuclear	17.8	26.5	0	47.7
Renewables	27.3	33.7	15.6	13.7
Other	0.9	0.9	0.5	1.0

Source: [46].

From 2010 to 2020, the role of coal in Poland declined, both in terms of energy systems, electricity generation, and coal production; since 2017, Poland has been a net coal importer. However, in 2021 and 2022, a significant increase was observed in coal demand, resulting in an over 70% share of coal-fired electricity.

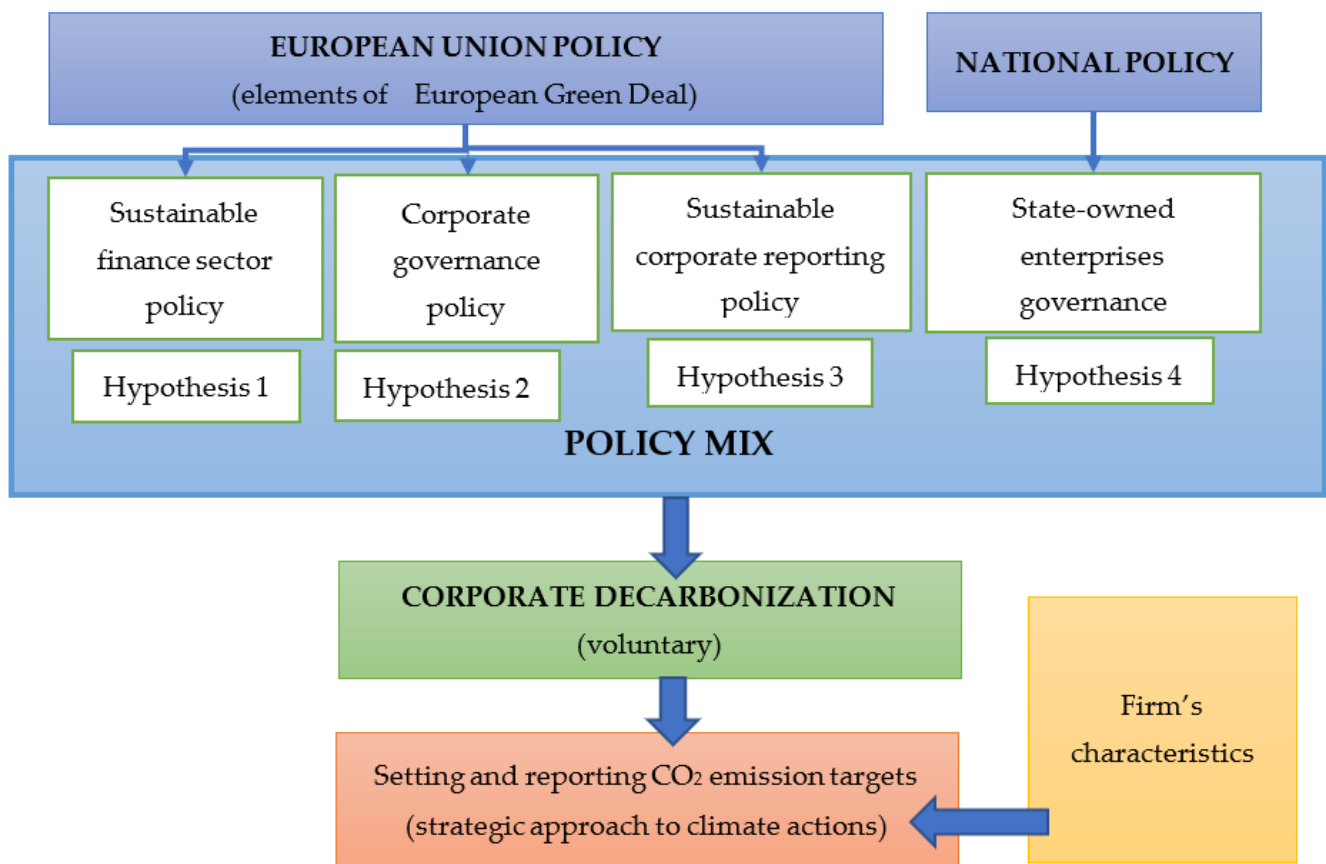
Despite this, Poland has already had some success in the process of energy transition. Poland's energy policy aims to reduce the carbon intensity of its energy supply through the increased use of renewables and natural gas, the introduction of nuclear energy, the higher electrification of energy demand (especially for transport), and improved energy efficiency [49]. The government support for solar photovoltaics (PV) has made Poland one of the fastest growing PV markets in the EU. There is also a well-designed strategy for the development of offshore and onshore wind farms. Poland is focused on energy security and a just transition that maintains affordable access to energy to promote economic growth and protect vulnerable consumers.

Contrary to Poland, according to the IEA report [50], Hungary was among the first countries globally to turn its 2050 emissions target into a legal commitment with the adoption of the Climate Protection Law in 2020. Hungary's energy and climate policy is guided by the National Energy and Climate Plan (NECP) of 2020 and the National Clean Development Strategy (NCDS) of 2021. Hungary's Climate Protection Law sets out energy targets, e.g., by 2030, the renewable energy sources should reach at least a 21% of gross final energy consumption.

Hungary's energy policy strategy for 2022 is designed to increase the country's energy independence. The administration promotes a plan to boost local gas and coal production, secure extra gas imports, and raise the output of the nation's lignite-fired power plant in order to handle the emergency brought on by the Russian invasion of Ukraine. Nuclear energy accounts for more than 47% of Hungary's total energy production (Table 2). Similar to Poland, Hungary uses household solar PV systems to encourage renewable energy sources.

The issue of the decarbonisation process in Poland and Hungary has already been discussed in several papers, but mostly from the macroeconomic perspective. Vavrek and Chovancova [51] suggest Poland and Hungary, as two of the Visegrad 4 (V4) countries, should speed up the implementation of new policies in order to meet the GHG emission reduction goals as defined in the 2050 agenda. The National Climate and Energy Plans of the V4 countries are presented in Mišík and Oravcová [12]. The macroeconomic analysis of CO<sub>2</sub> emissions, energy consumption, and the level of economic growth of GDP in the V4 countries are discussed by Myszczyzyn and Suproń [52]. The positive effect on the level of GHG emissions was observed in Visegrad countries for innovation and information technology. An increase in patents and R&D expenditures has led to a reduction in GHG emissions [53]. On the other hand, the limited impact of environmental taxes on the reduction in GHG emissions was proved by Rybak et al. [54]. Various factors of decarbonisation have also been analysed in studies [26–29]. But none of these papers have used the perspective proposed in this study focusing on the institutional determinants of voluntary corporate decarbonisation.

The conceptual framework applied in this study is presented in Figure 2.



**Figure 2.** Conceptual framework applied in this study. Source: own elaboration.

## 2.2. Sustainable Financial Sector Policy

The main link between the financial sector and sustainable development is indirect, through lending or investing, insurance, or project finance [55]. Nevertheless, presently, it is hoped that the finance sector will become a key actor for accelerating the transition to sustainability and climate neutrality [56].

