LUISS

Degree Program in Law, Digital Innovation and Sustainability

Course of Managing the Energy Transition

Energy Transition and Landscape Protection: A Comparative Governance Perspective

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Introduction

The dual challenge of accelerating the energy transition and protecting landscapes represents one of the most complex governance issues in Europe today. As the European Union strives to achieve its ambitious climate neutrality objectives through the Green Deal and REPowerEU, the rapid expansion of renewable energy sources has become a top priority. However, deployment frequently encounters delays and resistance, not due to technological limits, but because of tensions between spatial planning, institutional capacity, and public legitimacy. The energy transition, therefore, cannot be treated merely as a technological or economic endeavour. It is, above all, a spatial and political process that unfolds within specific territorial contexts and must contend with competing claims, values, and interests.

This thesis investigates how governance structures shape the conditions under which renewable energy can be deployed without undermining landscape protection, environmental integrity, or democratic accountability. It focuses on the interplay between regulatory frameworks, spatial planning tools, and participatory processes, asking whether, and how, these can enable a more coordinated, transparent, and territorially grounded energy transition.

The research adopts a comparative case study methodology centred on three peripheral yet strategically significant European regions: Sardinia (Italy), the Canary Islands (Spain), and Alentejo (Portugal). Each territory is marked by high renewable energy potential, rich landscape values, and multi-level governance tensions, making them particularly insightful for identifying both structural barriers and enabling practices. By analyzing how different institutional models perform in balancing development and protection goals, the thesis identifies lessons that are both context-specific and policy-relevant.

Chapter 1 lays the technical and territorial foundations by analyzing the spatial footprint and environmental compatibility of key renewable technologies, such as solar PV and wind power. It presents comparative data on deployment trajectories and national targets, evaluates the land-use intensity of various technologies, and explores criteria for territorial suitability, establishing the material basis upon which planning decisions and regulatory frameworks must operate.

Chapter 2 examines the legal and regulatory instruments that govern the spatial allocation of renewable energy in Italy, with particular attention to the definition of suitable areas, landscape safeguards, and environmental impact procedures. Chapter 3 explores the political and administrative dysfunctions that

hinder deployment, highlighting conflicts between national and regional authorities, local resistance, and fragmented authorization procedures.

Chapter 4 offers a detailed comparative analysis of the three case studies, identifying key differences in planning approaches, participation models, and institutional coordination mechanisms. Building on this analysis, Chapter 5 distils the lessons learned and proposes a taxonomy of operational solutions aimed at overcoming the recurring challenges identified throughout the thesis.

Ultimately, this thesis argues that the success of the energy transition depends not only on ambitious targets and financial support but, perhaps above all, on the quality of governance. Unlocking the full potential of renewables while protecting landscapes and engaging communities requires a paradigm shift. By offering a framework of comparative evidence and actionable strategies, the thesis aims to inform both academic debate and policy design, contributing to a more balanced, legitimate, and territorially sensitive transition.

1 Policy and Technologies

1.1 The European and National framework

1.1.1 EU Climate and Energy goals

The European Union has established an increasingly stringent and structured legislative framework to drive the clean energy transition, rooted in binding targets, regulatory instruments, and multilevel governance mechanisms. At the heart of this framework lies the European Green Deal, adopted in December 2019, which positions climate neutrality by 2050 as the overarching strategic objective for the European economy. It integrates climate, energy, industrial, and biodiversity policies into a single transformative agenda, setting the foundation for subsequent legislative developments (European Commission, 2019).

In order to enshrine this objective in binding legislation, the EU adopted Regulation (EU) 2021/1119, also known as the European Climate Law, which commits the Union to achieve net-zero greenhouse gas emissions by 2050 and establishes an intermediate binding target of at least 55% reduction by 2030 compared to 1990 levels. The Regulation also requires each Member State to align its national trajectory with this goal, contributing to the collective effort through integrated national energy and climate plans (NECPs).

The structure and obligations relating to these NECPs are detailed in Regulation (EU) 2018/1999 on the Governance of the Energy Union. This regulation establishes the framework for energy and climate planning, reporting, and monitoring, and mandates Member States to submit their NECPs in five-year cycles. It also introduces iterative dialogue processes with the European Commission to ensure consistency with the Union's overall climate goals.

In response to the energy security crisis exacerbated by Russia's invasion of Ukraine, the EU introduced the REPowerEU Plan, which complements the Green Deal by accelerating the deployment of renewable energy and enhancing energy system resilience. REPowerEU aims to reduce the EU's dependence on Russian fossil fuels through diversification of supply, increased energy efficiency, and faster permitting of renewable energy projects.

These objectives have been operationalised and reinforced through the recast Renewable Energy Directive (RED III), which entered into force on 20 November 2023.[1] RED III raises the binding EU

[1] Directive (EU) 2023/2413

target for renewable energy in gross final consumption to 42.5% by 2030, with an aspirational target of 45%. It introduces new planning and permitting instruments, most notably the designation of "renewables acceleration areas" (RAAs), within which administrative procedures are streamlined and deadlines significantly shortened.

Pursuant to RED III, RAAs include locations deemed suitable for renewable energy sources (RES) deployment due to their low environmental sensitivity, existing infrastructure, or previous human use, such as industrial zones, brownfield sites, and artificial surfaces, provided they are not subject to exclusion criteria under national or EU environmental law. While the Directive allows Member States to define these areas, they must do so in alignment with EU biodiversity legislation and planning instruments.

Within RAAs, Member States must ensure that permitting procedures do not exceed 12 months for new RES installations and 6 months for repowering projects, while outside RAAs the deadlines are 24 months and 12 months respectively. For small-scale solar PV installations up to 50 kW, the deadline is capped at one month, with tacit approval mechanisms applied if no decision is issued in time. The Directive also introduces a presumption of overriding public interest for renewable energy projects, facilitating legal clearance where other environmental or territorial constraints apply.

