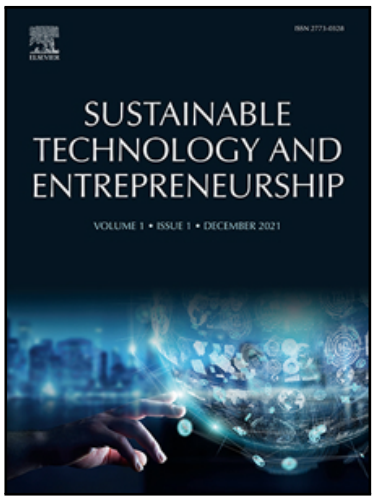

The European Union facing climate change: a window of opportunity for technological development and entrepreneurship

Ana-Zuazua Ruiz , Jose-María-Martín Martín , Juan-Francisco-Prados Castillo

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Full Length Article

The European Union facing climate change: a window of opportunity for technological development and entrepreneurship

Ana Zuazua Ruiz[1]; Jose María Martín Martín[2], PhD; Juan Francisco Prados Castillo[3,*], PhD

[1]Faculty of Political Science and Sociology, University of Granada, Spain.

anazuazua@correo.ugr.es

[2]Department of International and Spanish Economy, University of Granada, Granada, Spain.

martinmartin@ugr.es

[3]Facultad de Ciencias Sociales y Jurídicas, International University of Valencia, Valencia, Spain. juanfrancisco.prados@campusviu.es

[*]**Corresponding author:** Professor Juan F Prados-Castillo, Valencian International University, Spain, E-mail: juanfrancisco.prados@campusviu.es

Abstract

The fight against climate change is one of the significant challenges of the 21st century. The European Union's environmental policy has evolved as the perception of the problem has become more evident. This paper examines the environmental commitments made by the European Union on the global scene to verify its involvement and responsibility in environmental policy. A comprehensive analysis of the European Union's environmental policies compared to other countries has been carried out using a comparative methodological framework of these commitments. The results confirm the European Union's leadership in promoting and implementing policies to combat climate change and environmental sustainability, which therefore opens windows of opportunity for technological development and entrepreneurship. Future lines of research are proposed following the conclusions, considering the current economic and environmental situation in an environment of energy crisis and inflation.

Keywords: *Climate change, environmental policy, European Union, technological development, entrepreneurship*

1. Introduction

The fight against climate change represents the main challenge of the 21st century (UN, 2019). This paper seeks to analyse the solutions provided from a comparative perspective, focusing on the legislative and regulatory framework of the European Union (EU) as an element of comparison. Climate change has a relatively recent origin. Experts in the field place it in the 19th century, although it was already beginning to manifest itself in the 18th century. The great leap in impact occurred after the Industrial Revolution (1760) when gas emissions related to factories and vehicles increased significantly. However, it was not until 1856 when Eunice Foote warned of the relationship between CO2 and climate, noting that this could lead to global warming and its negative consequences (Jackson, 2020). Since this problem has been pointed out for over a century, this paper analyses the scope of the containment strategies implemented in legislative and regulatory terms. The analysis of this document takes as a central element the action of the EU in a context where a more significant political effort is requested in the framework of the United Nations Climate Change Conference CP26 (European Council, 2022b). Under the debate of whether environmental policies should be accelerated or delayed in the current political and economic context (Cerrillo, 2022). A strong commitment to combating climate change would create a great incentive for the development of green technologies and for sustainability entrepreneurship.

Sustainability has gone from being an aspirational concept to a key axis of public policies. Its implications on the security of countries have been recognized (de Castro et al., 2022a), and the objective is currently to achieve economic development that respects environments in all

their complexity (de Castro et al, 2021). Currently, the concept of sustainability includes four axes: environmental, social, economic and institutional and with this a new economic model is promoted (de Castro et al., 2022b). Since 1973, the EU has formulated different multiannual environmental action programs to set legislative proposals and objectives. The latest multiannual plan would be the 8th Environmental Action Programme (EAP) (2021) on the environment, which will run from 2021 to 2030 (European Parliament, 2021). This paper aims to contribute to the academic literature by providing a comparative framework of the EU's environmental commitments compared to other economic powers. A strong commitment to combating climate change would create a great incentive for the development of green technologies and for sustainability entrepreneurship. More precisely, this objective is intended to be channelled through the following Research Question: RQ1: How strong is the environmental commitment and involvement of the EU concerning the policies of other countries? The specific objectives of this paper are the review of European environmental policies and the analysis of their evolution over time. For this purpose, a comparative methodological framework of the EU's environmental commitments to other countries will be designed to determine whether the EU has a greater environmental involvement in the global scenario compared to other countries. With the findings in this document, the aim is to verify the EU's genuine involvement in environmental issues. Also, it is pretended to compare the efforts in the fight against climate change to other countries to confirm the leadership position of the EU on this issue.