One reason for this is that, with an increased emissions reduction target of 55% by 2030, the investment challenge is beyond the capacity of the public sector alone [57]. And although private sustainable investing—investing that takes environmental, social, and governance (ESG) information into account—has considerably increased its volume in the past decade [58], the current investment numbers for climate protection need to be scaled substantially [59]. Financial institutions are intermediaries that are able to channel capital to different regions, sectors, companies, or projects and, consequently, they are expected to become key in overdriving financial flows from brown to green projects.

Another reason for this is that, despite many defects, there is no better alternative to the financial sector in terms of efficient capital allocation [60]. Financial institutions have the potential to recognize which corporate decarbonisation projects can attract customers, improve operating margins, uplift productivity, mitigate risk, reduce cost, secure legitimacy, and improve reputation. They can also identify projects that may not pay off. Recognising and providing funds for profitable decarbonisation projects protects accessible resources, as well as safeguarding that the funding for such projects is available now and will be available in the future.

Finally, companies in the financial sector are proficient in pricing risk. They have already started to demand a higher risk premium from companies that underperform in terms of climate-related risk management [61]. Nevertheless, the higher risk premium on loans applies only to the risks stemming from direct emissions and the price of corporate carbon risk is low [62].

Considering the mentioned arguments, the European Union has launched policies focused on financial sector sustainability. The EU Sustainable Finance Action Plan is part of the implementation plan of Article 2 (1) I of the Paris Agreement and the UN 2030 Agenda for Sustainable Development. The EU's strategy for sustainable finance aims at (1) changing the financial system to increase the volume of investments aligned with the Paris agreement, (2) decreasing the cost of capital for sustainable projects, and (3) increasing transparency on the impacts of financial institutions' portfolios.

The first step in creating EU policy for sustainable finance was establishing a High-Level Expert Group on sustainable finance (HLEG) in December 2016 by the European Commission. The interim report of HLEG was published on 12 July 2017 and the final report was delivered on 31 January 2018. The reports discussed investor duties, integrated reporting, and fiduciary duties in terms of the significance of sustainability-related issues for investment decisions [63,64]. In this way, companies from the financial sector found themselves at the centre of interest of decision-makers. In 2019, the European Commission (EC) declared that sustainable finance has a key role to play in delivering on the policy objectives under the European Green Deal as well as the EU's international commitments on climate and sustainability objectives [65]. The new regulations placed a series of special demands on the financial sector.

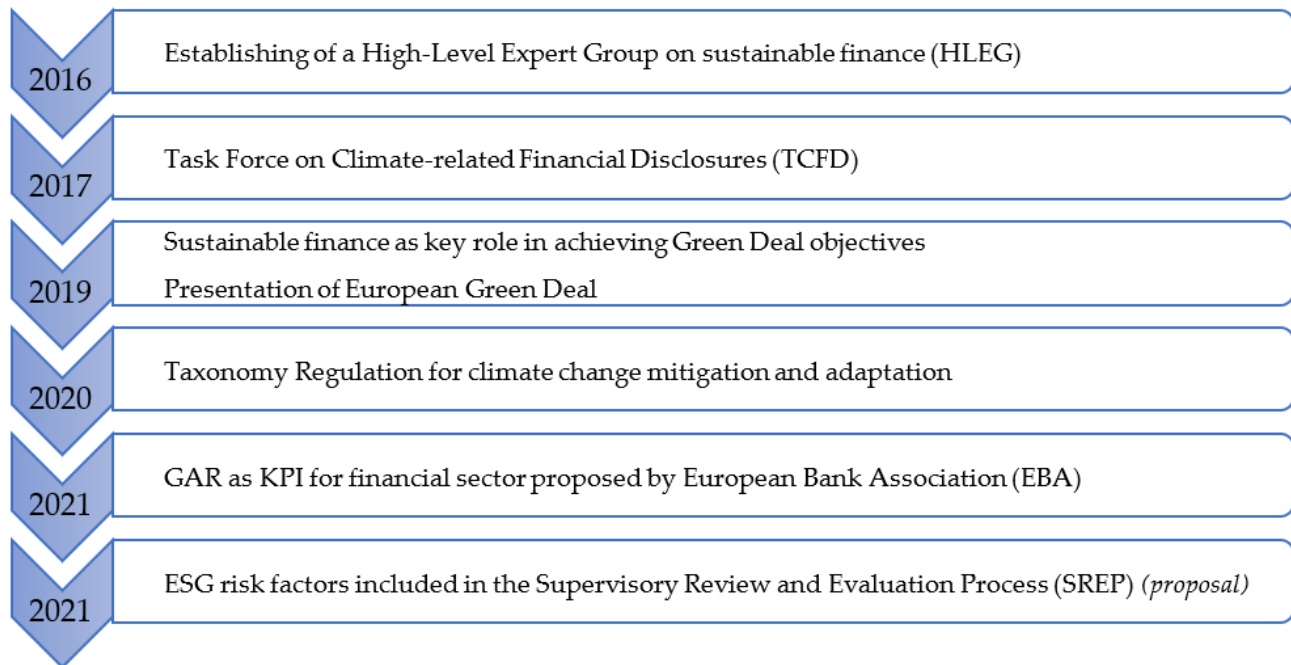
The EC collaborates closely with the Financial Stability Board, which established the Task Force on Climate-related Financial Disclosures (TCFD). The TCFD released climate-related financial disclosure recommendations in 2017. The recommendations apply to financial-sector organisations, including banks, insurance companies, asset managers, and asset owners, which all sit at the top of the investment chain. The recommendations' core elements encompass the disclosure of governance and strategy for climate-related risks and opportunities, the processes used by the organisations to identify, assess, and manage climate-related risk, and finally, metrics and targets. In June 2019, the EC published guidelines on reporting climate-related information that are in line with the TCFD recommendations. On 18 June 2020, the Taxonomy Regulation for climate change mitigation and adaptation was published in the Official Journal [66].

The requirements differ for companies in the financial sector and companies that do not offer financial products. Starting from 2023, it will be mandatory for companies in the financial sector to comply with EU taxonomy, that is, to disclose how and to what extent their economic activity includes, promotes, or finances sustainable projects according to the criteria of the EU taxonomy. Under the taxonomy regulation, EC requested the European Bank Association (EBA) to propose a number of key performance indicators (KPIs) for the disclosure, by credit institutions and by investment firms, on how and to what extent their activities qualify as environmentally sustainable. The proposed Green Asset Ratio (GAR) is considered as a leading KPI. In the consultation draft implementing standards released in March 2021, the EBA stressed that financial institutions should disclose quantitative information on the actions that they are putting in place to mitigate climate change-related risks [67]. The EBA has also started exploring the possibility of introducing ESG risk factors within the Supervisory Review and Evaluation Process (SREP) and the regulatory stress tests [68]. The key elements of the Sustainable Finance Action Plan are presented in Figure 3.