The transposition deadline for RED III expired on 21 May 2025. By that date, Member States were required to implement the core provisions, including the designation of acceleration areas and the simplification of permitting procedures. Some measures, such as those concerning rooftop solar and repowering, had earlier deadlines.[2]

Moreover, RED III and the Governance Regulation highlight the importance of spatial and environmental planning at the programmatic level. The presumption of compatibility with EU environmental law within acceleration areas reflects a broader strategy of frontloading impact assessment into strategic planning tools, such as Strategic Environmental Assessments and Natura 2000 screenings. This planning-driven approach is intended to reconcile ecological protection with the imperative of timely deployment, particularly in Member States with high biodiversity sensitivity or fragmented land-use patterns.

In this regard, RED III implicitly establishes a benchmark for administrative performance across the Union. By harmonising maximum permitting durations and introducing legal presumptions, the Directive

[2] Directive (EU) 2023/2413, Article 5

reduces the variance in permitting timelines, which has historically ranged from under 12 months to over 5 years depending on national and regional regimes. For countries like Italy, which have experienced long-standing permitting bottlenecks, this normative evolution not only raises the level of ambition but also introduces the risk of infringement procedures and project relocation in case of persistent underperformance.

Furthermore, the Directive addresses the regulatory uncertainty that has discouraged renewable energy investments in several Member States. By introducing legal deadlines, presumptions of public interest and streamlined procedures, RED III promotes greater predictability and reinforces the general principle of legitimate expectations under EU law.[3]

1.1.2 National plans and legal tools

Italy submitted its final updated NECP (PNIEC) to the European Commission on 1 July 2024, in compliance with Regulation (EU) 2018/1999. The plan outlines Italy's contribution to the 2030 climate and energy targets, including a revised renewable energy share and updated sectoral trajectories (MASE, 2024). The PNIEC integrates quantitative targets, scenario modelling, policy measures, and planned reforms across all five Energy Union dimension: decarbonization, energy efficiency, energy security, the internal energy market, and research, innovation and competitiveness.

In parallel, the Italian legislative framework has been progressively aligned with evolving EU requirements. Legislative Decree No. 199/2021 transposed RED II,[4] establishing the first national provisions for suitable areas and simplified permitting. RED III substantially amended RED II by strengthening targets and introducing the new concept of renewables acceleration areas. This prompted further national reforms, including Legislative Decree No. 190/2024, to ensure full alignment with the updated European framework.

Building on this, the Ministry for the Environment and Energy Security adopted the Ministerial Decree of 21 June 2024,[5] which provides detailed rules for the identification of suitable areas. This Decree, published in the Gazzetta Ufficiale No. 153 of 2 July 2024, establishes national criteria and timelines for regional governments to define suitable zones within their territories, consistent with environmental plans and the updated PNIEC. Among the criteria are proximity to grid infrastructure, land cover classification,

[3] Case C-201/08, Plantanol GmbH & Co. KG v Hauptzollamt Darmstadt, EU:C:2009:539
[4] Directive (EU) 2018/2001
[5] Decreto Aree Idonee

and absence of absolute constraints such as Natura 2000 sites. The Decree also allows regions to further refine these criteria in line with local specificities, provided that national minimum standards and EU legal obligations are met.

The governance and permitting framework were further consolidated through Legislative Decree No. 190/2024, which introduces a comprehensive reform of the administrative regimes applicable to renewable energy installations. The Decree rationalizes permitting procedures, introduces single-authorisation mechanisms, and harmonises requirements across technologies and jurisdictions, in line with RED III and Regulation (EU) 2022/2577.

This set of legal instruments aims to enhance legal certainty, reduce bureaucratic delays, and favour early spatial screening and environmental compatibility assessments. By establishing a framework for the proactive designation of low-conflict areas and the streamlining of permitting, Italy seeks to accelerate the deployment of renewable capacity while mitigating social and environmental friction. However, the effectiveness of these reforms depends critically on regional implementation and on the capacity to integrate planning, environmental, and energy objectives into coherent territorial strategies.

Despite the clarity of national objectives and the comprehensiveness of the legal framework, regional implementation has often proven uneven and fragmented. Several Italian regions continue to face structural difficulties in updating territorial energy plans, managing environmental assessments, and coordinating among departments (urban planning, energy, environment, culture). According to the European Commission (2024), these challenges are exacerbated by limited staffing, administrative overload, and lack of digitalization of permitting processes. As a result, even well-designed national frameworks may falter at the execution stage, undermining the effectiveness of policies intended to support the rapid and sustainable deployment of renewables.

1.2 Renewable sources and land impact

Under EU law, "energy from renewable sources" refers to energy from renewable non-fossil sources, including wind, solar (thermal and photovoltaic), geothermal, ambient energy, tide, wave and other ocean energy, hydropower, and biomass, encompassing landfill gas, sewage treatment plant gas, and biogas (RED II; RED III). These categories cover, in operational terms: impounded and run-of-river hydropower; onshore and offshore wind energy; solar energy as heat or electricity; geothermal power; heat from ambient sources via heat pumps; marine energy from various gradients; and solid, liquid, and gaseous bioenergy systems.

This thesis focuses on solar photovoltaic and wind power for three principal reasons.

First, they represent the heart of Italy's 2030 decarbonization pathway: the final updated National Energy and Climate Plan foresees approximately 80 GW of solar PV and 28 GW of wind power by 2030, representing the majority of the planned renewable capacity expansion compared to other RES technologies (PNIEC, 2024).

Second, they have been the primary drivers of recent growth and are the technologies that exhibit the most significant territorial implications. In 2024, Italy added 6,6 GW of PV and 0.6 GW of wind, reaching 76,6 GW of total RES capacity, while renewable sources generated approximately 128, 8 TWh, equal to 48,8% of total net energy production (Terna, 2025). These technologies pose the most salient questions regarding land take, landscape compatibility, grid connection, and storage integration, which are at the core of spatial governance strategies such as the identification of suitable areas and the assessment of Renewable Acceleration Areas.