As for the methodology used, a qualitative analysis has been carried out through different techniques, such as a bibliographic review and data collection, mainly based on existing indexes. The first section will analyse the negotiations within the framework of EU environmental policy, including a review of its evolution and the role played by this area in the negotiations of the various international treaties. The different axes around which

European environmental commitments revolve will also be examined. In a second section, a comparative analysis of the adopted environmental commitments will be applied, identifying whether the involvement and power of European environmental policy are superior to that of other states. Several studies justify this type of analysis and whose results can be helpful to validate the monitoring of the results of the environmental commitments made by the commitment countries. In addition, their findings can strengthen the analytical capacity to assess the implementation of environmental policy commitments and help establish future performance levels (Bulcourf & Cardozo, 2008).

2. Methodological framework

To analyse the EU's environmental policies in comparison to other countries has been considered the contribution to the global GDP of each of the countries is under consideration. For this, it has been necessary to study the evolution of European environmental policy and the role of the EU in international environmental agreements, defining its lines of action and the role adopted. Therefore, a bibliographic and documentary review of different texts, such as expert reports, comparative policy journals, academic journals and press articles, has been carried out. Also, technical working papers, all to compare the analysed countries.

To analyse the EU's environmental policies in comparison to other countries has been considered the contribution to the global GDP of each of the countries is under consideration. Given that the countries indicated, including those belonging to the EU, represent the most significant contribution to global GDP (Worldbank, 2021), this environmental comparison was made concerning the United States, Canada, China, Japan, India and Australia. This selection criterion can be considered appropriate since production and associated energy consumption are closely related to the effects of climate change (Cueva, 2014).

To respond to the Research Question posed, an analysis of the environmental commitments of the cited countries has been presented, for which the existence or not of these commitments has been analysed, as well as the goals set by each of the organisations. For this purpose, governmental information, regulatory standards, press releases, and commitments and goals adopted within the framework of the Paris Agreement (UN, 2015) have been taken as a reference. To achieve this objective has been adopted a cross-regional comparative methodology, performing an analysis of the commitments of the different countries regarding a series of homogeneous environmental commitment indicators. Finally, it should be noted that the strategy chosen for such an analysis is that of heterogeneous systems since it involves different systems that share the general phenomenon to be investigated, the adoption of environmental commitments and the national environmental policies that have been adopted.

3. Analysis of EU environmental policies.

3.1. Evolution of environmental policy in the EU.

European environmental policy has gained importance in recent years. As a result, the EU has positioned itself as one of the prominent leaders in the fight against climate change. This section will analyse to what extent this leadership position is justified. Before commenting on the evolution of environmental policy in the EU, it is helpful to define some initial terms. For example, in 1992, the adopted United Nations Framework Convention on Climate Change (1992: p.4), in its first article, defined climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods". Considering this problem as one of the leading global challenges of the 21st century, different countries and public and private organisations have proposed the need to develop a series of public environmental policies at both the national and regional levels,

with the aim of reducing the effects of climate change and improving environmental protection.

The basic principles governing EU environmental policy are based on precaution, prevention and correction of pollution at its source, as well as on the principle defined by the European Parliament (2021) based on the term "polluter pays". However, to reach this point, several steps had to be taken beforehand. Analysing the evolution of EU environmental policy involves going back to its precedents, specifically to the policy designed within the European Economic Community (EEC) framework. In the beginning, it was not possible to speak of an environmental policy as such; however, as a result of the free movement of goods, disagreements began to arise about what the minimum environmental standards had to be in the face of the disparity in national laws, even reaching the Court of Justice with the Danish packaging judgment (Corti, 2017).