Overall, the regulation demands transparency on how the financial institution and how the investment it makes impacts the climate as well as a strategic focus on these issues. Nevertheless, targeting pro-environmental regulations at companies from the financial sector is a challenge. Banks and other financial institutions have traditionally lagged in addressing climate risk [69]. In addition, their green practices have translated poorly into improved environmental performance [70]. The described regulation has started to put a hard pressure on the financial sector relatively recently, while, before 2021, the regulation was soft and based on encouraging, endorsing, consultation, and the announcement of further regulatory steps. Therefore, taking into account the period of analysis covering 2014–2021, the first hypothesis is formulated as follows:



**Hypothesis 1:** *In Poland and Hungary, operating in the financial sector has a negative effect on the probability of a company to set climate targets.*



**Figure 3.** Sustainable Finance Action Plan—stages. Source: own elaboration.

### 2.3. Corporate Non-Financial Disclosure Policy

In 2014, the European Commission adopted the Non-financial Reporting Directive (NFRD) that requires large public interest entities with over 500 employees (including firms, banks, insurance companies) to report information related to non-financial performance. Under the NFRD regulations, c.a. 11,000 companies in the EU are required to disclose non-financial information on five core aspects: (1) human rights, (2) environmental protection, (3) anti-corruption and bribery, (4) gender, education, profession, and age diversity, and (5) social responsibility and the treatment of employees. The main aim of the NFRD regulations is to provide stakeholders and investors with non-financial information that is important in assessing the value drivers and risk factors of the business activity. Additionally, it aims at encouraging businesses' responsibility over social and environmental issues. The NFRD included non-mandatory guidelines for companies to disclose environmental and social information. It means that companies are obliged to report, but the reporting rules have not been specified. Companies can use any adopted solutions, from self-developed, through to national or international, generally accepted standards. The most often used frameworks include the GRI (Global Reporting Initiative) [71], ISO 26000 [72], SASB [73], or OECD [74]. In 2019, the European Commission published the supplementary guidelines on reporting climate-related information, which include the concept developed in the European Taxonomy. An approach to reporting, based on the non-financial reporting directive (NFRD) without any standard, failed to meet market expectations as it was inefficient. It was pointed out that reporting is not comparable between companies and within the sector, and there were difficulties in verifying disclosed information due to a lack of external auditing.

To eliminate the limitations of the NFRD, the new directive was prepared—the Corporate Sustainable Reporting Directive (CSRD), together with uniform standards (in a form of delegated acts issued by the EC). In January 2023, the CSRD entered into force indicating social and environmental reporting requirements imposed on c.a. 50,000 companies in the EU, both large corporations as well as listed SMEs (see Figure 4). The first companies will

have to prepare the non-financial report based on the new regulations for reports published in 2025 covering the activity in the 2024 financial year. The companies will have to report according to the unified European Sustainability Reporting Standards (ESRS) developed by the EFRAG. The CSRD also extends the scope of the NFRD by adding the digitalisation of information and the obligatory audit of disclosures.



**Figure 4.** Corporate sustainability reporting—regulations. Source: own elaboration.

It is expected that the CSRD will have a positive impact on the market because enterprises will have clear guidelines to follow and will know what reporting is expected from them. This means that they will also be able to properly prepare for reporting in terms of the actions they should take to meet the standards. The introduction of the CSRD will be reported according to the  $3 \times 3 \times 3$  standard under three layers, three areas, and three topics. It is planned to apply the double materiality principle, i.e., financial materiality and impact materiality.

The NFRD required companies to report on policies, results, risks, procedures, and KPIs while the CSRD introduced a requirement report on goals. In addition, the NFRD was too soft and too general to enhance material corporate commitment to decarbonisation.

But announcing the CSRD and European Taxonomy in 2020 made managers aware that material actions should be taken, so that when the European regulations came into force, the company would be able to report significant changes in its model and provide information on the decarbonisation process. Additionally, previous research indicates that mandatory emissions disclosure led to a significant reduction in GHG emissions, as presented by Downar et al. for the UK [75] and by Tomar for the US [76].

From the year 2020 onwards was a period of severe natural catastrophes and increased NGO activism. These forces could also contribute to changes in corporate decarbonisation practices. However, it should be stressed that both Poland and Hungary differ from Western European countries when it comes to the perception of natural disasters as well as the power of NGOs in shaping public discourse around climate change. Since 2020, Poland and Hungary have been safe from wildfires, droughts, and floods. This has resulted in downplaying climate-related issues. Moreover, NGOs like the World Wide Fund for Nature, Corp Watch, Greenpeace International, Friends of the Earth International, and Friends of the Earth Europe are biased towards developed economies [77]. Therefore, changes in regulation are the most powerful events that happened for Poland and Hungary in the studied period.

Taking into account the period of analysis (2014–2021), our second hypothesis assumes the following:

**Hypothesis 2:** *After 2020, the frequency of corporate target-setting in Poland and Hungary increased.*

#### 2.4. Corporate Governance Policy

Corporate governance is the structure of rules, practices, and processes used to direct and manage a company. It determines the distribution of rights and responsibilities among different participants in the corporation and, as such, it is a concept of governing with authority and control [78]. The power within the corporation plays a fundamental role in formulating business strategies and business practices to achieve strategic goals. While maximising value for shareholders is still a major goal for corporations, organisations have become more inclined to broaden the basis of their performance evaluation from a purely financial focus to include long-term sustainability goals [79,80]. This trend is driven by ethical considerations as well as the expected positive effect of improved environmental performance on financial performance [81,82]. In this vein, carbon performance has become a primary dimension of environmental performance [83,84]. Nevertheless, the decision to adopt decarbonisation as the strategic goal of a corporation must be made, and here the role of corporate governance is paramount [85].

A large body of literature has provided policymakers with evidence on how corporate governance and its mechanisms affect corporate commitment to decarbonisation [32,86–88]. It is evidenced that board gender diversity has a significant positive effect on corporate carbon performance [32,87–91]. Another stream of research shows that corporate carbon performance is positively affected by board independence and board size [87,92–94]. Other studies signal the importance of certain board committees, board diligence, or of linking managerial compensation with environmental performance [95–97]. Corporate carbon reduction thus might demand a change in the structures of corporate governance in a way that shifts attention towards environmental objectives and the engagement of environmental non-governmental organisations in governance processes [98]. Since 2006, the EU has undertaken a number of corporate governance reforms that have brought about substantial convergence in corporate governance regimes among member states. These reforms have been aimed mainly at cementing the single market and bolstering the investors' confidence. Nevertheless, some of these reforms foster the adoption of both financial and environmental objectives by companies. These include the following:

- The recommendation that a sufficient number of independent directors should be elected to the board [99];
- Provisions for reporting on board diversity [100,101];
- Provisions for reporting on remuneration and how it contributes to the long-term sustainability of a company [100,102].