Third, photovoltaic and wind power offer the most clearly defined and institutionally benchmarked performance metrics, making them suitable for a rigorous and evidence-based comparison in terms of spatial trade-offs and territorial planning.

1.2.1 Photovoltaic systems

Italy's solar PV sector has expanded rapidly in recent years, supported by favourable policy frameworks, falling technology costs, and EU decarbonization targets. Public support schemes have played a decisive role in shaping deployment patterns, particularly favouring ground-mounted and utility-scale installations. Past and present mechanisms, such as the Conto Energia,[6] the Ministerial Decree of 4 July 2019, and more recently, measures under Italy's Recovery and Resilience Plan have channelled incentives toward larger plants connected to the medium- and high-voltage grid. The 2022 ministerial guidelines on agrivoltaics further reinforce this trend by setting eligibility criteria, such as minimum spacing, real-time monitoring of agricultural yields, and dual-use compliance, that apply predominantly to ground-based systems (MASE, 2022). Consequently, rooftop PV remains limited by structural constraints and market fragmentation, while most new capacity growth continues to occur on land. By

[6] Italy's national feed-in tariff scheme (2005–2013) that guaranteed twenty-year payments for each kilowatt-hour of electricity generated by photovoltaic plants.

the end of 2024, installed capacity reached 37,1 GW, up from 30,3 GW in 2023, the highest annual increment on record, accounting for over 91% of new RES installations in 2024 (Gaudi, 2025).

Solar installations in Italy are typically classified into three typologies: rooftop PV, utility-scale ground-mounted PV, and agrivoltaic systems. Each configuration entails specific implications for land occupation, energy yield, and spatial integration.

Rooftop PV installations on residential, commercial, and industrial buildings minimize land take and enable proximity to demand centers, easing grid pressure.

Utility-scale ground-mounted PV systems, while are more efficient in terms of cost and scale, frequently generate land use concerns, especially when sited on agricultural or ecologically valuable land. Average land take for ground-mounted PV in Europe is around 1.9 hectares per MW, although this figure varies with site-specific factors such as slope, orientation, and layout (JRC, 2023).

Agrivoltaic systems represent a hybrid approach, combining energy production with continued agricultural activity. National guidelines issued by the Ministry for the Environment and Energy Security (MASE, 2022) define minimum ground clearance, the use of adjustable modules to optimize sunlight, and the requirement to monitor agricultural productivity over time. Properly designed agrivoltaic systems can reduce net land use and improve resilience against climate extremes such as drought (JRC, 2023; MASE, 2022).

Observed capacity factors for PV in Italy range from 11% to 12%, reflecting both geographic location and orientation.[7]

The capacity factor expresses the ratio between the actual energy output of a plant over a year and the maximum possible output if it operated at full capacity continuously. This allows comparison across technologies by reflecting intermittency, siting conditions, and technological maturity.

From a visual perspective, PV systems primarily generate horizontal visual impacts. These can be mitigated using vegetative screening, integration into the existing land morphology, and strategic siting (Regione Toscana, 2013). Grid connectivity depends on proximity to medium- and high-voltage

[7] Capacity Factor = Annual MWh / (Installed MW × 8,760). Values in this section are derived from official 2024 national statistics (Terna)

substations, and storage technologies are increasingly necessary to compensate for the variable nature of solar generation (Terna, 2024).

1.2.2 Wind energy

Wind energy continues to play a critical role in Italy's renewable mix. As of 2024, installed onshore wind capacity stood at 13 GW, predominantly located in southern regions and along the Apennine ridges (Gaudi, 2025).

Unlike PV, wind turbines exhibit a relatively small direct land take, but require larger spatial envelopes for optimal turbine spacing. According to the JRC Land Use Observatory (2023), the direct footprint of onshore wind infrastructure (including turbine foundations, access roads, and substations) averages 0.77 hectares per MW, whereas the total areal extent for wind farms ranges between 10 and 30 hectares per MW, most of which remains available for other uses such as agriculture or grazing. Onshore wind in Italy typically achieves capacity factors between 19% and 20%, depending on wind regime and altitude.[8]

Offshore wind is still at an early development stage in Italy, though multiple floating wind projects are under consideration in the Tyrrhenian Sea and the Strait of Sicily. While they avoid terrestrial land conflicts, offshore projects raise challenges related to marine biodiversity, shipping routes, fisheries, and visual intrusion from the coastline. EU guidance allows offshore installations within Natura 2000 areas provided that appropriate environmental assessments demonstrate no adverse effects (European Commission, 2020).

Projected capacity factors for offshore wind installations are significantly higher than onshore plants, typically ranging between 35% and 45%, due to the more stable and stronger wind conditions found in marine environments (Wind Europe, 2025). As Italy, does not have operational fleet yet, these figures are derived from consolidated European benchmarks. While offshore turbines do not consume terrestrial land, they do require the allocation of marine surface area, generally expressed in terms of installed capacity per square kilometer (MW/km²). European case studies indicate typical offshore power densities

[8] Capacity Factor = Annual MWh / (Installed MW × 8,760). Values in this section are derived from official 2024 national statistics (Terna)

in the range of 3 to 6 MW/ km². Notable examples include Hollandse Kust Zuid in the Netherlands (6.7 MW/ km²), Walney Extension in the UK (4.5 MW/km²) and Horns Rev 3 in Denmark (5.0 MW/km²).

Onshore wind farms may also have ecological impacts, particularly in relation to avifauna and bats. Mitigation measures include micro-siting, shutdown-on-demand systems, and post-installation monitoring (European Commission, 2020).

1.2.3 Installed capacity and gaps

The updated PNIEC published in July 2024 sets ambitious targets for 2030: 131 GW of total RES capacity, including 80 GW of PV and 28 GW of wind (MASE, 2024). As of 2024, installed capacity stood at 76,6 GW, comprising 37.1 GW PV, 13 GW wind, 19 GW hydro, 4.1 GW bioenergy, and 0.8 GW geothermal (Terna, 2025). Achieving the 2030 targets would require an average annual addition of approximately 9 GW, compared to the 7.5 GW added in 2024, underscoring the urgency of addressing permitting, grid constraints, and investment barriers.

