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SPAIN AND THE CLIMATE TRANSITION: LEGISLATIVE ADVANCES AND INSTITUTIONAL CHALLENGES WITHIN THE FRAMEWORK OF PUBLIC LAW

*España y la transición climática: avances legislativos y retos
institucionales en el marco del Derecho público*

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Abstract

This article analyzes the evolution of Spain's climate law framework from 2014 to 2024, focusing on major legislative and policy reforms aimed at meeting international and European climate commitments. Using regulatory analysis and expert consultation, the study examines key milestones, including Law 7/2021 on Climate Change and Energy Transition, the National Integrated Energy and Climate Plan (PNIEC) 2023–2030 and the 2050 Decarbonization Strategy. The findings highlight significant progress, such as the integration of climate justice and human rights into environmental legislation. However, persistent challenges remain, including administrative complexity, insufficient coordination among government levels and uneven regulatory implementation. The study concludes that, although Spain has notably strengthened its climate legal framework, further efforts are needed to clarify institutional roles, streamline procedures and boost financing and innovation to achieve effective climate action.

Keywords

Environmental Law, Legislative reforms, Energy transition, Climate justice, Environmental sustainability.

Resumen

Este artículo analiza la evolución del marco jurídico climático de España entre 2014 y 2024, con especial atención a las principales reformas legislativas y de política pública orientadas al cumplimiento de los compromisos climáticos internacionales y europeos. Mediante un análisis normativo y la consulta a personas expertas, el estudio examina hitos clave, entre los que destacan la Ley 7/2021, de cambio climático y transición energética, el Plan Nacional Integrado de Energía y Clima (PNIEC) 2023–2030 y la Estrategia de Descarbonización a 2050. Los resultados ponen de relieve avances significativos, como la incorporación de la justicia climática y de los derechos humanos en la legislación ambiental. No obstante, persisten desafíos relevantes, entre ellos la complejidad administrativa, la coordinación insuficiente entre niveles de gobierno y una implementación regulatoria desigual. El estudio concluye que, aunque España ha reforzado de manera notable su marco jurídico climático, se requieren esfuerzos adicionales para clarificar las responsabilidades institucionales, simplificar los procedimientos y fortalecer la financiación y la innovación a fin de lograr una acción climática eficaz.

Palabras clave

Derecho ambiental; reformas legislativas; transición energética; justicia climática; sostenibilidad ambiental.

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I. INTRODUCTION

Climate law is a legal discipline that has emerged to address the global challenges of climate change, integrating principles from environmental law, human rights and climate justice (Peel 2008). Its development has been marked by milestones such as the 1972 Stockholm Conference (United Nations 1972), the creation of the Intergovernmental Panel on Climate Change (IPCC) in 1988 (IPCC 1988) and international agreements like the Kyoto Protocol and the Paris Agreement (United Nations 1997; 2015), which have strengthened its regulatory framework and promoted a more just and ambitious global response to climate change.

The evolution of climate law framework in Spain between 2014 and 2024 takes place within a global context of regulatory transformation and increasing urgency to address the climate crisis (European Commission. Directorate General for Climate Action. 2024). Thus, over the past decade, Spanish climate law has ceased to be merely an extension of environmental law and has consolidated itself as an autonomous discipline, integrating principles of climate justice and human rights (Geng et al. 2024). This process has been driven both by international commitments, such as the Paris Agreement and the European Green Deal, which set ambitious goals for climate neutrality by 2050 and by the internal need to adapt the regulatory framework to effectively respond to environmental and social challenges (United Nations 2015; European Commission 2019).

In this regard, during this period, Spain has made considerable progress in adapting its legal framework. For example, key laws have been enacted,

such as Law 7/2021 on Climate Change and Energy Transition (Official State Gazette 2021), the National Integrated Energy and Climate Plan (PNIEC) 2021-2030 (Ministry for Ecological Transition and the Demographic Challenge 2021, 2021-30) and legislative reforms such as Law 11/2014 (Official State Gazette 2014), Law 9/2020 (Official State Gazette 2020a) and Royal Decree-Law 23/2020 (Official State Gazette 2020b), which mark milestones in the transition towards a low carbon economy. Moreover, this regulatory effort is complemented by policies such as the National Climate Change Adaptation Plan and the Just Transition Strategy. Likewise, the autonomous communities have implemented measures, some-times stricter than national ones, which has generated jurisdictional tensions that highlight the need for better intergovernmental coordination (European Commission. Directorate General for Climate Action. 2024).

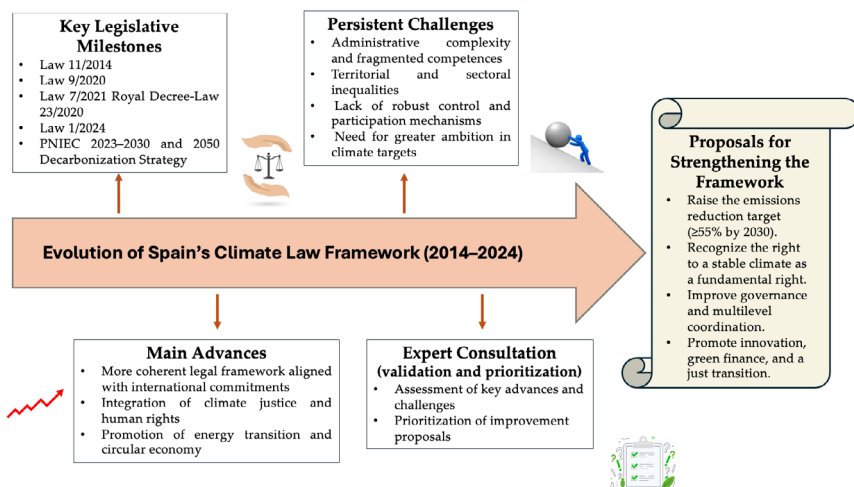
On the other hand, the strategic approach adopted by Spain combines mitigation, adaptation and just transition, setting binding targets such as a 23% (European Parliament 2024; Ministry for Ecological Transition and the Demographic Challenge 2021) reduction in greenhouse gas emissions compared to 1990 levels by 2030 and promoting the electrification of transport, renewable energies and the circular economy as pillars of sustainable development (European Parliament 2024; Ministry for Ecological Transition and the Demographic Challenge 2021). Nevertheless, challenges remain, notably the effective integration of local governments, the need for greater legislative coherence and overcoming structural limitations arising from administrative complexity and the tension between economic development and environmental protection (Boix Palop y Pavani 2025).

In this context, the evolution of Spanish climate law is analyzed in this work from a critical perspective. In this way, both the progress achieved and the persistent limitations are considered and the central role of human rights and climate justice is highlighted. It should be noted that the recent United Nations General Assembly Resolution 77/276 (United Nations General Assembly 2023) and decisions such as that of the United Nations Human Rights Committee underscore the importance of linking legal protection with the implementation of effective and equitable environmental policies (Mikhailova *et al.* 2023).

Thus, this article analyzes the evolution of Spain's climate law framework from 2014 to 2024, focusing by breaking down the main legislative milestones, assessing their impacts on fundamental rights and corporate sustainability and identifying key challenges to consolidating a robust framework aligned with international commitments and the principles of climate justice (Aigbe *et al.* 2025). Thus, a mixed approach is adopted that combines regulatory analysis with expert consultation, reviewing milestones such as Law 7/2021 on Climate Change and Energy Transition, the National

Integrated Energy and Climate Plan -PNIEC 2023-2030 and the 2050 Long-Term Decarbonization Strategy, along with other relevant regulations on environmental responsibility and emissions trading. Finally, based on this analysis, concrete proposals are presented to strengthen the climate regulatory framework in Spain, including legislative reforms aimed at improving the effectiveness and scope of climate law.