The mentioned elements of the EU corporate governance agenda enhance nominating independent directors, fostering board gender diversity, and the disclosure of a link between CEO compensation and the financial and non-financial goals of a company.

In 2020, the EU started an ambitious sustainable corporate governance initiative aligned with the European Green Deal. The aim of the initiative was to empower corporate directors to integrate wider stakeholder interests relevant for long-term sustainable goals into corporate decisions. The initiative encompasses gender equality requirements in the upper echelons as well as corporate sustainability due diligence. The EU efforts to adjust corporate governance towards sustainability challenges continue. In 2022, the EC adopted a new Directive on gender balance on the corporate boards of listed companies. The Directive set targets of 40% of the underrepresented sex among non-executive directors, or 33% among all board members, for listed companies by 2026. In February 2023, the EC adopted a proposal for the Directive on Corporate Sustainability Due Diligence. The proposal aims to foster sustainable and responsible corporate behaviour throughout global value chains. Nevertheless, the two Directives are about to come into force in the future. Still, the initiative is in the introductory phase and its effects cannot be observed yet. Therefore, the soft pressure on board diversity (gender diversity in particular) and on board independence, as well as on disclosing compensation and its link to corporate objectives, remain key elements in aligning EU corporate governance systems with climate policy, as these mechanisms have been proved to create an enabling environment that fosters a culture of environmental responsibility and accountability. However, it should be stressed that corporate governance provides the framework for attaining a company's objectives within a given institutional environment, which is capable of altering the outcomes of corporate governance mechanisms [103,104]. Ortiz-de-Mandojana and colleagues [105] show that the effectiveness of corporate governance in improving firms' environmental sustainability depends on their national institutional contexts. Their findings show that regulatory pressures discourage independent directors and separate board chairs to promote environmental sustainability whereas normative pressures have the opposite effect. Considering this, Filatotchev et al. [106] argue that an analysis of organisational outcomes of various governance practices needs to account for the specificity of the institutional environment. So far, the effects of CG mechanisms on the carbon performance of Polish and Hungarian companies have not been investigated yet, while institutional underpinnings in Poland and Hungary are critical for the set-up of corporate decarbonisation goals.

For many years, environmental protection came low on the priority lists of the Polish and Hungarian political establishments [107]. Although this has started to change, Poland and Hungary opposed the European climate strategy demanding detailed pledges for funds for the countries undergoing the green transition [108,109]. The underlying reason for this is that Poland and Hungary are doubly dependent on fossil fuels as fossil fuels have not only been a major source of energy but are also a source of revenue for governments, as well as companies, in both countries [110–112]. In Poland and Hungary, people are more concerned about the energy affordability issue caused by green transition than in other EU countries [110]. In addition, potential unemployment raises opposition regarding more ambitious climate goals in Poland [111]. In such an environment, the managers and directors of companies may see it as difficult to achieve financial gains through decarbonisation. In this case, efficiency-oriented corporate governance mechanisms can support the focus on values for shareholders while compromising environmental performance.

Poland and Hungary have a two-tier board structure, consisting of a supervisory board (SB), nominated by the General Meeting of Shareholders (GMS), and a management board (MB). SMs and MBs perform separate functions, which is the main differentiating

feature between Anglo-American (common-law) and Continental (civil-law) systems. In the continental system, the SB has a purely supervisory function and the MB is responsible for the management of the company. While in the Anglo-American system, the SB shares top executive responsibility. Because of the Continental system specificity, the SB and MB are equally important in governing a company. In the Continental system, the SB ensures that managers pursue the interests of shareholders. Its task is to monitor, discipline, and remove ineffective management teams. However, the MB is granted a wide independence within its everyday operations. The CEO is appointed by the SB and is a member of the MB. The CEO, jointly with the SB members, is accountable to the company for losses resulting from their activity or forbearance of duties.

Poland and Hungary are societies with a strong masculine culture and a very low participation of women in upper echelons [113–115]. In such an environment, women need to exhibit male-like features to be appointed to supervisory boards or managing boards, including being tough, in control, and extremely calculating [116]. As a consequence of female leaders being expected to be assertive and focused on material success, in Poland and Hungary, supervisory board gender diversity and managing board diversity may inadvertently compromise environmental goals. Therefore, our third hypothesis assumes the following:

**Hypothesis 3:** *In Poland and Hungary, performance-oriented CG mechanisms have a negative impact on the probability of a company to set a climate target.*

### 2.5. National Policies towards State-Owned Enterprises (SOEs)

It should be stressed that the decarbonisation process depends on the quality of the national climate policy. Due to several political and societal challenges, making the switch to a clean energy economy is particularly challenging for many countries that rely on fossil fuels. In terms of the number of climate policies and measures taken (by 2020), Poland and Hungary are comparable: Poland adopted 42 policies, Hungary—40, while the highest number was adopted in France—46, and the smallest in Peru—only 13 [46]. The policy mix consists of three major elements: (1) targets, governance, and climate data, (2) market-based instruments, and (3) non-market-based instruments. In both countries, market-based instruments dominate, followed by nonmarket-based instruments [38]. According to the classification adopted by the OECD [38], the market-based instruments consist of carbon pricing (ETS, carbon tax, fuel excise taxes), congestion charges, renewable electricity support (auctions, feed-in tariffs), financing mechanisms of energy efficiency, public R&D expenditure, the pricing of emissions from international aviation, and maritime transport. Non-market-based instruments include minimum energy performance standards, air pollution standards, fuel economy standards, building energy codes, banning and phase-out of fossil fuel extraction and new coal power plants, emission limit values, labels, planning for renewables expansion, motorway speed limits, the share of rail on total surface transport public expenditure, ending export credits, and the public financing of fossil fuels abroad. Targets, governance, and climate data in both countries represent less than 15% of all adopted policies (e.g., net-zero targets, independent climate advisory bodies, climate education, ratification of key international climate treaties, participation in international climate initiatives, GHG emission reporting and accounting), which may have an impact on the decisions of businesses to set and disclose climate targets.

The resistance to a reduction in coal production and consumption comes from various actors, such as coal mines and firms from the wide coal production chain, labour unions, parts of society, and the government. In this context, the state policy towards the governance of coal mines and other energy producers is of the highest importance.

In Poland and in Hungary, state-owned enterprises (SOEs) represent a significant share of industrial sectors that are central to a carbon-intensive economy. According to the OECD report [117], in 2015, the major sectors for SOEs' activity based on their equity value

were finance (26%), electricity and gas (21%), and transportation (18%). For example, in Poland, the ownership of generation and wholesale and retail electricity sales are highly concentrated, with four state-controlled energy companies. In 2015, in Hungary, there were 370 SOEs with 148,000 employees and in Poland—126 SOEs with 128,000 employees, placing these two economies among the eight countries with the largest SOE sectors in emerging market and post-transition economies [117].