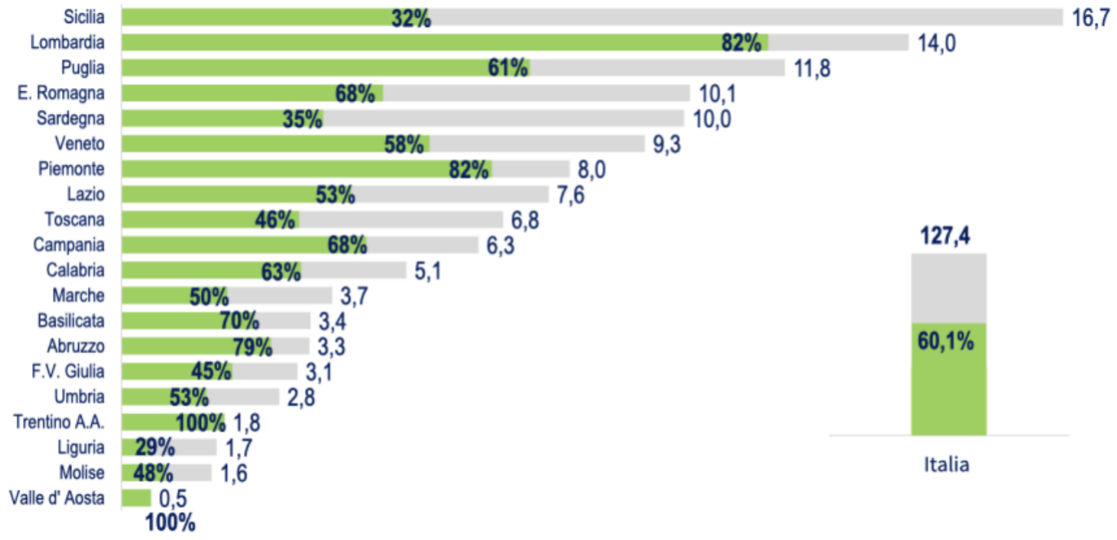
In terms of production, RES generated approximately 128.6 TWh in 2024, out of 261,2 TWh, representing 49% of gross national electricity generation, +4.6 % compared to 2023 data, and covering 42% of the overall consumption. The main contributors were hydropower (52 TWh), solar PV (36 TWh), and wind (22 TWh), with strong geographical concentration in Lombardia, Puglia, Abruzzo e Basilicata (Terna, 2025; The European House Ambrosetti, 2025).

These regions reflect a strong incidence of hydropower in their electricity generation mix, as they benefit from high installed capacity due to the specific characteristics of their territory. While this element can certainly be considered a positive factor, it also highlights the limited margin for further expansion, since the PNIEC does not foresee a significant increase in hydropower capacity by 2030, apart from repowering and revamping interventions.

Conversely, regions such as Sicily, Sardinia, Liguria, and Molise fall well below the national average level of progress, currently around 60%, towards the 2030 RES capacity target (127,4 GW), due primarily to inadequate spatial planning. local opposition and territorial complexities.

The graph below, taken from the study conducted by Thea Group, analyses the theoretical and practical potential for the deployment of renewable energy sources. Specifically, it compares the capacity already

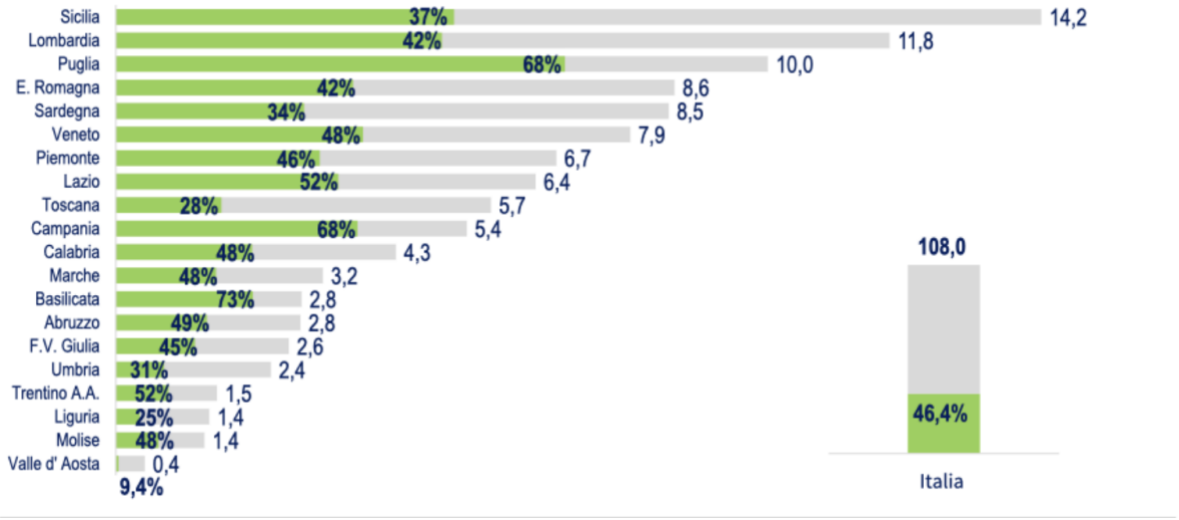
installed with the target capacity set by the PNIEC for 2030, considering solar, wind, and hydropower sources.