It is generally agreed that EU environmental policy really began after the European Commission's communication of 22 July 1971. This communication established a first political commitment, in which an environmental perspective for the development of economic activity was considered. Until then, there was no division of competencies regarding environmental policies. This situation changed with the declaration of the Council of the EU and the Member States after the Stockholm Conference in 1972. Thus, the 1st EAP was created on 22 November 1973, known as the first multiannual environmental action programme for the EU, which sets out a series of objectives and future actions, including horizontal strategies. These strategies will consider the forthcoming international environmental negotiations. This 1st EAP was a declaration of intent, as it set out a series of objectives to be met to improve the quality of life and living conditions within the EEC, with the creation of the principles that would govern environmental policy. These principles are

prevention, evaluation, linkage to scientific and technical knowledge, international solidarity, subsidiarity and coordination (López, 1986). Furthermore, this EAP sought harmonisation between the countries to create coherence between member states and European policies. Subsequently, after the publication of the 2nd EAP (1977-1981), there was a certain continuity concerning the first programme. In this second programme, particular emphasis was placed on preventive activities and the principles developed in the 1st EAP. In addition, during the course of both programmes, legislative activity was developed around issues such as trying to limit pollution and creating minimum quality standards in water and air management.

In the 3rd EAP (1982-1986), the EEC emerged as a stronger player in the environmental field, providing a set of actions in common areas such as transboundary pollution, noise pollution and effects on the Mediterranean Sea. In addition, in 1985, the Environmental Impact Assessment (EIA) was enacted, which incorporated environmental analysis into a wide range of projects, both public and private, in order to ensure environmental protection. This directive focused on preventing the various environmental policies adopted by EU member states from interfering in the internal market, attempting to solve competitive distortions between states by creating common environmental emission standards (Figueroa, 2009).

The 4th EAP (1987-1992) was marked by the Single European Act (SEA) adoption in 1985, which introduced a title on the environment, reinforcing the environmental commitment and providing a legal basis for a standard environmental policy. Thus, with the SEA, the objectives of preserving the quality of the environment, protecting human health and ensuring the rational use of natural resources were ratified in Article 25 et seq. of Title VII. In addition, the introduction of the principle of subsidiarity between member states when

implementing public policies in environmental matters was of vital importance, under the principle that environmental measures could be achieved more effectively within the EU framework if they were regulated by the EU (Izcara, 1999). On the other hand, the European Environment Agency was created (1990), whose work focused on observing and analysing the development, implementation and evaluation of environmental policies, as well as disseminating information to the public through various reports on the state of the environment.

All of this ties in with the 4th EAP, which emphasises the need to develop and improve existing regulations and strengthen compliance with Directives rather than establish new measures. One of the main problems that were attempted to be solved is that generated by legislative differences between the Member States, given that there were conditions that were unfavourable to competition, e.g., significant differences in regional regulations (European Commission, 2019). It should also be noted that the Maastricht Treaty (1992) and the Amsterdam Treaty (1997) can be identified with the moment when the EU's environmental policy took shape since the former established the standard foreign and security policy. The latter introduced sustainable development as one of the objectives to be achieved in the European integration process. The second treaty also established the obligation to introduce environmental protection into all sectoral policies. Moreover, it should be noted that Article 2 of the Maastricht Treaty stated that it would "work towards sustainable development in Europe" and "a high level of protection and improvement of the environment" (this information is included in the current Article 3 of the Treaty after the amendments it has undergone). Furthermore, the principle of integrating environmental requirements into other policies was established (Figueroa, 2009). It is from this point onwards that we begin to speak of European climate diplomacy, especially after the Kyoto Protocol.

In this context and parallel to the United Nations Conference on Environment and Development (1992), held by the United Nations, the 5th EAP (1993-2003) was born. In this programme, sustainable development was already mentioned, and the goal of sustainability was set. This programme aims to go beyond EU policy by adopting a series of long-term objectives and seven strategies, including climate change. In addition, environmental protection was considered a horizontal policy, which will be considered in all other policies adopted by the EU, and there was talk of shared responsibility. On the other hand, this EAP differed from its predecessors by opting for measures other than legislation, such as market corrections, incentives for producers and consumers, and information for citizens (European Commission, 2019).

In 2001, with the signing of the Nice Treaty, there was no significant development in environmental matters. However, there was a boost to the 6th EAP (2001-2010), which sought more excellent dialogue with industry, NGOs and other international actors, as well as to improve existing instruments (García, 2021), based on reports by the European Environment Agency. In this way, the main challenge was established as overcoming the legislative and technical approach imposed to take a more strategic one (García, 2009). One of the crucial points in the evolution of public policies on climate change is the Lisbon Treaty (2007), in which the fight against climate change was introduced as a specific objective in article 191. At that time, the EU had the legal personality to sign international treaties in this area (Ballesteros, 2010). On the other hand, in analysing the evolution of European environmental policy, the 7th EAP (2013-2020) should be considered. This includes three priority areas: the protection of natural capital, the transformation of the EU into a "hypo-carbon economy" (looking primarily at the transformation of waste into resources), and the well-being and health of human beings. It does this not only with a regional, EU-centred focus but also by seeking cooperation with other countries and global commitments (García,

2019). Furthermore, this EAP was inspired by the principles of the new public administration, seeking to improve the management and implementation of policies.