Figure 0. *Graphical Abstract*



II. METHODOLOGY

The present study adopts a mixed and interdisciplinary methodology to provide a comprehensive analysis of the evolution of climate law in Spain between 2014 and 2024. This methodology is structured around four main approaches: dogmatic-legal, sociolegal and bibliometric, each contributing to a holistic understanding of the subject. First, a dogmatic-legal analysis is conducted, connecting a detailed examination of the content, structure and coherence of key regulations such as Law 11/2014, Law 9/2020, Law 7/202 and Royal Decree-Law 23/2020 (Official State Gazette 2021, 7; 2014, 11; 2020b). This allows for the identification of the normative principles underpinning climate policy and an assessment of their internal consistency and alignment with Spain's international commitments. Secondly, the study incorporates a socio-legal approach, focusing on the practical application of these regulations and their real impact on society and the environment, through the review of official reports, case studies and relevant statistics, as

well as the organization of focus groups with specialists in climate law, renewable energy and environmental governance, who participate in structured surveys providing empirical data to compare the theoretical effectiveness of legal provisions with their actual outcomes, highlighting both achievements and remaining challenges. As a methodological complement, an academic review is carried out to map trends, gaps and emerging approaches in scientific literature on climate law, using databases such as Scopus, situating the Spanish experience within a broader academic context and helping to identify areas for future research. Within the empirical component, a structured survey was administered to five recognized specialists from academic, institutional and business fields, who evaluated and ranked different elements of the current regulatory framework, such as Law 7/2021, Law 9/2020, PNIEC 2023–2030 and the Long-Term Strategy for 2050, based on criteria such as relevance, feasibility and potential impact. The degree of agreement among the experts was measured using Kendall's W coefficient, which quantifies consensus on the identified priorities, including a statistical significance test to validate the robustness of the results. The study combines documentary analysis with both quantitative and qualitative assessments, offering a well-founded and multidimensional view of the effectiveness of climate policies in Spain, ensuring a critical evaluation of both the legal framework and its social and environmental implications and supporting the urgency of continuous regulatory updates in the field.

III. THEORETICAL BACKGROUND

1. *Historical Evolution of the Concept "Climate law"*

Climate law has emerged as an essential legal discipline to address the global challenges of climate change, integrating principles from environmental law, human rights and climate justice (Peel 2008). Its historical evolution is marked by a series of milestones that have shaped its current structure, from its origins in environmental law to its consolidation as an autonomous regulatory framework. The earliest antecedents of climate law are found in the development of environmental law, which began to take shape in the second half of the twentieth century (Lazarus 2023). Although environmental regulations already existed since the nineteenth century, such as those aimed at protecting specific natural resources, it was the United Nations Conference on the Human Environment, held in Stockholm in 1972 (Peel 2008; United Nations 1972), that marked a turning point. This international event recognized the need to protect the environment as a fundamental right and laid the groundwork for the development of international legal instruments focused on global environmental problems (United Nations 1972).

In 1987, the Brundtland Report introduced the concept of sustainable development, which integrates the economic, social and environmental aspects of human progress [21]. This report highlighted the need to meet present needs without compromising the abilities of future generations, establishing an ethical and political framework that would be key to addressing problems such as climate change (Keeble 1988). Shortly after, in 1988, the Intergovernmental Panel on Climate Change (IPCC) was created, an international scientific institution tasked with assessing the impacts of climate change and proposing mitigation and adaptation strategies (Houghton 1998; Alfsen y Skodvin 1998). The IPCC's reports have been fundamental in providing scientific evidence to support political and legal decisions related to climate change (Houghton 1998; Alfsen y Skodvin 1998).

A major milestone in the evolution of climate law was the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) during the Rio Summit in 1992 (United Nations 1992). This international treaty established a framework for global cooperation in the fight against climate change, recognizing the principle of "common but differentiated responsibilities" (United Nations 1992). This principle emphasizes that, although all countries have a responsibility to combat climate change, developed countries must assume greater commitments due to their historical contribution to greenhouse gas (GHG) emissions.

Additionally, the Kyoto Protocol, adopted in 1997 and entered into force in 2005, represented the first international agreement to impose binding commitments to reduce GHG emissions. Although it faced significant challenges, such as the lack of ratification by some key countries (notably the United States), this protocol set important precedents by establishing concrete targets for developed countries. However, its limited focus on these countries generated criticism for not including broader commitments involving all nations (United Nations 1997).

Since the year 2000, the concept of climate justice has gained relevance, addressing the inherent inequalities of climate change. This approach highlights how countries historically less responsible for emissions are often the most affected by their impacts. Climate justice seeks to integrate ethical principles and human rights into climate policies, promoting an equitable distribution of both responsibilities and benefits derived from climate action (Parsons et al. 2024).

The Paris Agreement, adopted in 2015 during the Conference of the Parties (COP21), marked a new chapter in the evolution of climate law. Unlike the Kyoto Protocol, this agreement includes commitments for all signatory countries, with the main objective of limiting the increase in global temperature to less than 2°C above pre-industrial levels and striving to limit it to 1.5°C (United Nations 2015). Moreover, it incorporates key elements such as

adaptation to climate change, technology transfer and climate finance to support developing countries (Lin y Jiang 2025). The Agreement also underscores the importance of human rights and explicitly recognizes the need to protect vulnerable communities from climate impacts (United Nations 2015).

As can be seen from the above, in recent decades, climate law has evolved into a more comprehensive and ambitious regulatory framework. Indeed, today climate law faces significant challenges, mainly related to its effective implementation and its integration with other areas of international and national law. The growing urgency to address climate change from a holistic perspective has led to the development of innovative legal mechanisms that seek to facilitate a transition toward low carbon and climate resilient economies.

2. *European Context: Paris Agreement and Other Relevant Instruments*

The Paris Agreement and the resulting European instruments have, above all, been decisive in the evolution of climate law in Spain between 2015 and 2024. To begin with, this international treaty, adopted in 2015 and ratified by Spain in 2017, sets global objectives such as limiting the increase in the global average temperature to well below 2°C above pre-industrial levels, with efforts to limit it to 1.5°C. Furthermore, it introduces Nationally Determined Contributions (NDCs), periodic reviews and transparency mechanisms to assess collective progress (United Nations 2015).

In this context, the European Union has played a crucial role as a global climate leader, establishing ambitious targets that, in turn, have directly influenced Spanish climate policies. From a European perspective, the European Green Deal, presented in December 2019, has served as the strategic framework for achieving climate neutrality by 2050 (Ojo et al. 2020). In addition, this pact includes cross sectoral initiatives in energy, transport and industry and has been reinforced by the European Climate Law (2021), which makes binding the objective of reducing net emissions by at least 55% by 2030 compared to 1990 levels (European Commission 2019; Regulation (EU) 2021/1119 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law' 2021).

Moreover, instruments such as the EU Emissions Trading System (EU ETS) and the "Fit for 55" legislative package have driven the transition toward a low-carbon economy (Ellerman et al. 2016). These measures have also been supported by significant budget allocations: the Multiannual Financial Framework 2021-2027 dedicates at least 30% of its resources to climate action, which is further complemented by NextGenerationEU funds (Ellerman et al. 2016).

Regarding Spain, these European guidelines have been fundamental for recent legislative reforms. Specifically, the Climate Change and Energy Transition Law, approved in 2021 (Geng *et al.* 2024), responds directly to the commitments of the Paris Agreement and European policies. This law sets national targets such as reducing emissions by 23% by 2030 compared to 1990 and achieving climate neutrality before 2050 (Official State Gazette 2021). Additionally, it includes instruments like the Integrated National Energy and Climate Plan (PNIEC) and the Long-Term Decarbonization Strategy, also promoting renewable energy, energy efficiency and sustainable mobility through specific plans (Ministry for Ecological Transition and the Demographic Challenge 2021).