SOEs are business entities in which a state has control as a result of ownership. They have distinct corporate governance structures, objectives, relationships with the government, and sources of finance. Most SOEs operate in domestic markets in the utilities, infrastructure, and energy sectors. However, in some cases, SOEs become entities that are important players in the international markets, representing the state policy towards climate change mitigation. Benoit and colleagues [118] suggest that SOEs can be more effective vehicles for decarbonisation compared with private sector firms if they are under the guidance of governments pursuing ambitious climate policies and have the financial and technical capacity to invest in the decarbonisation process. Thus, in this context, it is suggested the role of the state ownership policy (the state as the shareholder and investor) in mitigating climate change becomes more important than the role of the state as a regulator [119]. It is postulated that states as owners should initiate actions towards the decarbonisation of their national economies.

However, the energy sectors, dominated by fossil fuels, are important employers in both countries. In the mining and quarrying sector in Hungary at the end of 2021, there were 4400 employed persons [120]; while in Poland—131,000 persons, of which over 75,000 were employed in SOEs [121]. In the electricity-, gas-, steam-, and air conditioning- supply sector, there were close to 27,000 persons employed in Hungary, while in Poland—close to 120,000 persons, of which over 53,000 were employed in SOEs. Polish hard coal mines are scheduled to close by 2049, which means that the well-targeted retraining of workers is needed, as well as well-designed complementary policies for the wider coal value chain to address the underlying social inequalities [122]. Therefore, the social, economic, and demographic aspects of the energy transition are very important in both countries, which may make the corporate decarbonisation process less effective and slower. It may be also hampered by political constraints as explained by Meckling and colleagues [39] or by Szabo and Fabok [11].

The willingness of SOEs to disclose carbon information has already been analysed in several studies but with mixed results. For example, Chen et al. [123] found that in China, state-owned enterprises (SOEs) are less willing to disclose carbon information than private firms. On the other hand, Wu et al. [124] showed that Chinese state-owned enterprises voluntarily disclose a higher carbon information level, as compared with non-state-owned enterprises. As governments tend to lever control in SOEs, Hypothesis 4 is formulated as follows:

**Hypothesis 4:** *In Poland and Hungary state ownership has a negative effect on the probability of a company to set climate targets.*

### 3. Methodology

#### 3.1. Data

This research analysed whether Polish and Hungarian companies exposed to EU-wide and country-level policies supporting voluntary climate protection commit to decarbonisation. This study considered corporate commitment to decarbonisation to be an outcome (dependent variable) while being exposed to certain policies was a condition (independent variable) that led to the outcome (as illustrated by Figure 2). The period of analysis covered 2014–2021.

To understand corporate commitment to decarbonisation, the analysis was focused on firms' setting CO<sub>2</sub>-emission targets. Target setting has proliferated in recent years

and entails planning a carbon reduction path that should be aligned with carbon budgets and life cycle management [125]. A growing number of global initiatives are supporting corporate emission target-setting efforts, including Science-Based Targets (GHG emissions) and Pivot Goals (sustainability), with large firms now commonly setting climate change targets. Putting a real figure behind declarations on environmental policies is perceived as an actual, material commitment to decarbonisation [126]. Companies set targets to reduce their carbon emissions across various scopes. Scope 1 refers to direct emissions from owned or controlled sources, such as emissions from facilities or vehicles owned by a company. Scope 2 encompasses indirect emissions associated with purchased energy, such as electricity or heating. Scope 3 covers a broader range of indirect emissions that result from the company's value chain, including emissions from business travel, supply chain activities, and investments. The Refinitiv data on target emissions do not specify the type of scope of the target and thus can refer to Scope 1, 2, or 3. Hereafter, the corporate commitment to decarbonisation was captured through a binary variable indicating whether the company is setting a 1, 2, or 3 emissions target or not.

Data on setting target emissions and financial ratios were retrieved from Refinitiv database for Polish and Hungarian firms listed on the public stock exchange during the analysed period. The research sample covered firms from different sectors and of various sizes. Financial data and information about emission targets were supplemented by corporate governance factors manually collected from the corporate annual reports.

### 3.2. Variables and Sample

In this study, financial and non-financial variables were used. Following previous research [44,127,128], in order to measure corporate decarbonisation, a dummy variable, Emission Targets, was used. The dummy variable equalled one if the company had set and communicated a specific CO<sub>2</sub> reduction target, and zero otherwise. This variable was constructed from Refinitiv, which provides data about the target emission reduction until a specific future year. Firms setting a target to reduce carbon emissions reflect a material commitment to corporate decarbonisation. Final sample consists of 214 firm year observations. In this, 154 observations (72% of sample) were not linked to any target in the analysed period and had a value of 0, while the remaining 60 (28%) had target emissions and received a value of 1.

Further corporate characteristics were used as proxies for the firm's exposure to particular policies. Data were obtained from Refinitiv, with the exception of gender diversity data on corporate bodies (Management Board and Supervisory Board), which was collected manually from the corporate annual reports.

To understand if a company was exposed to national policy by leading political powers, a dummy variable, state ownership, was used in the model. The state ownership variable equalled 1 if a government holds some portion of equity (even less than 50%) and 0 if the government is absent from the ownership structure. The variable was chosen because, in Poland, the power of government is usually higher than the power of other shareholders and even a small fraction of equity gives the government a decisive power over corporate practices [129].

In order to measure the exposure to tightening sustainability-related disclosure, a dummy variable, Period from 2020, was used. This variable equalled 0 for observations from 2014 to 2019 and 1 for observations from 2020 to 2021, that is, for years in which companies learnt about the upcoming CSRD and needed to prepare for reporting in line with EU Taxonomy. Therefore, the period after 2020 represents a timeframe for corporate exposure to tighten disclosure policy.

In order to measure exposure to policies focused on the financial sector, a dummy variable, Financial sector, was used. This variable takes value 1 if the firm operates in the financial sector (Refinitiv) and thus straightforwardly receives sector-specific pressures; otherwise, it takes 0.

In order to understand if pro-efficiency corporate governance measures are present in a company, several corporate governance characteristics were used in the model: CEO gender, supervisory board (SB) independence, supervisory board size, managing board (MB) size, gender diversity in supervisory board, and gender diversity in managing board. The selection of these characteristics was based on EU policy described in Section 2, as well as on recent relevant literature on corporate carbon disclosure, e.g., [88]. CEO gender was measured with a dummy variable which equalled 1 if a CEO is a woman and 0 otherwise. Variable, board independence, was measured with a share of independent directors in the total number of supervisory board members. Variable, management and supervisory board size, was measured with total number of members in MB and SB, respectively. To measure gender diversity in managing and supervisory boards, a Blau index [130] was used for MB and SB, respectively. All measures were aligned with the relevant literature on corporate governance and sustainability [131,132].