Finally, the European Green Deal sealed in 2020 has been the great moment in EU environmental policy (Álvarez Cuesta, 2020), the last great moment in environmental policy, with a roadmap and strategy that seeks an equitable and prosperous society with a modern, resource-efficient and competitive economy, in which there will be no net greenhouse gas emissions in 2050 and economic growth will be decoupled from resource use (European Commission, 2019: p. 2). Thus, the European Green Pact began a process of greater ambition in the fight against climate change that led to a public policy push by the EU. From that moment on, these policies no longer only affected large sectors such as industry and energy but integrated others such as technology, and implied changes in the day-to-day life of citizens in the fight against climate change from a just transition in which no one is left behind. This new approach leaves behind the technocratic and sectoral vision of environmental and climate policy, based on the recognition of the climate emergency, to become the economic and social policy matrix of the EU as a whole and the general framework in which the Union's foreign and security policy, its identity as an international actor, and its relations with the world will be inscribed (Sanahuja Perales, 2021, p . 91).

Fig. 1. The European Green Pact. Source: Own elaboration from European Commission.

In conclusion, it can be seen that European environmental policy has developed considerably, mainly thanks to the introduction of the principle of subsidiarity for the establishment of various directives regulating this sector, as well as the introduction of environmental protection and the fight against climate change as one of the EU's main objectives. This progress can only be understood with the EAPs, which have been setting the lines of action and objectives, as analysed above. Furthermore, this environmental policy has moved from purely technocratic actions to a policy that goes much further, attempting to incorporate civil society and providing a more cross-cutting vision of the environment, positioning the EU as a leader in international society. Today, the European Green Deal is a new roadmap that aims to boost action against climate change. However, to understand the power of European climate change policy, the EU's diplomatic importance in various international agreements cannot be overlooked, and this will be explained below.

3.2. The role of the EU in the international environmental context

The EU's role in combating climate change is not defined solely through a set of environmental policies. The EU has been a pioneer in environmental diplomacy, which can be defined as "working both in multilateral fora and bilaterally to promote ambitious global climate goals and actions in pursuit of a planetary transition to climate neutrality" (European Council, 2022a). The EU's environmental diplomacy has had three distinct periods that are key to shedding light on the main objective of this research, and this evolution is necessary to understand the importance of the EU's involvement in environmental matters in comparison with the environmental policies of other countries. The first period involves unilateralism or classical leadership, the second consists of a mediation period, and the third involves a period of coupling or co-leadership (Corti, 2021). There is a consensus in the academic literature on the EU's leadership role in climate diplomacy, especially about the promotion of international agreements. The first period of unilateralism or classic leadership (1990-2011) consolidated the role of the leader in climate matters, which resulted in various proposals, most notably those formulated within the framework of the Kyoto Protocol (Gupta & Ringius, 2001). It should be borne in mind that in this period, there was still no European climate policy per se, which is why the leadership of certain countries, such as the United Kingdom and Germany, had already begun to develop their internal policies on decarbonisation, would stand out (Corti, 2021). However, one of the main issues that will make the EU particularly strong on climate change is the loss of US leadership, as the American Reagan administrations in the 1980s and 1990s began to resist signing international agreements. The EU took advantage of this window of opportunity to seize global leadership (Kelemen & Knievel, 2016). In this way, major global environmental milestones such as the 1991 United Nations Framework Convention on Climate Change and the Kyoto Protocol, signed in 1997, are being addressed.

In the United Nations Framework Convention on Climate Change, the EU put climate policy at the top of the international agenda and took the aforementioned loss of US leadership. At

this early stage, emission reductions were raised, but no consensus was reached. However, it was with the Kyoto Protocol that, as Varela (2017: p. 178) points out, "the first victory for European climate diplomacy was observed, where an ambitious project to reduce emissions in industrialised countries by 8% of CO^2 was presented". However, although the EU presented itself as a leader in the negotiations, the US never ratified the Protocol, leaving out one of the most influential countries and restricting the impact at the international level, although it was helpful in pushing for the creation of the European Emission Rights Program. This involved the creation of an emissions trading system to limit the total emissions of specific industrial sectors, and within this overall limit per sector, companies can buy and sell emission rights according to their needs (Joltreau & Sommerfeld, 2018). Thus, this system was indeed the real success of the EU, shaping itself as the world's largest emissions trading market, which applies not only to EU member states but also to Iceland, Liechtenstein and Norway.