The impact of the Paris Agreement is likewise reflected in Spanish climate governance. Notably, the Nationally Determined Contributions (NDCs) submitted by Spain are aligned with European and global goals. Similarly, periodic reviews under the Agreement's "global stock take" have encouraged greater ambition in national policies (Tompkins *et al.* 2018). For example, Spain has leveraged European funds to finance energy transition and climate adaptation projects. The European context derived from the Paris Agreement has been key in shaping Spain's regulatory framework during this period. Indeed, legislative reforms not only reflect a commitment to international and European objectives but also aim to position Spain as a relevant actor in the fight against climate change.

IV. EVOLUTION OF THE CLIMATE LEGAL FRAMEWORK IN SPAIN (2014–2024)

1. *Law 11/2014 on Environmental Liability*

This law represents a significant milestone in Spanish legislation by incorporating a preventive approach based on the "polluter pays" principle. This principle, widely recognized in the international arena, seeks to internalize the environmental costs associated with economic activities, thereby incentivizing more sustainable and responsible practices (Gómez-Baggethun *et al.* 2010). The law not only establishes a legal framework for the remediation of environmental damage but also introduces innovative mechanisms for allocating financial guarantees according to the environmental risk associated with each activity.

Law 11/2014 promotes the prevention of environmental damage by establishing financial guarantees proportional to the risk associated with economic activities. This regulation, which amends Law 26/2007, aims for operators to adopt preventive measures and, in the event of damage, to restore the environment to its original state. Additionally, it introduces the obligation to conduct

environmental risk analyses to identify potential impacts and determine the necessary financial guarantees. This approach not only encourages more sustainable business practices but also ensures that the costs of remediation do not fall on society, but rather on those who cause the damage. The effective implementation of this law is crucial for environmental protection and the promotion of a responsible economy. To further understand how this principle is integrated into the environmental policies of the European Union and to prevent the costs of pollution from unfairly falling on society (European Court of Auditors 2021).

Essentially, the “polluter pays” principle is fundamental to the environmental policy of the European Union (EU), implying that polluters should bear the costs of their pollution, including measures to prevent, control and repair pollution (General Council of Spanish Lawyers 2019). According to this source, regarding its areas of application, the report analyzes the implementation of the principle in four areas: industrial pollution, waste, water and soil, evaluating the Commission’s measures related to the Environmental Liability Directive (ELD) and their effectiveness. It also examines whether the Commission and Member States protected the EU budget to prevent it from being used to cover expenses that should have been paid by polluters. The authors of the present study, as a general conclusion, consider that the principle is reflected and applied heterogeneously across different EU environmental policies and its coverage and application have not been completed. Therefore, they recommend that the Commission should assess the possibilities of strengthening the integration of the principle into environmental legislation, as well as consider the possibility of reinforcing the application of the ELD and preventing EU funds from being used to finance projects that should be paid for by polluters. To delve deeper into this topic, it is recommended to review in detail the special report “Polluter Pays Principle” published by the European Court of Auditors, which analyzes the application of this principle in various EU environmental policies. This document offers a comprehensive and detailed view of how polluters can be incentivized to avoid environmental damage and assume responsibility for their actions (European Court of Auditors 2021).

Additionally, the article “Environmental Liability: Some Pending Issues” presented by the General Council of Spanish Lawyers addresses challenges and key aspects in the application of the Environmental Liability Law in Spain, providing a critical perspective on its implementation and areas for improvement (General Council of Spanish Lawyers 2019). These resources offer in depth and updated analyses that can enrich the academic discussion on environmental liability and the application of the “polluter pays” principle in the European and Spanish context.

In this regard, Law 11/2014 aligns with the guidelines of the European Union, particularly with Directive 2004/35/EC on environmental liability,

which emphasizes the need to efficiently prevent and remedy environmental damage (Directive 2004/35/CE on environmental liability with regard to the prevention and remedying of environmental damage 2004). However, the implementation of this regulation in Spain has posed challenges, especially regarding the determination of adequate levels of financial guarantees and the accurate assessment of environmental risk. The lack of uniform criteria for risk assessment can generate uncertainty for both companies and competent authorities. Furthermore, Law 11/2014 has been analyzed in the context of its contribution to the transition towards a circular economy.

The internalization of environmental costs through mechanisms such as financial guarantees can encourage the adoption of cleaner technologies and more efficient production processes (Kirchherr et al. 2017). Nevertheless, it is essential that these measures are accompanied by complementary policies that promote innovation and collaboration between the public and private sectors. On the other hand, the effectiveness of Law 11/2014 largely depends on its practical implementation. In this context, it is necessary to improve the training of the actors involved, including public officials and industry representatives, to ensure coherent and effective implementation of the regulation.

For all these reasons, Law 11/2014 constitutes an important step forward in environmental protection in Spain by establishing a legal framework that combines prevention, responsibility and financing. However, its long-term success will depend on the ability to overcome the identified challenges and on the integration of this regulation into a broader approach to sustainability and the circular economy. Future research should focus on evaluating the real impact of this law on reducing environmental damage and identifying best practices for its implementation.

Table 1 presents a detailed timeline of the implementation process of Law 11/2014 on Environmental Liability in Spain, highlighting the main milestones and methodological components of its application. The sequence begins with the introduction of the law, followed by the adoption of a preventive approach that prioritizes the mitigation of environmental risks before significant damage occurs. Subsequently, a regulatory framework for remediation is established, ensuring the restoration of the affected natural environment.

Table 1. *Detailed timeline of the implementation process of Law 11/2014 on environmental liability in Spain*

PHASE	DESCRIPTION
<i>Introduction of Law 11/2014</i>	<i>Approval and initial implementation of the environmental liability law</i>

PHASE	DESCRIPTION
<i>Preventive Approach</i>	<i>Implementation of measures to prevent environmental damage before it occurs</i>
<i>'Polluter Pays' Principle</i>	<i>Establishment of the principle according to which the person responsible for the damage must assume its cost</i>
<i>Framework for Repair</i>	<i>Definition of mechanisms to restore the affected environment</i>
<i>Financial Guarantee Mechanisms</i>	<i>Creation of financial instruments to ensure coverage of damages.</i>
<i>Environmental Risk Analysis</i>	<i>Systematic assessment of environmental risks of economic activities</i>
<i>Promotion of Sustainable Practices</i>	<i>Promoting responsible and sustainable business practices</i>
<i>Alignment with EU Guidelines</i>	<i>Adaptation of the Spanish regulatory framework to European standards</i>
<i>Challenges in Implementation</i>	<i>Identification of practical and legal obstacles to law enforcement</i>

The table on the implementation of Law 11/2014 on environmental liability in Spain shows an ambitious regulatory process that, although it introduces key principles such as prevention and the “polluter pays” principle, faces significant legal challenges in practice. Problems persist, such as regulatory fragmentation, the technical complexity of risk analyses, insufficient financial guarantees and limited civil society participation in procedures. All of this creates legal uncertainty and hinders the effective application of the law, highlighting the need for greater regulatory clarity, administrative resources and stronger control and participation mechanisms to ensure real and effective environmental protection.

2. Law 9/2020 and the Emissions Trading Scheme

On the other hand, Law 9/2020 of December 16, which amends Law 1/2005 of March 9, has represented a significant update to the Emissions Trading Scheme (ETS) in Spain, aiming to intensify the reduction of greenhouse gases in an effective and economically efficient way. This amendment is part of the EU’s commitment to cut at least 40% of global emissions by 2030 compared to 1990 and, specifically, to achieve a 43% reduction target for sectors covered by the ETS (Official State Gazette 2020a). Spain has also

ratified the Paris Agreement, which seeks to limit the global temperature increase to below 2°C above pre-industrial levels. In this context, Law 9/2020 introduces measures such as increasing the linear reduction factor, establishing auctioning as the main method for the allocation of emission allowances and maintaining free allocation for sectors at risk of carbon leakage. It also addresses specific provisions for the aviation sector, keeping certain existing limitations and preparing for the application of a global market-based measure, promoting cooperation between the General State Administration and the autonomous communities in climate change matters (Official State Gazette 2020a). Table 2 summarizes the main advantages and disadvantages of this updated ETS.