Source: TEHA Group elaboration on Terna data and the 2025 PNIEC

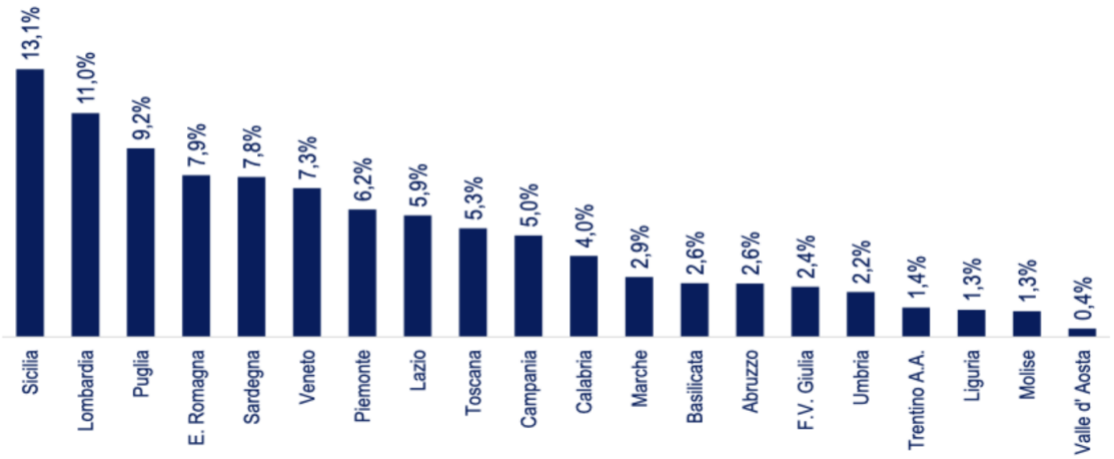
An alternative breakdown, focusing exclusively on solar and wind capacity, offers a complementary perspective that excludes mature technologies such as hydropower, thus highlighting regions requiring stronger acceleration. In this case, the national average for combined solar and wind stands at 46.6%, meaning that less than half of the potential has been installed relative to the targets set by the PNIEC for 2030.

The most virtuous regions are Apulia, Lazio, Campania, and Basilicata, each surpassing the 50% threshold. By contrast, Sicily, Sardinia, Emilia-Romagna, and Lombardy lag significantly behind when compared to their potential, with the latter showing a particularly low value relative to the previous chart, thereby highlighting its delay compared to hydropower performance. A similar situation can be observed in Trentino-Alto Adige and Valle d'Aosta, where hydropower heavily influences the overall results.



Source: TEHA Group elaboration on Terna data and the 2025 PNIEC

Finally, this graph illustrates the expected contribution of each region to the achievement of the PNIEC 2030 targets.



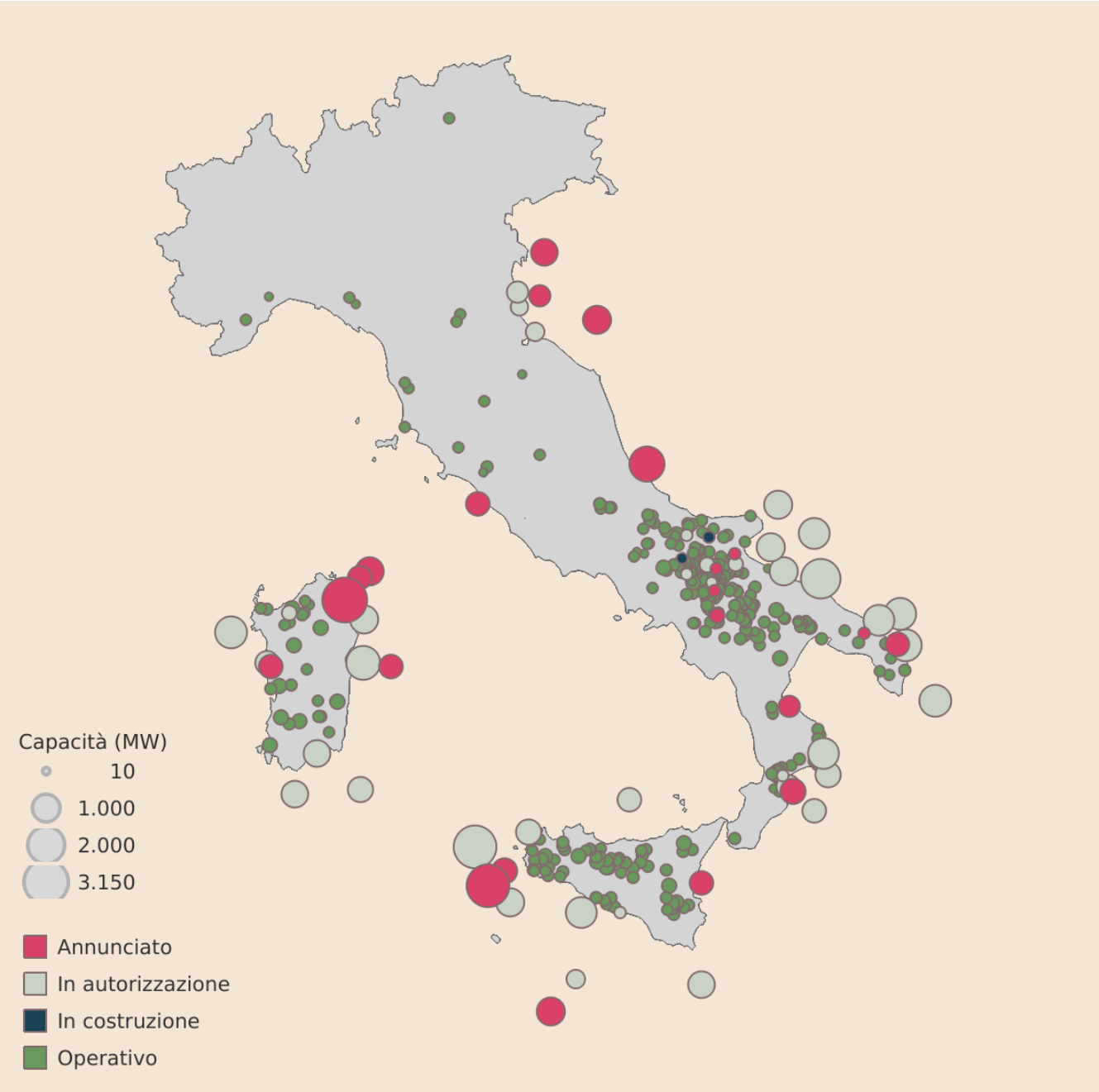
Source: TEHA Group elaboration on Terna data and the 2025 PNIEC

As illustrated in the table below, published in the 2025 Legambiente report and based on data provided by Terna, the vast majority of Italian regions are shown to be facing substantial delays.