In the second mediation period (2011-2014), a series of informal mechanisms can be highlighted in environmental policy that was structured so that member states would have a more proactive role in the negotiations and not everything would be relegated to rigid procedures that did not encourage consensus and participation (Delreux & Keukeleire, 2016). At this point, it is worth noting that the EU had the support of the United Nations for the implementation of climate policies and the adoption of agreements, highlighting the importance of the United Nations Climate Change Conference held in Durban (2011). It should be noted that at this Conference, Canada abandoned the Kyoto Protocol, the creation of a green fund was agreed upon, and the participants acknowledged that the measures were not sufficient. Furthermore, this Conference saw a predominance of national diplomacy to the detriment of the European Commission (Corti, 2021), which led to agreements promoted by the countries themselves that were then transferred to the EU institutions. Thus, in this stage,

the unidirectional diplomacy developed in the first stage was left behind, as consensus was reached with different actors without imposing a roadmap.

In the third period of leadership, which began in 2014 and has lasted until the present, the Paris Treaty (2015) stands out. In this stage, the EU developed an instrumental leadership, in which, as Varela (Corti Varela, 2017) points out, 'it positions itself as a mediator between great powers with the aim of reaching coalitions and alliances'. Here the role of the EU will be fundamental in relevant events such as the Paris Treaty agreement, which generated a system of commitments and national objectives that are reviewed over a period of 5 years. This treaty stands out for its importance, as it is the first binding international agreement for 196 countries on climate issues, having set the goal of limiting global warming and reducing greenhouse gas emissions (Fernández-Reyes, 2016), a historic negotiation in which the role of the EU was fundamental as a mediator between great powers.

Currently, the EU has managed to place climate change on the international agenda as an undeniable fact, accepted by countries such as the US, which at certain times experienced setbacks in its involvement, especially during the Trump administration. However, there is no international consensus on the solution or the approach to be adopted, although there is, or at least it is promoted as such, a consensus on the EU's leadership in both environmental commitments and policies in international politics.

4. Comparative analysis of EU involvement in environmental policy

4.1. Axes of EU environmental policy

The environmental policies developed in the context of the EU have been directed towards a series of central axes such as biodiversity, water protection and management, air pollution, resource efficiency and the circular economy, as pointed out by the European Parliament

(2021). These lines of action have been implemented through a series of public policies under the legal framework of articles 191 to 193 of the Treaty on the Functioning of the EU.

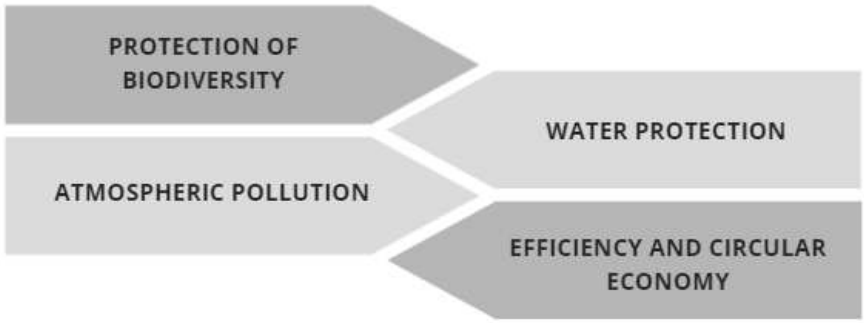

Fig. 2. Axes of EU environmental policy. Source: own elaboration.

With regard to policies for the protection of biodiversity, the central objective is the conservation of biodiversity and the protection of nature, enshrined in various agreements such as the Convention on Biological Diversity (UN, 1992a), the Paris Agreement (2015) or the European Green Deal (2020). In fact, it is in the latter that the biodiversity axis is materialised in order to intensify the protection of the various habitats and link biodiversity objectives to the fields of agriculture, fisheries and forestry and intensify the EU's contribution to preventing biodiversity loss (Sanchez, 2012).

The water axis aims to ensure sustainable consumption in the long term, as well as protection against natural disasters that may arise as a result of climate change. In relation to this axis, sectoral and specialised legislation has been developed, such as the EU water directive (European Parliament, 2000) or the Directive on environmental quality standards in the field of water policy (European Parliament, 2008a). Moreover, this axis is interconnected with the first since it also seeks the protection of marine ecosystems and a sustainable maritime economy, as pointed out by the European Parliament in its resolution on international ocean governance (European Parliament, 2018b). In this sense, in order to mitigate pollution, the

framework directive has focused on the reduction of so-called "water bodies" to prevent pollution from agricultural waste in the waters of member states (Souza & Molina, 2016). To this end, certain discharges have been banned, there is a wastewater treatment policy, and specific water uses must have administrative authorisation.