In addition, key control variables were adopted: size of a company, its profitability, and financial leverage. The summary of dependent, independent, and control variables is presented in Table 3. The selection of these variables was determined by the research objective and research hypotheses as presented in Section 2. These variables are commonly used in the empirical studies of carbon disclosure, such as [31,92].

**Table 3.** Dependent, independent, and control variables.

Variables	Description
Emission targets	Dummy variable that takes a value of 1 if a firm sets a target for emission reduction, 0 otherwise
CountryPoland	Dummy variable that equals 1 if country of firm's headquarters is Poland 0 otherwise
CountryHungary	Dummy variable that equals 1 if country of firm's headquarters is Hungary, 0 otherwise
Period from 2020	Dummy variable that equals 0 for observations from 2014 to 2019 and 1 for observations from 2020 to 2021
Financial sector	Dummy variable that takes 1 if firm operates in the financial sector according to TRBC classification, otherwise takes 0
Size	Decimal logarithm of total assets value
State ownership	Dummy variable that takes 1 for state-owned firms, otherwise takes 0
Financial leverage	Total debt to total assets ratio
Profitability (ROA)	Net profit to total assets (%)
Female_CEO	Dummy variable that takes 1 if CEO is female, otherwise takes 0
Share_SB_Independent	Share of independent directors in the total number of supervisory board members
SB_size	Number of supervisory board members
MB_Size	Number of management board members
Gender_diversity_SB	Blau index for supervisory board
Gender_diversity_MB	Blau index for management board

This study investigates the influence of particular policies on voluntary corporate decarbonisation by logistic regression analysis on firm-level data. To avoid biases from unobserved company-specific effects, the applied estimates are based on hierarchical regressions where they are represented by random realisations from a Gaussian distribution.



Research sample consists of an unbalanced panel of 39 Polish and Hungarian publicly listed companies that are transparent with respect to their carbon policy. The analysis was conducted for eight consecutive years: 2014–2021, when climate policy in Europe became a primary social and economic goal. Data for companies were collected from 2014 to 2021; overall, this resulted in 214 data-points. Table 4 presents the sample composition by year, with the highest number of observations in years 2019–2020.

**Table 4.** Number of companies by year.

Year	2014	2015	2016	2017	2018	2019	2020	2021
Companies	20	23	24	25	39	37	36	10

The number increases over time, with 2021 being an exception. The reason for this can be that data supply for databases is sometimes delayed. Obviously, the number of companies that were included in this study was highly impacted by data availability. Only companies with full data records were accepted for analysis. This impacted the results as less transparent companies were not included in the final sample.

Ten of the thirty-nine considered firms belong to the financial sector, and five were state-owned for at least one year of observation. Descriptive statistics on a firm's characteristics are represented in Table 5.

**Table 5.** Descriptive statistics on a company's characteristics.

Size (log10 of Assets Value)	Leverage (%)	Profitability (%)
Min.: $9.815 \times 10^8$	Min.: 0.000	Min.: −319.000
1st Qu.: $4.827 \times 10^9$	1st Qu.: 6.725	1st Qu.: 0.600
Median: $2.774 \times 10^{10}$	Median: 17.800	Median: 2.350
Mean: $5.529 \times 10^{11}$	Mean: 20.922	Mean: 1.299
3rd Qu.: $6.755 \times 10^{10}$	3rd Qu.: 31.775	3rd Qu.: 4.875
Max.: $2.334 \times 10^{13}$	Max.: 71.300	Max.: 40.200

The analysed sample is characterised by a relatively low level of financial risk measured with leverage ratio, with a maximum value of 71% and mean value of 21% total debt to total assets ratio. Profitability of assets for the sample is quite low with a mean value of 1.3% and a median value equal to 2.3%.

Furthermore, Table 6 shows descriptive statistics on the supervisory (SB) and the management board (MB) compositions.

**Table 6.** Descriptive statistics on a company's board.

SB_Size	SB_Women	MB_Size	MB_Women
Min.: 3.000	Min.: 0.000	Min.: 2.000	Min.: 0.000
1st Qu.: 6.000	1st Qu.: 1.000	1st Qu.: 4.000	1st Qu.: 0.000
Median: 7.500	Median: 1.000	Median: 6.000	Median: 0.000
Mean: 7.893	Mean: 1.509	Mean: 5.874	Mean: 0.752
3rd Qu.: 10.000	3rd Qu.: 2.000	3rd Qu.: 7.000	3rd Qu.: 1.000
Max.: 15.000	Max.: 6.000	Max.: 12.000	Max.: 5.000

The maximum size of a supervisory board was 15 members, while median and mean values were c.a. 8 members. The management board sizes were relatively smaller with a median equal to 6 members and a maximum of 12 members per board. The share of women on boards was very low—on average 1 woman per supervisory board and even less for the management board. Finally, only six companies had a female CEO (and only for some years of observation). Therefore, the diversity of corporate bodies is very low for the analysed sample of firms. This, however, is common practice in the studied countries.

#### 4. Model Specification and Results

This study examines whether being exposed to certain policies or circumstances influences a company's choice to set a specific CO<sub>2</sub>-reduction target. To achieve this goal, the following econometric model was employed:

$$\text{Emission Targets} = \text{Country} + \text{Period} + \text{Financial sector} + \text{Size} + \text{State\_ownership} + \text{Leverage} + \text{Profitability} + \text{Female}_{\text{CEO}} + \text{Share}_{\text{SB}_{\text{Independent}}} + \text{SB}_{\text{Size}} + \text{Gender diversity}_{\text{SB}} + \text{MB}_{\text{Size}} + \text{Gender diversity}_{\text{MB}}$$

In this model, corporate characteristics (type of sector, type of ownership, corporate governance variables) and year represent a company's exposure to certain policies or circumstances as explained in Section 3.2. Size, leverage, and profitability, as well as country variables, represent control variables. All the variable descriptions are provided in Table 3.

To find out the importance of particular variables, two random effects models (Table 7) were estimated: (1) a linear probability model (LPM); (2) a logistic regression (Logit) according to Nerlove's method [133].

**Table 7.** LPM and Logit results.

Independent Variables	Dependent Variable: Targets_Emissions			
	LPM		Logit	
CountryHungary	−5.790	***	−157.179	***
CountryPoland	−4.842	***	−134.857	***
PeriodFrom 2020	0.205	***	4.397	**
FinancialYes	−0.516	.	−12.675	***
log10(Size)	0.524	***	13.105	***
State_ownedYes	−0.748	***	−4.937	**
Leverage	0.010	***	0.195	***
Profitability	−0.001		0.090	
Female_CEO	0.191	.	3.094	
Share_SB_Independent	−0.002		−0.077	*
SB_Size	−0.001		0.436	
Gender_diversity_SB	−0.001		−0.074	.
MB_Size	−0.013		−0.694	.
Gender_diversity_MB	−0.005	**	−0.092	*
Sigma			11.963	***

$p < 0.1$ . \*  $p < 0.05$ . \*\*  $p < 0.01$ . \*\*\*  $p < 0.01$ .