Region	2024 Target	Achieved in 2024	% of 2030 Target achieved	Years of delay
Valle d'Aosta	27	24	7.3%	44.7
Molise	175	102	10.2%	29.3
Calabria	549	386	12.2%	22.9
Sardinia	998	812	13%	20.9
Umbria	279	234	13.3%	20
Liguria	198	176	16.6%	14.1
Tuscany	667	587	13.8%	13.8
Sicily	1842	1778	17%	13.6
Marche	457	400	17.1%	13.5
Abruzzo	454	366	17.5%	12.9
Apulia	1672	1356	18.4%	11.8
Basilicata	543	415	19.7%	10.3
Emilia-Romagna	1288	1443	22.8%	7.5
Campania	909	1087	27.3%	4.6
Piemonte	1098	1409	28.2%	4.2
Lombardy	1963	2509	28.6%	4
Veneto	1373	1689	29%	3.8
Friuli-Venezia Giulia	404	659	33.6%	1.9
Trentino-Alto Adige	279	389	33.9%	1.8
Lazio	933	1896	39.9%	0
Italy	16109	17717	22.1%	8.1

Source: Legambiente elaboration on Terna data, 2025. Data in MW

The spatial distribution of solar and wind energy across Italy remains significantly unbalanced. While photovoltaics installations have progressively spread through the national territory, wind energy remains largely concentrated in a limited number of regions. In these areas, the development of new projects is frequently constrained by siting limitations, local opposition, and rigid planning frameworks. As a result, wind power in Italy contributes only 8% to the national electricity mix, well below the EU average of 19% (Wind Europe, 2025).



Source: Il Sole24Ore elaboration on Global Energy Monitor and Global Wind Power Tracker data, 2025

Drawing on current installed capacity and institutional projections, a preliminary estimation of land requirements to achieve Italy's 2030 renewable energy targets can be formulated. It is assumed that approximately 28 GW of additional photovoltaic capacity will be deployed as ground-mounted systems, representing around 65% of the total PV target and consistent with recent installation trends. Furthermore, an additional 7 GW of onshore wind capacity is expected to be developed between 2024 and 2030, bringing the total onshore wind capacity to 18 GW by the end of the decade. This would still

fall 8 GW short of the national wind target, which is expected to be partially covered by around 2 GW of offshore wind, with the first projects anticipated to become operational no earlier than 2028 (Wind Europe, 2024). The corresponding land take associated with this projected development is estimated as follows:

- Ground-mounted PV: 28 GW × 1.9 ha/MW = 63,200 ha (approximately 532 km²)
- Onshore wind: 7 GW × 0.77 ha/MW = 5,390 ha (approximately 54 km²)

These are upper-bound values, likely to be reduced through the expansion of rooftop PV, agrivoltaics, and more efficient site selection. Agrivoltaic systems, in particular, enable dual land use and offer resilience benefits such as reduced evapotranspiration and improved farm yields (MASE, 2022; JRC, 2023).

Lastly, system integration costs, connection infrastructure, dispatch balancing, and large-scale storage, remain crucial for the operational effectiveness of RES growth. Terna's Grid Development Plan (2025–2034) allocates over €23 billion to upgrade transmission capacity, especially across RES-concentrated corridors (Terna, 2025).

Despite the availability of regional targets for cumulative renewable energy capacity by 2030, these targets are not disaggregated by technology or by implementation model. In the absence of detailed regional plans specifying the contribution expected from each renewable source and deployment typology, it is currently not possible to provide a rigorous estimate of the land area that will be required to meet the 2030 targets.

This lack of granularity not only limits the analytical potential of land-use modelling but also reflects a broader governance gap: planning uncertainty hinders the ability of local authorities and stakeholders to assess spatial trade-offs, anticipate infrastructure needs, and mitigate landscape-related conflicts.

Achieving Italy's 2030 RES targets in a territorially balanced and socially accepted manner requires a diversified deployment strategy. Rooftop PV can relieve land pressure in urban areas; agrivoltaics offer synergy with agriculture in rural zones; and offshore wind, if appropriately planned, can provide high-yield generation without direct land consumption. The key challenge lies in aligning this technical portfolio with clear regional plans and governance structures that anticipate spatial trade-offs rather than react to them.

2 Law and Landscape

2.1 Constitutional and European principles

The relationship between landscape protection and the deployment of renewable energy infrastructures in Italy is embedded in a complex legal and constitutional architecture. This section examines the key foundations of this system, starting from the constitutional level and the supranational commitments, notably the European Landscape Convention, before moving into the interpretative developments by the Constitutional Court.

The legal evolution of landscape protection has been shaped by a tension between the need to accelerate the energy transition and the imperative to safeguard the integrity of territorial, cultural, and ecological heritage. The Legislative Decree No. 387/2003, which first promoted renewable energy development in Italy, explicitly subordinated such development to compliance with environmental, landscape, and cultural protection rules. This foundational principle has been consistently reaffirmed by the Constitutional Court, which has clarified that while energy planning may fall within regional competence, overarching interests such as environmental and landscape protection remain under the exclusive legislative competence of the State.

A decisive turning point came with the constitutional reform of February 8, 2022, which amended Articles 9 and 41 of the Italian Constitution. Article 9, traditionally focused on the Republic's duty to safeguard the landscape and historical-artistic heritage, was expanded to include the protection of the environment, biodiversity, and ecosystems**,** also in the interest of future generations. Additionally, a reference to animal welfare was introduced, delegating to the State the responsibility of defining its concrete implementation. These amendments signify the recognition of the environment not as a mere legislative matter but as a core constitutional value and a cornerstone of sustainable development.