It can be seen that one of the main axes and objectives against climate change is related to combating atmospheric pollution, which is the leading cause of environmental death in the EU (European Environment Agency, 2020). In fact, this issue has been the central axis of the various EAPs, as well as the inspiration for other basic EU principles such as "the polluter pays". Thus, in this backbone, criteria have been configured to refer to air quality, with air pollutant limits and specific measures to be applied in the event of exceeding these limits, as established in Directive 2008/50/EC (European Parliament, 2008b). This axis focuses on the main polluting activities such as industry, agriculture, transport and energy production (European Parliament, 2021). To this end, a central point is the promotion of renewable energies as alternatives to fossil fuels, with comprehensive legislation in this area so that this will account for 40% of the energy produced in the EU by 2030. On the other hand, in the area of atmospheric pollution, the regulation of transport has been addressed, with pollutant emission limits for vehicles. In addition to this, air pollution is the subject of reinforcement in the European Green Deal, which aims to revise air quality regulations in order to improve quality standards, similar to the recommendations made by the World Health Organization (Kuklinska et al., 2015).

The fourth axis, resource efficiency and circular economy, represents a change in the current European strategy, as it points out that environmental regulations and limits are of no use if they are not accompanied by specific green economy practices and efficient resource management. In this way, a circular economy is proposed as an objective, defined as "a non-

linear economy based on the extract-use-and-throw away trinomial, but in which the concept of waste disappears, and the concept of resources appears, which can be used again by the production system" (Álvarez Cuesta, 2020:81). To this end, particular emphasis is placed on sustainable consumption and production. It is worth highlighting Directive (EU) 2018/851 (European Parliament, 2018a), which reinforces the prevention of producer obligations in design (durable, repairable, reusable and upgradable products), that critical raw materials are used (more easily recyclable) and that the use of hazardous substances or substances with significant environmental effects is eliminated, unless not technically feasible. It also sets specific recycling targets for municipal waste (55% by 2025) and the obligation for separate collection of bio-waste (composting) and hazardous textile waste (Poveda & Cutanda, 2021). Therefore, both the European Green Deal and the Circular Economy Action (European Commission, 2020) aim to promote a climate-neutral economy with sustainable products, based on a circular economy and efficient use of resources, doing more with less, with both short- and long-term commitments at all levels (Cerdá & Khalilova, 2016).

In conclusion, the EU has four cross-cutting axes in its environmental policy, which are interrelated and often regulated within the same standard or plan. The main commitments in these axes are aimed at establishing minimum quality and protection standards, as well as constant review and updating, based on the parameters of organisations such as the World Health Organization and the review and analysis of the European Environment Agency.

4.2. Comparison of environmental commitments.

After analysing the evolution of European environmental policy as well as the role of the EU in international environmental agreements, a comparison of the environmental commitments of the EU, Canada, Australia, Japan, China, India and the US will be

addressed. The aim is to answer the research question: How strong is the environmental commitment and involvement of the EU concerning the policies of other countries? This will be done by analysing the commitments made in several thematic blocks. Firstly, the commitments made on energy will be examined. The EU currently has a commitment in the European Green Deal to reduce greenhouse gas emissions by 55% by 2030. Meanwhile, the Canadian government has committed under the Paris Agreement to reduce greenhouse gas emissions by up to 30% by 2030. Similarly, Australia committed itself in the exact legal text to a reduction of between 26 and 28% of these emissions by 2030. With regard to commitments to reduce methane emissions, one of the primary atmospheric pollutants along with CO2, the EU, Canada, Japan and the USA have the commitment to reduce this component by 30% by 2030, as a result of the agreements adopted at the UN Climate Change Conference in Glasgow (COP26) in 2021. However, the governments of Australia, China and India are not expressly committed to reducing methane, and this lack of commitment coincides with the fact that these countries, together with Russia, are the ones that emit the most methane into the atmosphere.