Table 2. *Analysis of the pros and cons of the updated emissions trading system under Law 9/2020*

ADVANTAGES	LIMITATIONS
Greater integration. Facilitates harmonization between participating sectors and countries, promoting a coordinated response to climate change.	Speculative practices. Risk that the market will be used for financial purposes that distort its environmental objective
New actors. Incorporates more economic agents, expanding the coverage and effectiveness of the system	Need for greater oversight. Requires rigorous controls to prevent fraud and ensure effective compliance
Long-term planning. Allows you to design sustainable strategies with progressive emission reduction goals.	Carbon leakage risk: Possibility of companies moving their production to countries with more lax regulations
Effective emissions reductions. Establish clear and progressive limits that contribute to climate change mitigation.	Administrative Burden. Imposes additional bureaucratic processes on companies and regulatory authorities
Flexibility. It offers mechanisms such as the exchange of emission rights, adapting to the capabilities of each actor.	Potential market distortions. Can generate economic imbalances if the allocation of rights is not adequately adjusted

According to Table 2, the update of the emissions trading system under Law 9/2020 has strengthened Spain's integration into the European market, providing greater predictability and flexibility for economic actors and facilitating the strategic alignment of companies with decarbonization objectives.

However, from a critical perspective, structural challenges remain that may limit the system’s effectiveness: the risk of speculation and manipulation in the emissions allowances market demands more rigorous administrative oversight, the free allocation of allowances, although it protects competitiveness, may discourage technological innovation and the adoption of cleaner solutions in the long term if not periodically reviewed. Furthermore, the administrative complexity of the ETS creates significant burdens for both companies and authorities, with the potential to distort competition between sectors and complicate climate governance.

3. *Law 7/2021 on Climate Change and Energy Transition*

Law 7/2021 on Climate Change and Energy Transition constitutes a key pillar of Spanish climate policy, establishing binding targets for emissions reduction, promoting the electrification of transport and prioritizing the deployment of renewable energies. At the same time, it adopts a comprehensive vision that includes a just transition for the most vulnerable sectors, aiming to minimize the socioeconomic impacts of decarbonization (Fernández De Gatta Sánchez 2023). From a doctrinal perspective, studies emphasize the importance of incorporating elements of climate justice and human rights protection in the formulation of these policies (Díaz-Cruces y Méndez Rocasolano 2025). Table 3 succinctly presents the five fundamental pillars of Law 7/2021: (1) Compliance with the Paris Agreement, (2) Decarbonization of the economy, (3) Sustainable development, (4) Administrative cooperation and (5) Adaptation to climate change.

Table 3. *Fundamental axes of Law 7/2021*

PILLARS	DESCRIPTION
1. Compliance with the Paris Agreement	It establishes binding commitments to ensure that Spain contributes to the global objectives of emissions reduction and climate neutrality.
2. Decarbonization	It promotes the transformation of the energy and production model by progressively reducing the use of fossil fuels and promoting renewable energy.
3. Sustainable Development	Promotes economic growth compatible with environmental protection, social equity and the conservation of natural resources
4. Administrative Cooperation	Strengthens coordination between different public administrations and levels of government in the planning and implementation of climate policies

PILLARS	DESCRIPTION
5. Adaptation to Climate Change	It incorporates measures to prevent, mitigate and manage climate risks, ensuring the resilience of natural, economic and social systems.

In particular, the law is aimed at fulfilling Spain’s international commitments under the 2015 Paris Agreement, by promoting a reduction of greenhouse gas emissions by at least 23% compared to 1990 levels by 2030, achieving 42% renewable energy in final energy consumption and improving energy efficiency by 39.5% (Fernández De Gatta Sánchez 2023). The law sets specific mandates to facilitate the integration of renewable gases and the development of energy sources with zero or low carbon emissions.

It also promotes the creation of low emission zones before 2023 and strengthens the Just Transition Strategy, whose objective is to optimize employment opportunities and economic activity during the transition to a low carbon economy. To this end, part of the General State Budget is allocated to climate change and energy transition goals and revenues from GHG emissions allowance auctions are channeled towards these objectives (Fernández De Gatta Sánchez 2023). Furthermore, the law encourages the participation of social, economic and public actors in the fight against climate change. Overall, Law 7/2021 strengthens climate governance in Spain by integrating cooperation among different levels of public administration, an aspect highlighted by legal scholars (Alenza García, y Sanz Rubiales 2017; Simou 2022). It also introduces measures for adaptation to the impacts of climate change, such as the development of a National Climate Change Adaptation Plan, with the aim of increasing the resilience of the Spanish economy and society to future environmental challenges.

4. *Royal Decree-Law 23/2020*

Royal Decree-Law 23/2020, published in the Official State Gazette (BOE-A-2020-6621), reinforces Spain’s commitment to the energy transition and economic reactivation through the implementation of new measures focused on the development of renewable energies, energy efficiency and innovation in key sectors (Official State Gazette 2020b). In this context, the regulation addresses several fundamental aspects:

Firstly, it focuses on the regulation of renewable energies and electricity networks. Specifically, it readjusts access and connection to electricity transmission and distribution networks, promoting the production of electric energy from renewable sources through a new remuneration framework (Boix Palop y Pavani 2025). Additionally, it encourages the elimination of

administrative barriers, promoting digitalization, decarbonization and climate neutrality. It also introduces innovative figures such as the independent aggregator and renewable energy communities, which facilitate citizen participation in the energy transition.

Secondly, the regulation deals with energy efficiency. It amends Law 18/2014 to create a national system of energy efficiency obligations, extending its validity until 2030 (Official State Gazette 2020b). Furthermore, it creates the National Energy Efficiency Fund, endowed with financing mechanisms for energy improvement projects, which contributes to achieving the European Union’s energy efficiency objectives.

Thirdly, measures for economic reactivation and employment are addressed. It allows the use of local authority surpluses to finance investments in electric vehicles and their infrastructure, which boosts the electrification of transport. Additionally, it increases the deduction in Corporate Income Tax for technological innovation activities in the automotive industry, promoting innovation and employment in this sector (Official State Gazette 2020b).

Finally, complementary sectoral measures are included. It guarantees the balance and liquidity of the electricity system, preventing structural deficits and encouraging investment in electricity transmission and distribution networks. This incentivizes the modernization of energy infrastructure, ensuring a sustainable and competitive energy transition (Official State Gazette 2020b).

Table 4. *Overview of Royal Decree-Law 23/2020*

STRATEGIC PILLAR	DESCRIPTION
<i>New Business Models</i>	<i>It promotes digitalization and the elimination of regulatory barriers to facilitate the entry of new players into the energy system.</i>
<i>Energy Efficiency</i>	<i>It establishes a national system of energy efficiency obligations, along with a specific fund for their implementation.</i>
<i>Economic Recovery</i>	<i>It boosts economic recovery through investment incentives in strategic sectors, such as electric vehicles. .</i>
<i>Development of Renewable Energy</i>	<i>It promotes the installation and production of clean energy, with special emphasis on facilitating access to electrical grids.</i>
<i>Sectoral Measures</i>	<i>Introduces regulatory adjustments to ensure the economic and financial balance of investments in electrical infrastructure.</i>

Table 4 summarizes the central axes of this Royal Decree-Law and the comprehensive coverage the regulation offers to different areas of the energy

transition and economic recovery. At the top, the pillars of new business models can be seen, based on digitalization and the removal of barriers, the development of renewable energies, energy efficiency and economic recovery, sectoral measures aimed at balancing and strengthening electricity networks are also included. This scheme reflects the overall vision of the regulation, which seeks to align the transformation of the energy sector with job creation, technological innovation and environmental sustainability.