In parallel, Article 41 was modified to specify that private economic initiative must not harm health or the environment, thus introducing constitutional boundaries to economic freedom. This norm reinforces the need to balance industrial and infrastructural development with ecological responsibility, particularly relevant in sectors such as renewable energy.

The Constitutional Court has contributed to shaping the legal status of environmental and landscape protection as primary and cross-cutting values. In Decision No. 407/2002, the Court affirmed that environmental protection cannot be confined to a specific legislative matter but represents a transversal

interest justifying uniform protection standards across the national territory. This does not preclude Regions from adopting stricter measures, as confirmed by Decision No. 63/2020, which upheld a regional law deemed more protective than the national minimum standards.

The distinction between "environment", "landscape" and "territory" is essential to understand the layered nature of protection. Territory refers to a physical and administrative space, environment to the set of natural and ecological conditions (air, water, soil, biodiversity), and landscape is a cultural and perceptual construct, shaped by human interaction with nature and imbued with symbolic, historical, and aesthetic values. This distinction has juridical relevance, especially when weighing competing interests in the context of spatial planning and project permitting.[9]

The European Landscape Convention, signed in Florence on October 20, 2000, and ratified by Italy in 2006,[10] marks a paradigm shift. It defines landscape as "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors." The Convention thus recognizes landscape as a universal good, encompassing not only outstanding or protected areas but also every day and degraded ones. It requires States to integrate landscape into environmental, agricultural, social, and spatial policies, and to ensure public participation in related decisions.

This conceptual expansion is mirrored in Article 131 of the Cultural Heritage and Landscape Code,[11] which defines landscape as the "expressive territory of national identity", shaped by natural and human factors and their interrelations. The definition highlights the landscape as a cultural product rather than a purely physical entity, a view echoed by scholars such as Paolo Carpentieri (2021), who frames the landscape as an expression of the human spirit rather than a quantifiable object of scientific observation.[12]

Over the years, the Constitutional Court has interpreted Article 9 in two main directions. One strand, beginning with Decision No. 239/1982, emphasized the distinct constitutional status of landscape protection, distinguishing it from urban planning and environmental regulation. The Court affirmed that landscape is not only a matter of visual beauty but also an expression of cultural identity, requiring coordinated governance across administrative levels.

[9] G. Costa, Strumenti per la tutela del paesaggio: PPR, Beni paesaggistici/identitari. Componenti di paesaggio, autorizzazione paesaggistica.
[10] Law No. 14/2006
[11] Legislative Decree No. 42/2004
[12] P. Carpentieri, Paesaggio, ambiente e transizione ecologica, giustizia insieme.it

A second strand of jurisprudence, developed more recently and not without criticism, tends to subsume landscape within the broader notion of environment, arguing for a unified legal concept that facilitates centralized governance and avoids fragmentation. Notably, Decision No. 367/2007 reiterated that environmental and landscape protection constitute a complex, indivisible good that may prevail over other public interests and limit regional competences. While this integrative vision promotes coherence, critics argue that it risks flattening the specific identity and cultural significance of the landscape, especially when confronted with the techno-rational imperatives of the energy transition.

These tensions are particularly evident in the permitting of renewable energy infrastructures, such as wind farms and large-scale photovoltaic installations. While these projects are essential to decarbonization, they may profoundly alter the landscape, especially in rural or culturally sensitive areas. Their visual and spatial impacts have triggered growing resistance, particularly when they replace agricultural land or compromise scenic and historically valuable settings.

Such dynamics underscore the urgency of adopting an integrated and balanced approach, one that reconciles both the imperatives of the energy transition and the constitutional duty to protect landscape values. Legislative and planning instruments must be refined to allow for a harmonious coexistence between technological progress, environmental sustainability, and the preservation of cultural and identity-related heritage. In this context, institutions play a critical role in promoting a long-term vision that aligns modernization with the respect for historical, aesthetic, and social values embodied in the landscape, making it a key element of national identity and quality of life (Meli, 2021). The Italian constitutional and legal framework thus establishes landscape as a primary, identity-bearing value**,** requiring proportional and reasoned balancing whenever infrastructure development threatens its integrity. The European Landscape Convention and the Constitutional Court's jurisprudence converge in demanding that landscape be integrated into planning and permitting as a strategic dimension, not a residual constraint. The following sections will explore how this legal framework is operationalized through national legislation, regional planning, environmental procedures, and land-use policies, with particular attention to the challenges posed by renewable energy development.

2.2 Landscape Code and Regional planning

The need to rationalize, modernize, and unify the fragmented legislation on cultural heritage and landscape culminated in the adoption of Cultural Heritage and Landscape Code. This comprehensive framework of 184 articles constitutes the central legal instrument for the protection and enhancement of

Italy's cultural and landscape assets, reflecting the constitutional duties enshrined in Articles 9 and 117. It replaces earlier legislation, including Law No. 1089/1939 and Law No. 431/1985 (so-called Galasso Law), with a more coherent and integrated system aimed at safeguarding cultural identity and ensuring sustainable territorial governance.

Part II of the Code is devoted to cultural assets, defined as immovable and movable property that, pursuant to Articles 10 and 11, display artistic, historical, archaeological, anthropological, archival, or bibliographic interest. This definition significantly broadened the earlier notion of heritage by including not only objects of artistic value but also those that serve as testimonies of civilization. The Code thus links protection with both conservation and public enjoyment, establishing detailed rules for declaring cultural interest, imposing protective measures, and regulating management.

Part III of the Code is dedicated to landscape assets. Article 134 defines these as immovable properties and areas that express historical, cultural, natural, morphological, or aesthetic values of the territory. They fall into three categories:

- properties and areas of notable public interest declared under Article 136 (e.g., sites of outstanding natural beauty, geological formations, villas, gardens, panoramic viewpoints);
- areas protected by law under Article 142 (coastal zones within 300 meters of the shoreline, lake shores, riverbanks, mountains above certain altitudes, glaciers, volcanoes, forests, nature reserves, and archaeological zones);
- and areas and properties identified by regional landscape plans under Article 143.