On the other hand, renewable energies are one of the main axes in the climate transition, as they create alternatives to fossil fuels, which are the primary pollutants. For this reason, it is essential to analyse the commitments regarding the quotas that are intended to be reached in relation to the total amount of energy used. In this sense, Canada has set a target of 90%, making it one of the pioneering countries with the highest use of renewable energies at present. This is followed by Australia with a target of 69%, and then the EU, as well as China and India, which have a target of 40%, closely linked to the agreements and negotiations produced in the context of the United Nations Climate Summits. On the other hand, Japan is the country with the lowest commitment, with the aim of reaching a quota of between 22% and 24%, although the USA has zero commitment in this area. In relation

to the above, a series of commitments have been established to improve energy efficiency in order to do more with less. In this regard, the EU has made a 32.5% improvement in efficiency, Japan (30%) and Australia (20%), while the rest of the countries (China, India, Canada and the USA) have made no commitment in this area.

In addition, the main objective, which underpins all of the above commitments, is to achieve zero net emissions, for which countries have set various dates. In this sense, the EU, Canada, Australia, Japan and the USA aim to reach this commitment by 2050, while China plans to reach it a decade later (2060) and India by 2070. Thus, in energy matters, both the EU and Japan are the most committed cases, as they comply with all the items studied, although it should be noted that the EU's commitments are more ambitious than those of Japan. The other cases analysed sometimes have more ambitious targets, although they do not have commitments in other strategic areas, such as reducing methane emissions or improving energy efficiency.

Table 1. Comparison of environmental energy commitments. Unit: percentage. Source: own elaboration.

Energy							
Commitments	**UE**	**Canada**	**Australia**	**Japan**	**China**	**USA**	**India**
Greenhouse gas emission reductions	55%	30%	26 - 28%	46%	65%	50-52%	45%
Methane emission reductions	30%	30%	-	30%	-	30%	-

Share of renewable energy	40%	90%	69%	22 - 24%	40%	-	40%
Improved energy efficiency	32,5%	-	20%	30%	-	-	-
Net zero emissions year	2050	2050	2050	2050	2060	2050	2070

Secondly, an analysis has been made of environmental commitments in financial matters, given that the objectives in this area are a fundamental first point in the prevention of climate change, as well as in the development of public policies. Thus, if we look at financing for developing countries to reduce pollution, we can see that there is a significant difference between countries. 23.39 billion, followed by the US with 11.4 billion, both being the leading investors, according to the UN Green Climate Fund. Canada has an investment commitment of 5.3 billion and Australia's 1.5 billion, with a minor commitment coming from Japan at 42 million. In contrast, China and India do not have any commitment to this type of financing (Green Climate Fund, 2021). These results are due to China's geostrategic interests, with the investment of funds for the construction of thermal power plants and the fact that India is a recipient of this type of aid. Similarly, it is worth highlighting the commitments to financing the fight against climate change at a global level, mainly through governmental commitments in the form of budgetary allocations. This funding is mainly aimed at supporting climate change mitigation and adaptation actions. In this item, the EU is again the case with the most significant

commitment, at 337.9 billion euros, well above the US. Japan has a budget commitment of 1.5 billion, while Canada has a commitment of 277 million. The country with the lowest financial commitment is Australia, with 187 million. It is also worth noting that neither China nor India have expressed commitments in budgetary allocations to the fight against climate change at the global level.

On the other hand, a significant variable for analysing the environmental commitment of the cases analysed consists of observing whether there is a budget line within the institutions for climate action or the environment, and this is affirmative in all cases except India. Lastly, in financial matters, the existence of green bonds can be highlighted as an environmental commitment, which publicly benefits those companies that carry out a series of favourable environmental policies or behaviour, with all the cases studied having this type of commitment. Thus, after the above analysis, it can be seen that in financial matters, the EU is the leader, with a commitment that is highly differentiated from the rest of the cases, as it has a higher level of financing. The financial commitment of the USA also stands out, albeit with much less funding. In contrast, China and India are significantly less committed than the rest, as they have no commitments for financing.

Table 2. Comparison of the environmental and financial commitments. Figures in euros. Source: own elaboration.