5. *Royal Decree 34/2023*

Royal Decree 34/2023 strengthens regulations on air quality, industrial emissions and financial guarantees in waste management, with the aim of streamlining the response to critical pollution episodes (Official State Gazette 2023). However, its implementation highlights the need to improve inter-administrative coordination, especially regarding short-term action plans and traffic restrictions.

In terms of air quality, the regulation amends previous decrees, such as Royal Decree 102/2011, to align national legislation with European directives that set thresholds and monitoring parameters for pollutants (for example, arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons). Laws such as 34/2007, complemented by national air quality plans (Plan AIRE I) and the National Climate Change Adaptation Plan 2021-2030, form the reference framework for preventing, monitoring and reducing air pollution, with special emphasis on human health and the protection of vulnerable ecosystems (Official State Gazette 2023).

Likewise, Royal Decree 34/2023 addresses the classification of vehicles according to their polluting potential and the adoption of traffic restrictions in urban areas to mitigate episodes of high pollution. It also reviews administrative aspects, such as reducing the period for reviewing integrated environmental authorizations (from six to five months) and modifying criteria for calculating financial guarantees in waste management, which reduces their amount (Official State Gazette 2023). All these measures are framed within the principles of necessity, effectiveness, proportionality, legal certainty, transparency and efficiency.

6. *Law 1/2024, of 17 April, on the Circular Economy of the Community of Madrid*

Within the regional context, Law 1/2024, of 17 April, on the Circular Economy of the Community of Madrid constitutes a significant milestone in the transition towards a more sustainable and environmentally responsible economic model in the region. This legislative instrument, which entered

into force on 25 April 2024 and supersedes Law 5/2003, is aligned with both European and national directives on the circular economy (Official State Gazette 2024).

The law establishes a comprehensive framework designed to promote the efficient use of resources, extend the lifespan of products, prevent and reduce waste generation and foster the valorization and reintegration of waste into the productive cycle (Official State Gazette 2024). These measures are intended to contribute to sustainable socioeconomic growth and the creation of employment. Structurally, the law comprises 48 articles distributed across a preliminary title and five main titles, addressing issues ranging from the allocation of competences between the Community of Madrid and local authorities, to strategic planning in the field of the circular economy, the implementation of specific measures, the regulation of waste and its circularity and the regime for inspection, monitoring and control.

Among its most salient features, the law identifies priority value chains, including the forestry, agri-food, construction, electronics, packaging, textile, transport and water sectors. Additionally, it mandates that the regional public sector incorporate circular economy criteria in public procurement processes and requires municipalities with more than 5,000 inhabitants to adopt a circular economy plan (Official State Gazette 2024; Díaz-Cruces 2025, 1). The legislation further promotes public-private collaboration for the implementation of circular business models and updates the regulatory framework for circular waste management, incorporating measures for prevention and sustainable management.

Although the primary obligations are directed at public administrations, the provisions of the law are expected to have a broad impact on all economic operators within the region, applying to all economic activities conducted in the Community of Madrid and to the waste generated thereby.

V. PLANNING STRATEGIES (PNIEC 2023–2030 AND LTS 2050)

The update of the National Integrated Energy and Climate Plan (PNIEC) 2023–2030 and the Long-Term Decarbonization Strategy (LTS 2050) have raised Spain's climate ambition, aligning with the objectives of the European Climate Law and initiatives such as Fit for 55 and REPowerEU. These plans not only consider the reduction of greenhouse gas emissions, but also project significant socio-economic benefits, such as the creation of quality jobs, strengthening industrial competitiveness and reducing energy dependence (Ministry for Ecological Transition and the Demographic Challenge 2021; 2020a; 2020b).

In recent years, the ecological transition has become a driver of modernization for the Spanish economy, enhancing investment opportunities,

technological innovation and rural development. The PNIEC, in particular, acts as a national strategic tool for energy and climate policy, setting a horizon to 2030 that integrates the following updated targets: a 32% reduction in GHG emissions compared to 1990; 48% renewables in final energy consumption; 43% improvement in energy efficiency (in terms of final energy); 81% renewable energy in electricity generation; and a reduction of energy dependence to 50% (Ministry for Ecological Transition and the Demographic Challenge 2021).

To ensure consistency with environmental legislation, the PNIEC has undergone a strategic environmental assessment in accordance with Law 21/2013 of December (Official State Gazette 2013). This planning is also integrated into the Strategic Energy and Climate Framework, whose key regulatory piece is Law 7/2021 on Climate Change and Energy Transition. This law consolidates in Spanish law the planning instruments—the PNIEC and the LTS 2050—provided for in Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action (Official State Gazette 2013, 7; Simou 2022, 7).

The LTS 2050, for its part, complements the efforts of the PNIEC by setting out a roadmap to achieve climate neutrality before mid-century. This approach offers stability to investors and social stakeholders, allowing Spain to aspire to be one of the most competitive countries in the energy transition, with tangible benefits in supply security, industrial innovation, mitigation of energy poverty and the creation of green jobs (Ministry for Ecological Transition and the Demographic Challenge 2021; 2020a).

VI. PROPOSALS TO STRENGTHEN CLIMATE LAW IN SPAIN

The Spanish legal framework on climate change has seen remarkable progress in recent years, especially with the adoption of Law 7/2021 on Climate Change and Energy Transition. However, the acceleration of the climate crisis and the tightening of international commitments highlight the need to strengthen and update climate law in Spain. Law 7/2021 represented a milestone in environmental legislation, but today a thorough review of its provisions is essential to address current and future challenges (Fernández De Gatta Sánchez 2023).

A comprehensive reform of this law should begin by raising the emissions reduction target for 2030, increasing it from the current 23% to at least 55% compared to 1990 levels, in line with the most ambitious objectives of the European Union. Likewise, it would be necessary to increase the target for the share of renewable energy in final energy consumption for 2030, surpassing the current 42%. In terms of sustainable mobility, bringing forward the ban on the sale of internal combustion vehicles from 2040 to 2030 would

accelerate the transition toward clean transportation. Additionally, expanding the requirement for low emission zones to municipalities with more than 20,000 inhabitants would improve air quality for a greater number of citizens. Adaptation to climate change, a frequently underestimated aspect, would be strengthened through a reform of the National Climate Change Adaptation Plan, incorporating more detailed and binding sectoral plans. To improve climate governance, it is essential to reinforce the role and resources of the Committee of Experts on Climate Change and Energy Transition, granting it greater influence and ensuring that policies are based on the best available scientific evidence (Díaz-Cruces y Méndez Rocasolano 2025).

Nevertheless, updating the legislative framework should not be limited to Law 7/2021. Other key regulations must be amended to ensure the coherence and effectiveness of climate action. Law 34/1998 on the Hydrocarbons Sector must progressively eliminate subsidies for fossil fuels, aligning energy policy with decarbonization objectives. Law 24/2013 on the Electricity Sector requires facilitating self-consumption and energy communities, empowering citizens in the energy transition. Law 21/2013 on Environmental Assessment should include the mandatory evaluation of climate impact in all projects, ensuring that new infrastructure is compatible with long-term climate objectives. At the local level, Law 7/1985 Regulating the Bases of the Local Regime should grant greater powers to municipalities in climate action, recognizing their essential role in implementing mitigation and adaptation measures. In the fiscal sphere, Law 15/2012 on fiscal measures for energy sustainability needs a more ambitious green tax system that penalizes polluting activities and encourages clean technologies. Finally, Law 43/2003 on Forests should be strengthened to incentivize the CO₂ capture capacity of carbon sinks, recognizing the importance of natural ecosystems in climate change mitigation (Official State Gazette 2013, 7; Simou 2022; Díaz-Cruces y Méndez Rocasolano 2025; Fernández De Gatta Sánchez 2023).