In both models (Table 7), the results show that the company's Size has a significant positive effect on Emission targets. This positive effect indicates that a larger company is more likely to set a specific CO<sub>2</sub> emission-reduction target than a smaller one. Similarly, both models reveal that the probability of setting a target is significantly higher after 2020 and for firms with higher leverage. Considering the lack of other time-specific events related to climate in Poland and Hungary in 2020, the effect of time can be interpreted as the impact of new corporate disclosure regulations on a firm's decisions regarding setting target emissions. Therefore, Hypothesis 2 is supported. In the contrary, the effects of the Financial sector and State ownership variables on the dependent variable are statistically significant and negative, suggesting that the probability of setting a climate target by a company operating in the financial sector is significantly smaller than the probability of setting an emission target by a company operating in any other sector. Similarly, the probability of setting a climate target by a company in which the government owns any amount of equity is significantly smaller than the probability of setting an emission target by a company where the government is absent in the equity ownership structure. These findings support Hypotheses 1 and 3.

The gender diversity of the management board measured by the Blau index proves to be negatively linked to the probability of setting climate targets, in both models.

However, the logit regression analysis also indicated that the level of independence of the supervisory board (Share\_SB\_Independent) and the size of the management board (MB\_Size) have a negative effect on the probability of setting climate targets. Therefore, firms with larger and more diversified management boards and with higher levels of independence of the supervisory board are less likely to set GHG target emissions. This finding supports Hypothesis 4. On the other hand, the linear probability model showcases that Female\_CEO has a positive effect on the probability of setting climate targets, thus, firms with female CEOs are more likely to set target emissions. Profitability proves to be insignificant for setting climate targets.

Furthermore, using a linear hypothesis test to assess the difference between countries, it is proved that Polish companies are more likely to declare emission targets than Hungarians in both cases.

Finally, it is confirmed that unobserved company-specific effects matter. In LPM, company-specific effects cause 89% of the total error variance and are strongly significant, according to the Honda LM-test [134]. In Logit, they are strongly significant ( $p$ -value of  $\sigma < 0.001$ ).

## 5. Discussion

This study examines which EU policies, framed under the sustainable finance agenda aimed at voluntary corporate decarbonisation, can bring about material results for Poland and Hungary. Research hypotheses are built based on the analysis of evolving EU regulatory frameworks and the particular institutional environments of Poland and Hungary, being unique subjects of research.

In particular, the empirical research confirms the first hypothesis (H1) that operating in the financial sector in Poland and in Hungary has a negative effect on the probability that a company may set emission targets. This finding is in line with evidence from western and highly developed economies where the financial sector seems to lag in addressing climate change [69,70]. Financial investments and loans, attributed to Scope 3, comprise the most relevant climate warming impact of firms operating in the financial sector. Nevertheless, setting Scope 3 targets for firms operating in the financial sector is not harder than for companies operating in other sectors, thus the specificity of operation is not a reason for not setting emission targets. In addition, Refinitiv data on emission targets can also refer to Scope 1 and 2, where actions needed to achieve reductions in GHG emissions in the financial sector are the same as in other sectors. Consequently, the most important finding showcases that despite EU regulatory efforts to mobilise the financial sector to actively participate in green transition the financial sector in Poland and Hungary is lagging behind all other sectors on the path to decarbonisation. Consequently, it may be interpreted that the EU-wide policy to support sustainable finance is weaker than sectorial tendencies to defer investment in sustainability. These tendencies are evidenced in the literature. Chang et al. [135] showed that among Fortune 500 the financial sector has the worst average efficiency in managing their carbon footprints of all the other sectors. Weber et al. [55] indicated that the financial sector has the lowest level of sustainability performance among all other sectors. Pizzi et al. [136] showed that companies from the financial sector are significantly less willing to report on sustainable development goals than firms from other sectors. These findings for Poland and Hungary confirm the financial sector's resistance to environmental performance improvement. While EU regulators attribute a prominent role to the EU financial sector in the fight against climate change, there appear to be stronger norms within the sector to counter regulatory pressure. These norms can be long-lasting relationships with heavily polluting clients or shared scepticism about environmental goals for the sector. Such mechanisms require an in-depth study in order to design policies that address them properly and to effectively support the financial sector to undertake a leading role in climate protection.

The results also support the second hypothesis (H2). It was confirmed that after 2020 the frequency of corporate target-setting in Poland and Hungary increased. This can be linked to the fact that the EU Taxonomy Regulation was adopted in June 2020 and stricter reporting requirements held companies accountable for their environmental impacts. These results are in line with Downar et al. [75] who present evidence that mandatory emissions disclosure in the UK led to an economically significant reduction in greenhouse gas emissions. Tomar [76] reports similar findings for the US. The original value of this paper stems from the fact that it provides novel insights based on the effect of mandatory regulation in countries, where climate protection is low on the business and policy priority list. The suggested interpretation of the findings is that a failure to comply with the requirements can result in penalties and reputational damage. Therefore, Polish and Hungarian companies may be more willing to invest in systems, processes, and data collection methods to meet the reporting obligations. These economically legitimate investments can also facilitate commitments to decarbonisation in other member countries where decarbonisation is costly and contested. Consequently, it may be stated that the EU sustainability disclosure can become a benchmark for other countries aspiring to effectively reduce corporate carbon emissions.

This study provides confirmation for the fourth hypothesis (H4) that SOEs in both Poland and in Hungary are less likely to set climate targets than the companies in which the government does not hold any stake. This result is in line with Chen et al. [123] who found that, in China, private firms compared with state-owned enterprises (SOEs) are more willing to disclose carbon information. This result can be interpreted as an outcome of domestic governments focusing on minimising social costs related to energy transition and safeguarding energy security and affordability. Different results were obtained by Wu et al. [124], who showed that, in China, state-owned enterprises voluntarily disclose a higher carbon information level, while non-state-owned enterprises reveal a lower level of carbon information. However, Wu et al. [124] analysed heavily polluting companies only, thus the companies in their sample could be driven to disclose carbon information because of their being under a tighter environmental scrutiny. Therefore, jointly with Chen et al., [123] presented results uncovering the negative effect of government ownership on corporate decarbonisation that can be observed in different institutional environments. Apparently, governments use state-owned enterprises to ensure the provision of essential services and promote social stability, while the goal of addressing market failures—negative pollution externalities—is compromised. This illustrates the conflicts between short-term and long-term goals as well as between economic and social and environmental goals. Inconsistencies within public policy can impair the mandating and endorsing function of governmental environmental policy, which are key functions in supporting voluntary corporate actions [137]. Therefore, the inconsistencies need to be addressed by policymakers.

This study highlights an uneven pace of improvements with regards to corporate carbon footprint, which today is a main pillar of corporate environmental performance. Finally, the results of this study add to the discussion started by Vavrek and Chovancova [51] who demonstrate that Poland and Hungary should speed up by implementing new policies in order to meet the GHG emission-reduction goals. This study showcases that the improved pace of decarbonisation caused by stimulating voluntary corporate commitments is a difficult task and harder measures are necessary.