Financial matters							
Commitments	**UE**	**Canada**	**Australia**	**Japan**	**China**	**USA**	**India**
Funding to developing countries to reduce	23.4 billion	5.3 billion	1.500 billion	42 million	-	11.4 billion	-

pollution under Green Climate Fund							
Funding to combat climate change at the global level	337.9 billion	277 million	187 million	1.5 billion	-	3 billion	-
Environment budget line	Yes	Yes	Yes	Yes	Yes	Yes	No
Environmental bonds	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Thirdly, the block of environmental commitments adopted in relation to transport is analysed, as these are responsible for a large part of the greenhouse gas emissions that aggravate climate change. To this end, two fundamental objectives and commitments are analysed: emission limits for passenger cars and sales of electric vehicles. Regarding carbon monoxide emission limits for passenger cars, this commitment is vital, given that in areas such as the EU, cars are responsible for 12% of greenhouse gas emissions. In addition, carbon monoxide is a hazardous substance, as it can cause death if found above the limits in enclosed spaces (Téllez et al., 2006). Thus, all the cases studied have commitments in terms of these limitations, using the EURO standards as a framework, albeit with a greater or lesser commitment, calculating emissions in grams per kilometre. Thus, the EU has the most restrictive limitations for this substance with 95 g/km, followed by China with 117 g/km and Japan with 122 k/gm. After this, Canada, Australia and the USA have an identical commitment, with 125 g/km, while India is at the bottom with 130 g/km. On the other hand, as a target for reducing pollution, certain countries have made a

commitment to encourage sales of electric vehicles. Thus, India has set a target date of 2030 for electric vehicle sales to reach 100%, while the EU, Canada and Japan have set 2035 as the target date. In contrast, the USA sets a commitment of 50% of sales by 2030, China 40% and Australia 30% by the same year. Consequently, the EU has more ambitious commitments in transport, although what tips the balance in its favour is the emissions limitations for passenger cars.

Table 3. Comparison of environmental commitments in transport. Units: g/km and percentages. Source: own elaboration.

Transports							
Commitments	**UE**	**Canada**	**Australia**	**Japan**	**China**	**USA**	**India**
Emission limits for carbon monoxide in passenger cars	95 g/km	125 g/km	125 g/km	122 g/km	117 g/km	125 g/km	130 g/km
Sale of electric vehicles	100% by 2023	100% by 2035	30% by 2030	100% by 2035	40% by 2030	50% by 2030	100% by 2030

5. Discussion and conclusions

The fight against climate change is one of the main challenges of the 21st century, which requires the articulation of an effective environmental policy. As has been explained, the EU has assumed a leading role in this fight. However, this leadership has evolved over the years with the achievement of various milestones in the negotiations and the evolution of its regulation, as has been explained in the theoretical framework of the research.

Throughout this work, a contextual, descriptive and analytical study has been carried out. Firstly, of European environmental policy and the role of the EU in international negotiations and, derived from this, a detailed study in which the environmental commitments adopted, as well as their results, in the global panorama have been examined in depth.

Therefore, this paper has conducted a comprehensive investigation to answer the research question: How strong is the environmental commitment and involvement of the EU concerning the policies of other countries? Thus, the main objective was to compare the EU's environmental commitments in the global picture to study its involvement and, as a specific objective, to observe whether the effort and performance of these EU environmental policies are more substantial in comparison to other countries. In this way, based on a cross-regional study based on the comparison of the commitments referred to other countries, it can be established that the EU has a greater involvement in the global panorama with respect to the implementation of environmental measures, resulting in more ambitious commitments with respect to the countries compared. This involvement has been established after a thorough analysis of the commitments made in the areas of finance, energy and transport, as well as the cross-cutting themes of environmental policies to combat climate change. A more outstanding commitment has even been observed in different areas, such as the financing of measures to combat climate change, the reduction of greenhouse gas emissions or the discouragement of emissions from vehicles for personal use. This confirms the EU's leading role, not only in terms of taking on the role of mediator and negotiator in various summits and agreements but also in terms of adopting commitments and measures compared to the other cases analysed, with its role in the financing dimension being particularly noteworthy. It is therefore confirmed that in the EU an enabling environment has been created for the development of sustainable

entrepreneurship and for the development and implementation of green technologies.

Future lines of research raise questions about the coordination and articulation of EU measures with the member states in order to achieve greater power in their performance and attain the objectives set. Considering the global context of rising energy prices and the various political and military conflicts that are putting pressure on energy markets, it will be interesting to see whether it will be possible to sustain the EU's efforts in this area. It will be interesting to see whether the EU manages to sustain this environmental policy given the new environmental factors and how it affects the different macro and microeconomic variables and their impact on economic sectors such as industry and tourism markets. Likewise, the importance of transferring a better implementation of these environmental policies to the member states with a worse performance is also pointed out, as it is necessary to reduce this gap in order to try to achieve better results in the whole area in the proposed objectives to reduce climate change and its effects. It would also be interesting, with a view to future research, to analyse the performance of environmental policy by comparing, for different countries, existing indicators developed by organisations such as Eurostat or the World Bank, or even to work on methodologies that provide their indicators.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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