Crucially, the right to a stable climate must be recognized as a fundamental right. Currently, the Spanish Constitution contemplates the right to an adequate environment as a guiding principle, but not as a fully enforceable fundamental right. Elevating the right to a stable climate to the highest normative level would allow citizens to demand robust guarantees from both the State and private actors, granting direct justiciability to this right and obliging the State to adopt effective mitigation and adaptation measures. This recognition aligns with the international trend, where the United Nations and the European Court of Human Rights have linked climate change to the protection of fundamental rights. Including the right to a stable climate in the Spanish Constitution would not only elevate climate action to the highest legal status but also provide a solid basis for judicial protection of citizens' environmental rights, consolidating the intergenerational obligation and

facilitating comprehensive and coherent climate action. In conclusion, the reform of the Spanish legal framework on climate change must be ambitious, crosscutting and focused on the recognition of the right to a stable climate as a fundamental right, thus ensuring an effective and legitimate response to the current and future climate crisis. See Table 5.

Table 5. *Proposals for Reforming Spain's Climate Change Legal Framework*

Proposal	Current Situation	Proposed Reform	Objective
Emissions reduction target for 2030	23% reduction compared to 1990 levels	Raise to at least 55% reduction by 2030, aligning with EU ambitions	Accelerate decarbonization and meet EU climate goals
Renewable energy share in final energy consumption (2030)	42 %	Increase beyond 42%	Promote clean energy transition
Ban on sale of internal combustion vehicles	Scheduled for 2040	Bring forward to 2030	Speed up transition to sustainable mobility
Low-emission zones	Required in municipalities with more than 50,000 inhabitants	Expand to municipalities with more than 20,000 inhabitants	Improve air quality for more citizens
National Climate Change Adaptation Plan	Existing plan, limited sectoral detail	Reform to include more detailed and binding sectoral plans	Strengthen adaptation to climate change
Committee of Experts on Climate Change and Energy Transition	Advisory role, limited influence and resources	Reinforce role and resources, grant greater influence, ensure science-based policies	Improve climate governance
Law 34/1998 on Hydrocarbons Sector	Allows fossil fuel subsidies	Progressively eliminate subsidies	Align energy policy with decarbonization goals
Law 24/2013 on Electricity Sector	Barriers to self-consumption and energy communities	Facilitate self-consumption and empower energy communities	Empower citizens in energy transition
Law 21/2013 on Environmental Assessment	No mandatory climate impact evaluation for all projects	Require mandatory climate impact evaluation	Ensure new infrastructure aligns with climate objectives

Proposal	Current Situation	Proposed Reform	Objective
Law 7/1985 Regulating the Bases of the Local Regime	Limited municipal powers in climate action	Grant greater powers to municipalities	Strengthen local role in mitigation and adaptation
Law 15/2012 on fiscal measures for energy sustainability	Limited green taxation, weak incentives for clean technologies	Implement more ambitious green tax system, penalize polluting activities, incentivize clean technologies	Encourage sustainable economic activities
Law 43/2003 on Forests	Insufficient incentives for CO ₂ capture	Strengthen law to incentivize carbon sink capacity	Enhance role of forests and ecosystems in climate mitigation
Recognition of the right to a stable climate as a fundamental right	Right to environment is a guiding principle, not fully enforceable	Elevate right to a stable climate to constitutional fundamental right	Guarantee judicial protection and effective climate action, align with international human rights standards

VII. ASSESSMENT OF CLIMATE DIMENSIONS AND EXPERT CONSULTATION

A widely used statistical procedure, Kendall’s W coefficient, was applied for expert consultation and subsequent concordance analysis (Legendre 2005; Marcinkiewicz 2017; Sen 1968). The criteria and steps for this purpose are summarized below.

A review was conducted on the main methods for consulting experts on these legal issues and five dimensions were defined (Table 6).

Table 6. *Key dimensions of climate regulation*

ITEM	DESCRIPTION
A	Degree of decarbonization
B	Governance quality
C	Socioeconomic impact
D	Technical feasibility
E	Territorial equity

The sample selected for this study consists of a group of specialists from academic, institutional and business sectors, all with recognized experience in climate law, renewable energies and environmental governance. They hold advanced degrees (master’s and doctorate) and have proven expertise in research, policy formulation, legal advisory, business management and international cooperation on climate matters. These five specialists were asked to assign an order of importance to each dimension proposed in Table 5, where “1” is the least relevant and “5” the most relevant, following the categorization proposed by (Olaz Capitán 2021).

Table 6 and Figure 1 show the results of the assessment by each expert. To obtain the results, the rankings assigned by each expert to the different evaluated dimensions were first collected, summing the ranks given to each one. Based on these sums, Kendall’s coefficient of concordance (Kendall’s W) was applied, which quantifies the degree of agreement among participants regarding the priority order of the analyzed items. The calculation yielded a W value of 0.65, indicating a moderate to high level of concordance among the experts, thus reflecting a notable consistency in their assessments of the regulatory and planning aspects considered in the study.

Table 7. *Preliminary results of the expert consultation. E1–E5 refer to the 5 experts who participated in the consultation. A–E represent each of the established dimensions (Table 5). Σ represents the sum of the 5 dimensions and $\times$ the corresponding average*

EXPERT	A	B	C	D	E	S	X
E1	5	4	2	4	2	17	3,4
E2	5	2	3	4	4	18	3,6
E3	4	2	4	3	5	18	3,6
E4	5	3	4	3	2	17	3,4
E5	2	3	2	4	4	15	3,0
Total						85	13,4

Figure 1. *Assessment of climate criteria by the experts consulted. E1–E5 refers to the five experts who participated in the consultation*

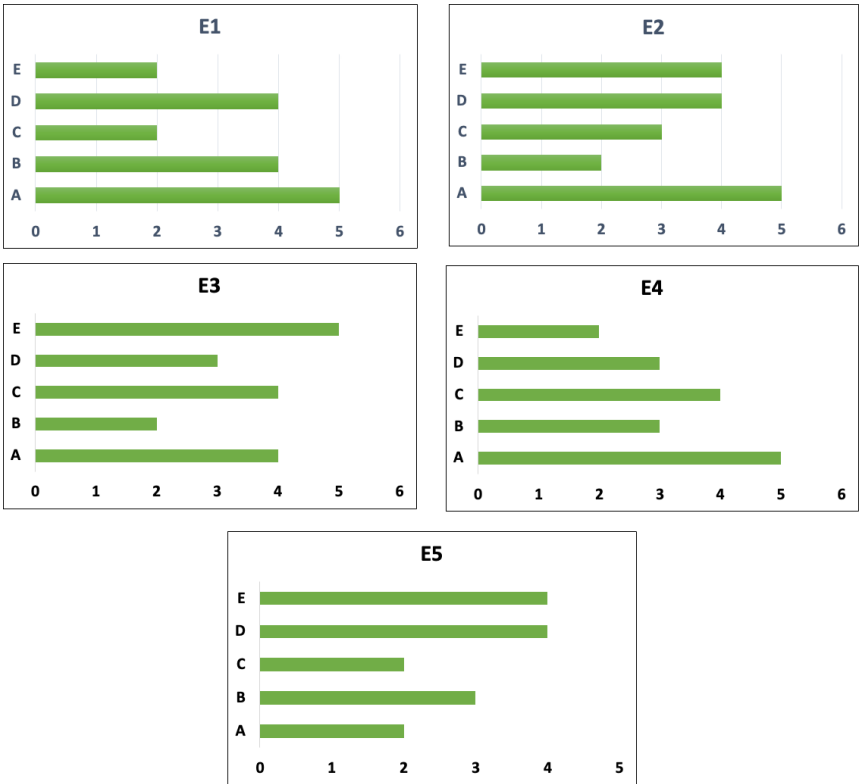


Figure 1 shows the charts corresponding to the responses of five experts (E1, E2, E3, E4 and E5). Each chart reflects the individual assessment of the five items: A (Degree of Decarbonization), B (Quality of Governance), C (Socioeconomic Impact), D (Technical Feasibility) and E (Territorial Equity). Firstly, in the chart for Expert 1 (E1), it can be observed that item A (Degree of Decarbonization) has the highest concordance, as this expert consistently ranks it with a high value close to 5. On the other hand, item C (Socioeconomic Impact) shows lower concordance due to its lower ranking compared to the other items.