The empirical model shows various effects of corporate governance variables on the probability that a company sets emission targets. The positive effect on setting target emission reduction was observed only for a CEO being female (but only in the linear probability model). The effects of gender diversity in the managing board and gender diversity in the supervisory board, as well as the size of the management board and the independence of the supervisory board on corporate decarbonisation in Poland and in Hungary are negative. This showcases that, in Poland and in Hungary, performance-oriented CG mechanisms have a negative impact on the probability of a company to set emission targets, as suggested in Hypothesis 4. These results are in contrast with the

results of Walls et al. [87], Karim et al. [88], Aliani [32], and Haque [92]. A famous study by Walls et al. [87] showcases the positive and significant effect of board size, diversity, and independence on corporate environmental performance. Karim et al. [88] found a positive effect of board size, board independence, audit committee independence, gender diversity, and audit committee expertise, aggregated through a Principal Component Analysis on carbon disclosure. Aliani [32] found a positive impact of board diversity on the scope of CO<sub>2</sub> emissions score among Best Citizen companies. Thus, the presented results provide new insights into the effect of corporate governance mechanisms on corporate carbon policies. This study provides evidence that operating under institutional forces that contest climate protection leads to efficiency-oriented governance mechanisms that compromise environmental goals. Consequently, it shows that corporate governance reforms undertaken in the EU in order to cement the single market and to give a boost to the investors' confidence might regionally impair EU climate goals. Therefore, it is suggested that EU-wide climate policy could make use of corporate governance mechanisms provided that it defines specific environmental requirements for the supervisory boards and the managing boards.

## 6. Research Implications and Policy Implications

The observed effects of the applied control variables indicate interesting findings, showing promising directions for further research.

First of all, this study proves that operating in Poland increases the probability of a company setting emission targets as compared with operating in Hungary. Thus, although both countries are heavily dependent on fossil fuels, Polish companies are more ready to reduce their carbon footprint than Hungarian companies. Further analysis may be directed at finding the reasons for such differences.

In addition, a company's size in terms of total assets has a positive and significant effect on the probability of setting emission targets. Therefore, the size of a company is certainly a driver of corporate decarbonisation, which underlines the importance of economies of scale and the availability of resources, as well as general public visibility for voluntary corporate decarbonisation. In the literature, there is vast evidence that larger companies exhibit better environmental performance [138]. This result adds to this stream of literature showing that size has the same effect when setting emission targets is considered and when institutional snags defer business sustainability.

Finally, an interesting finding is that the level of financial leverage has a significant and positive effect on setting emission targets. In Poland and in Hungary, the majority of corporate debt is in the form of bank loans. However, the effect of leverage cannot be attributed to banks setting higher environmental standards for corporate clients as the observed results also point to the tardiness of financial institutions in setting carbon emission targets. Therefore, the effect of leverage can be linked to emission-target setting being oriented towards mitigating overall corporate risk augmented by the financial leverage. Another possible explanation is the evidenced link between capital expenditure and corporate carbon disclosure [88]. Therefore, this result, related to financial leverage having a positive impact on setting emission targets, can be explained by companies using debt to finance capital expenditures that stimulate carbon disclosure. In summary, the positive effect of financial leverage on voluntary corporate decarbonisation can be explained in various ways. Therefore, additional detailed studies are necessary to explain how financial leverage affects setting carbon targets and carbon disclosure.

The practical implications of this result are that policymakers should consider stricter regulation framed under a sustainable finance agenda as a mechanism to provide legitimacy to corporate investment in decarbonisation. Such legitimacy can outweigh informal institutions defying climate protection and help to foster voluntary decarbonisation in countries lagging in terms of climate policy. Another practical implication is that EU-wide climate policy design has to take into consideration the potential conflicts with local formal and informal institutions, as well as potential tensions arising from different goals

(environmental, social, and economic goals). These conflicts should be identified and minimised in advance in order to avoid institutional complexities that create room for excusing corporations dragging environmental investment. Therefore, accounting for the national specificities while designing policies for Europe-wide green transition is recommended.

## 7. Conclusions

The main objective of this research was to identify the drivers of corporate voluntary decarbonisation. In particular, it aimed to examine whether policies focused on fostering voluntary corporate decarbonisation are effective. Corporate characteristics are assumed as proxies for a company's exposure to certain policies. Voluntary decarbonisation was observed by focusing on the company's choice to set a specific CO<sub>2</sub> emission-reduction target. The analysis was carried out in the context of EU-wide and national policies applicable to the activity of Polish and Hungarian firms that operate in institutional environments where climate protection is often contested.

The empirical research proved that softer EU policies, including a focus on improving climate management in the financial sector, non-financial disclosure (NFRD), and enhancing performance-oriented corporate governance mechanisms, fail to bring the desired results, as financial companies and companies governed by larger, independent, and diversified boards are less likely to set definite emission-reduction targets. On the other hand, introducing stricter requirements through the implementation of mandatory EU Taxonomy-based disclosure may materially foster corporate commitment to decarbonisation.

The theoretical implication of this finding is that corporate national institutions alter the effect of corporate governance mechanisms known in the West from enhancing corporate carbon performance. In Poland and in Hungary, board independence, board size, and gender diversity restrain corporate decarbonisation instead of stimulating it. By examining the environmental performance dimension—carbon emission reduction targets—this study provides a novel insight into the literature of institutional variations in corporate governance mechanisms' relation with corporate performance.

Additionally, this paper shows that the financial sector in Poland and Hungary is still resistant to EU efforts to mobilise sustainable finance. Contrary to hopes for the financial sector stimulating other sectors to invest in low-carbon technologies, the financial sector seems to be the least willing to decarbonize. This sectoral pattern is clearly a sub-national institution determining the organisational field of finance. There is a need for deeper studies on the mechanisms consolidating this institution and identifying ways of challenging it.

The limitation of this study is that, in the studied period, events other than changes in regulation and public policy could trigger changes in corporate behaviour. Such changes could be natural catastrophes or NGO pressure. Although such changes were not observed in Poland and Hungary, the causality between changes to disclosure regulation and changes in corporate behaviour is not perfectly strong.

This study reveals problems in designing climate policies that would be equally effective in diverse institutional settings. However, finding the solution to the problems should be examined in depth. For example, it is important to uncover how performance-oriented governance mechanisms can improve environmental performance in fossil fuel countries. Should additional measures be implemented? Can sub-national governance mechanisms moderate the effect of performance-oriented governance mechanisms on corporate carbon policies? In addition, in future research, the larger sample of firms from all EU member state countries may be analysed to identify the similarities and differences in the main drivers of the voluntary corporate decarbonisation process. Such extended analysis enables the identification of the key drivers and directs all policymakers' efforts to strengthen their power to accelerate the deep decarbonisation process.

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