Regarding Expert 2 (Chart E2), once again, item A (Degree of Decarbonization) stands out for having the highest concordance, with a high value assigned by this expert. However, item B (Quality of Governance) shows

lower concordance as it receives a lower score compared to the other evaluated criteria. In the chart for Expert 3 (E3), item E (Territorial Equity) has the highest concordance, as this expert assigns it the highest value in their assessment. In contrast, item B (Quality of Governance) reflects lower concordance due to its significantly lower score compared to the other items.

In the chart for Expert 4 (E4), it is noted that item A (Degree of Decarbonization) continues to have the highest concordance, receiving a consistently high score. However, item E (Territorial Equity) shows lower concordance due to the lower ranking assigned by this expert. Finally, in the chart for Expert 5 (E5), item D (Technical Feasibility) shows the highest concordance, as this expert ranks it with a high and uniform value. On the other hand, item C (Socioeconomic Impact) has lower concordance as it receives a lower score compared to the other evaluated criteria.

Given these results, the analysis suggests that item A (Degree of Decarbonization) tends to have the highest concordance among the experts overall (E1, E2 and E4), items B (Quality of Governance) and C (Socioeconomic Impact) tend to be the most inconsistent in the individual assessments. This reflects clear patterns regarding how each expert perceives certain aspects related to the evaluated criteria.

1. *Interpretation of Results on Expert Participation*

The analysis presented regarding the evaluation criteria for Spanish climate policies reveals both significant achievements and limitations. Firstly, the degree of decarbonization is the criterion with the greatest consistency in the experts' assessments, as all of them agree in assigning it high values, with several experts prioritizing it with the highest scores. This reflects Spain's commitment to emission reduction, in line with Law 7/2021 and the PNIEC 2023–2030. However, despite this consensus, practical implementation faces challenges due to inequalities between economic sectors and regions, suggesting the need for stricter oversight and strategic adjustments to ensure effective results.

On the other hand, the quality of governance shows notable variability in the evaluations. Also, some experts assign it intermediate scores, others rate it lower, reflecting divergent perceptions regarding the effectiveness of legislative reforms and inter-administrative coordination. These differences suggest significant gaps in governance, which hinder the uniform implementation of climate policies. This calls for a thorough review of coordination mechanisms between administrative levels to ensure that climate strategies are coherent and effective. Additionally, the socioeconomic impact also shows significant variability in the assessments. Concerns about how climate policies affect different sectors and vulnerable populations are evident, indicating that the principles of social justice have not yet been fully integrated into current climate

strategies. This is crucial for a just transition towards a low-carbon economy, as it is essential to ensure that climate policies are not only environmentally sustainable but also socially just. Technical feasibility is another aspect that shows limited concordance among the experts. The differences reflect concerns about the technological capacity to meet established climate objectives, which may be linked to limitations in institutional capacity to implement effective solutions. This requires investment in infrastructure and technology to improve the technical feasibility of climate policies and ensure that the objectives are achievable. Finally, territorial equity is one of the criteria with the lowest overall concordance among the experts. Divergent perceptions regarding how climate policies address inequalities between regions reveal significant shortcomings in this aspect. Territorial equity is fundamental to ensure that all regions benefit equitably from climate policies, which is essential to establish a fair and efficient regulatory framework.

2. *Global Considerations from the Expert Consultation*

The conclusions of the experts on climate governance in Spain underscore the need to prioritize emissions reduction and governance, without underestimating socioeconomic or equity factors. The use of Kendall's W method validated the consistency of expert judgments, revealing both agreements and discrepancies among specialists and expanding the empirical basis for conclusions about the effectiveness of climate governance in Spain. In this context, experts propose several reforms aimed at improving the effectiveness of climate policies. First, they suggest clarifying the distribution of competences, including the right to a stable climate in the Spanish Constitution and precisely defining climate change competences to avoid overlaps and jurisdictional conflicts. Additionally, they recommend streamlining administrative procedures by simplifying and modernizing processes for the approval and execution of projects in the energy transition field, adopting digital tools and more efficient management models.

Another key proposal is to strengthen participation and oversight, establishing mechanisms for citizen participation and accountability in decision making, as well as reinforcing technical and administrative oversight bodies. Finally, they suggest promoting financing and technological innovation by increasing financial incentives for the adoption of renewable energies and clean technologies, aimed at improving competitiveness without sacrificing environmental protection. Beyond these proposals, experts believe that Spain should raise its emissions reduction target to 55% or more by 2030, aligning with the 1.5°C goal of the Paris Agreement (United Nations 2015). They also suggest implementing a fossil phase out plan, including ending subsidies and setting concrete dates for the cessation of gas and oil use. Climate justice and

a just transition are fundamental aspects; Spain's Just Transition Strategy is advanced, but experts suggest expanding it to more sectors and considering specific agreements for the integration of renewables. Finally, coordination among administrative levels remains a challenge. Improving coordination mechanisms is crucial to ensure effective implementation of climate policies.

Additionally, despite progress in energy transition and climate protection, the study identifies several significant barriers hindering effective progress. First, ambiguity in the distribution of competences is a major challenge. The lack of clear constitutional provisions on climate change creates legal uncertainty and complicates coordination between the State and autonomous communities. Jurisprudence, such as Constitutional Court Ruling 87/2019, has restricted regional autonomy, limiting the possibility of setting more ambitious local climate targets. This not only affects the effectiveness of local climate policies but may also delay the implementation of necessary measures to address climate change effectively.

Moreover, bureaucracy and complex administrative procedures, partly regulated by Law 39/2015, slow down the implementation of strategic projects in the energy transition. This bureaucratic sluggishness not only affects the effectiveness of adopted measures but also discourages investors and reduces the competitiveness of the Spanish energy sector internationally. Another significant challenge is the tension between economic development and environmental protection. Though investments in renewables can generate economic benefits, the lack of clear incentives and adequate financing limits the adoption of clean technologies in traditionally energy intensive sectors. This tension is exacerbated by the need to balance economic growth with environmental protection, requiring policies that promote sustainability without compromising economic competitiveness.

Finally, the lack of participation and accountability mechanisms is a major obstacle to effective climate policy implementation. Insufficient integration of citizen and business participation mechanisms negatively impacts transparency and the effectiveness of climate governance. This not only reduces the legitimacy of adopted policies but also limits the ability to respond to the needs and concerns of society. Therefore, it is crucial to strengthen participation and accountability channels to ensure that climate policies are inclusive, effective and sustainable in the long term.

VIII. LIMITATIONS AND STRENGTHS OF THE EVOLUTION AND CHALLENGES OF SPAIN'S CLIMATE LAW FRAMEWORK (2014–2024)

Despite the significant progress made in consolidating a more coherent and ambitious legal framework for climate action in Spain, this study reveals

several profound limitations that, presenting challenges, also open avenues for future improvement and innovation. First, the limited sample size and the predominance of academic profiles among the consulted experts may restrict the representativeness and practical applicability of the findings, particularly in dimensions such as technical feasibility and socio-economic impact, where the perspectives of business and institutional actors are crucial. However, this academic focus has enabled a rigorous and specialized analysis, laying a solid foundation for future research that can expand both the disciplinary scope and the diversity of stakeholders involved.

Administrative complexity and the fragmentation of competences between the central government and the autonomous communities continue to generate legal uncertainty and coordination difficulties. Yet, these challenges underscore the urgent need to design more flexible and adaptive governance mechanisms that can respond to territorial specificities and foster effective multilevel cooperation. The incomplete integration of territorial equity and climate justice criteria in policy implementation highlights persistent inequalities but also drives the agenda toward a fairer and more inclusive transition, in line with international principles and the growing societal demand for the protection of fundamental rights.

Furthermore, the exploratory and non-conclusive nature of the study, due to the impossibility of applying more robust statistical techniques, should not be seen merely as a limitation. Rather, it highlights the urgency of generating new empirical evidence and promoting broader participation from all sectors of society in the construction of more effective and legitimate climate policies. In this sense, the critical recognition and analysis of these limitations transform them into drivers for regulatory evolution, governance innovation and the strengthening of environmental and social protection within the Spanish context.

IX. DISCUSSION

The discussion of the results obtained in this study on the evolution of Spain's climate legal framework between 2014 and 2024 allows for the identification of substantial progress and persistent challenges in consolidating a robust, coherent regime aligned with international and European commitments. The main findings show that, over the past decade, Spain has moved from a fragmented regulatory system to the adoption of more ambitious legislative and strategic instruments, such as Law 7/2021 on Climate Change and Energy Transition, the National Integrated Energy and Climate Plan (PNIEC) 2023–2030 and the Long-Term Decarbonization Strategy, which have placed climate action at the center of the national political and legal agenda (Official State Gazette 2021; Ministry for Ecological Transition and the Demographic Challenge 2021; Simou 2022).

These results confirm the initial hypothesis, which held that legislative innovation, supported by expert consultation and intersectoral planning, is essential to address the urgency of the climate crisis and ensure an effective transition toward climate neutrality. In line with previous studies, the integration of climate justice and human rights principles into Spanish environmental legislation represents a significant advance, although its practical application remains uneven, especially regarding the protection of the most vulnerable sectors and citizen participation (Díaz-Cruces *et al.* 2024; Akyüz 2021; Benevolenza y DeRigne 2019; Geneva Environment Network 2024; Ivanova y Serrano 2022). As result of the comparative analysis with international literature shows that progress in Spanish regulation responds directly to instruments such as the Paris Agreement and the European Green Deal, which have driven structural reforms and the adoption of binding targets for emissions reduction, renewable energy and energy efficiency. However, Spain's experience also reflects challenges common to other European countries, such as administrative complexity, insufficient effective coordination among different levels of government and disparities in the implementation of climate policies at the regional and sectoral levels (Boix Palop y Pavani 2025; European Commission 2019; Bongardt y Torres 2022).

Of particular interest is the identification of legal and administrative barriers, such as ambiguity in the distribution of competences among the State, autonomous communities and local entities. The jurisprudence of the Constitutional Court, particularly ruling STC 87/2019, has limited the capacity of autonomous communities to set their own climate targets, reinforcing state centrality but generating tensions and setbacks in regional climate action (Judgment 87/2019, of June 20, 2019. Constitutional appeal 5334-2017. Filed by the President of the Government in relation to various provisions of Law 16/2017 of the Parliament of Catalonia, of August 1, on climate change. 2019). This phenomenon has been identified in the literature as an obstacle to the effectiveness of climate policies and the necessary multilevel coordination, like what is observed in other European federal systems.

Another critical aspect is the uneven application of climate rights and the absence of effective control and enforcement mechanisms, which has led to an increase in climate litigation in Spain. This phenomenon, also observed in other European countries, highlights the importance of advancing toward the recognition of the right to a stable climate as a fundamental right, following the international trend set by UN resolutions and decisions of the European Court of Human Rights (Alhoussari 2025; Chen y Liu 2023). Similarly, regarding the interaction between economic development and climate protection, the study's results confirm the structural dilemma of reconciling economic growth with decarbonization and environmental protection. However, the transition to renewable energy and the circular economy offers

opportunities for job creation and industrial modernization, resistance persists in traditional sectors and challenges remain in financing clean technologies (Karakosta y Papathanasiou 2025). These tensions, widely documented in the literature, require integrated policies that incentivize innovation, promote a just transition and strengthen public awareness of the benefits of a sustainable economy.

Based on these findings, the study proposes a series of reforms aimed at strengthening Spain's climate legal framework. Key recommendations include raising the emissions reduction target for 2030 to at least 55%, increasing the share of renewables in final energy consumption, bringing forward the ban on the sale of combustion vehicles to 2030, expanding low-emission zones, reforming the National Adaptation Plan to include binding sectoral plans, reinforcing the Committee of Experts, progressively eliminating fossil fuel subsidies, facilitating self-consumption and energy communities, mandating climate impact assessment for all projects, strengthening green taxation and constitutionally recognizing the right to a stable climate. Further, methodologically, the combination of regulatory analysis, bibliometric review and structured expert consultation has enabled triangulation of results, enhancing the robustness of the conclusions, although the limited sample of experts and the predominance of academic profiles constitute a limitation that must be considered when interpreting the results. As far as the broader context of global climate governance, the results of this study contribute to understanding the factors that facilitate or hinder the construction of effective legal frameworks for climate action. The Spanish experience illustrates the importance of legislative coherence, multilevel collaboration and the integration of climate justice as key elements for a just and sustainable transition. However, it also underscores the need for ongoing reforms, more robust accountability mechanisms and greater ambition in climate targets to respond to the accelerating climate crisis.

Looking ahead, research should deepen the analysis of the effectiveness of the proposed reforms, assess the real impact of just transition policies in the most affected territories and sectors and explore innovative mechanisms for citizen participation and judicial oversight. It would also be relevant to compare the evolution of the Spanish legal framework with that of other European countries to identify best practices and transferable lessons that contribute to strengthening international climate governance. In this context, the findings of this work reinforce the hypothesis that regulatory innovation, adaptive governance and the integration of approaches based on justice and human rights are indispensable conditions for ensuring a just, effective and sustainable response to the climate crisis and provide a concrete roadmap for improving Spain's climate legal framework and aligning it with the most advanced international standards.

X. CONCLUSIONS

Over the past decade, the legal framework addressing climate change in Spain has undergone significant evolution, shifting from a fragmented regulatory system to the consolidation of a more coherent and ambitious regime aligned with international and European commitments. This progress is exemplified by the adoption of key legislation such as Law 7/2021 on Climate Change and Energy Transition, the Integrated National Energy and Climate Plan (PNIEC) 2023–2030 and the 2050 Decarbonization Strategy, which have placed climate action at the core of the national political and legal agenda. The process has been characterized by the progressive integration of climate justice and human rights principles, in line with international trends such as the Paris Agreement and the European Green Deal, although practical implementation still reveals disparities, particularly regarding the protection of the most vulnerable sectors and in fostering citizen participation.

Nevertheless, at present, significant structural challenges persist. Among the most impactful challenges, administrative complexity and the fragmentation of competencies among the State, autonomous communities and local entities generate legal uncertainty and hinder multilateral coordination, resulting in territorial and sectoral inequalities in the implementation of climate policies deserve special attention. Furthermore, bureaucracy and delays in administrative procedures impede the rollout of strategic projects for the energy transition and discourage private investment. In the present case of study, the Spanish experience reflects common challenges to other European countries, such as the need for greater legislative coherence and more robust control and accountability mechanisms, as well as the urgency to raise the ambition of national targets by increasing emission reductions, expanding the share of renewable energy and advancing the phase out of internal combustion vehicles. As several expert analyses confirmed, it is of paramount importance to clarify first the allocation of competencies, as it will be the responsible for strengthening social participation and technical oversight, but also promoting innovation and financing in clean technologies. As revealed though our analysis, it would be also essential to recognize the right to a stable climate as a fundamental right, elevating its protection to the highest normative level and ensuring effective judicial remedies. In this context, although Spain has significantly reinforced its legal framework for climate action, it is worth to mention that lot of work is still ahead to pursue these ambitious, cross cutting reforms oriented toward climate justice, territorial equity and the protection of fundamental rights, thereby ensuring a just, effective and sustainable transition toward climate neutrality.

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