These provisions consolidate a vision of landscape not merely as an aesthetic dimension, but as an identity-bearing element of the nation's cultural and environmental heritage**.** As emphasized by the Constitutional Court,[13] the Galasso Law had already shifted protection from isolated "beauty spots" to systemic categories of territory, a principle that the Code now integrates into a modern planning framework.

The key procedural instrument for ensuring compatibility between development and landscape protection is the landscape authorization**,** regulated by Article 146 of the Code. Any intervention that alters the external appearance of protected assets requires prior authorization, granted by the Region (or delegated

[13] Judgment No. 151/1986

local authority) and subject to the binding opinion of the Ministry of Culture through the competent Soprintendenza**,** the regional cultural and landscape authority. This authorization ensures that projects—ranging from construction works to renewable energy installations—are assessed for their impact on protected landscapes before implementation. The system was further refined by Decree of the President of the Italian Republic No. 31/2017, which introduced a simplified procedure for minor interventions, while maintaining the full procedure for major works such as wind farms and ground-mounted photovoltaic plants. Jurisprudence has repeatedly confirmed that the lack of such authorization renders works unlawful and subject to demolition.[14]

Furthermore, the Code allows Regions to delegate authorization powers to municipalities or other local entities, provided that the Ministry of Culture retains supervisory control through the Soprintendenze. This decentralization aims to streamline administrative procedures, but in practice it has produced uneven enforcement and significant variations in local administrative capacity. The Constitutional Court has clarified that such delegation cannot undermine the unitary framework of protection, since the State remains ultimately responsible for ensuring uniform standards nationwide.[15]

Article 143 of the Code regulates the Regional Landscape Plan (PPR). These plans are prepared through a co-planning procedure between the Region and the Ministry of Culture, ensuring that both levels of government jointly identify and regulate landscape values. The Constitutional Court has confirmed the binding nature of this mechanism, stressing that landscape planning represents a primary interest of the State that cannot be unilaterally disregarded by regional authorities.[16]

The Code prescribes that PPRs must include:

- a survey of the territory's landscape features;
- mapping of assets already declared of public interest;
- identification of areas under legal protection (art. 142);
- an assessment of territorial transformation dynamics and related vulnerabilities;
- zoning of the territory into different landscape areas;
- and measures for recovery, restoration, and enhancement of compromised areas.

[14] Judgment No. 2329/2017
[15] Judgment No. 232/2005
[16] Judgment No. 367/2007

These plans are binding on regional and municipal urban planning, as confirmed by the Constitutional Court and reiterated by the Council of State.[17] In practice, they often prevail over local development ambitions, as evidenced by the case law concerning the Sardinian PPR, which has repeatedly been central in disputes over the siting of wind and photovoltaic plants.

The Code thus embodies a dual logic: case-specific control, exercised through the authorization procedure, and strategic planning, operationalized through PPRs. Together, these instruments ensure that landscape protection is not left to ad hoc assessments but embedded in territorial governance. The challenge lies in reconciling this framework with emerging demands for renewable energy deployment. While subsequent legislation on renewables acceleration areas will be later examined, it is clear that such tools must coexist with, and not override, the binding framework of the Landscape Code. The Constitutional Court has repeatedly held that landscape protection constitutes a primary and absolute value, one that must be balanced proportionately against other public interests, but never disregarded.[18]

2.3 Renewable Energy Directive and permitting reform

The increasing urgency to accelerate renewable energy deployment in line with EU decarbonization goals has led to a progressive transformation of Italy's national permitting framework. Building on the European Renewable Energy Directive, and in continuity with the principles outlined in Legislative Decree No. 199/2021, the Italian legal system has introduced a new set of planning and authorization rules that aim to reconcile energy development with landscape and environmental protection.

The notion of "suitable areas" was introduced under Article 20 of Legislative Decree No. 199/2021. This article defines a two-tiered system: on the one hand, it outlines certain locations that are *ex lege* suitable for renewable energy development, such as disused industrial zones, abandoned quarries, marginal agricultural land, and areas adjacent to existing transport or energy infrastructure; on the other hand, it mandates the adoption of further implementing measures to guide regional planning.

This mandate was initially implemented through the Ministerial Decree of 21 June 2024, which set out common principles and criteria for the regional identification of suitable areas. These included a preference for pre-anthropized land, the exclusion of sites under absolute protection,[19] and the possibility

[17] Judgment No. 3080/2021
[18] Judgments No. 367/2007 and No. 101/2010
[19] pursuant to Articles 10 and 136 of the Cultural Heritage and Landscape Code

for regions to introduce buffer zones of up to 7 km around landscape or cultural assets. Furthermore, the Decree required each Region to adopt a regional act within 180 days, defining the spatial extent and regulatory framework for suitable areas in accordance with Article 20 of Legislative Decree No. 199/2021 and the national PNIEC. However, this approach drew criticism for fostering regulatory fragmentation and legal uncertainty. Under Article 7(2)(c) of the Decree, Regions were initially allowed to declare as non-suitable areas that had already been classified as suitable under national legislation. This provision, along with the buffer zone mechanism, became the subject of judicial review. The Regional Administrative Court of Lazio annulled both Article 7(2) and the 7-kilometre buffer zones, deeming them disproportionate, lacking clear legal basis, and in contrast with the objectives of the national and European renewable energy framework.[20] As a result, Regions may no longer exclude areas recognized as suitable *ex lege*, nor apply generic landscape buffer zones beyond those strictly required by existing national legislation.

In parallel, the State-owned renewable energy support agency, Gestore dei Servizi Energetici (GSE) and the energy system applied research center, Ricerca sul Sistema Energetico (RSE) are mandated to monitor regional implementation and to submit, by 31 July each year, an annual report assessing the progress achieved by the Regions in designating suitable areas. Where delays or inaction are observed, MASE may propose substitute acts to the Presidency of the Council of Ministers to ensure compliance. This governance model underscores the growing importance of coordinated planning, while also exposing the system to political friction and procedural delays.

Legislative Decree No. 190/2024, commonly referred to as the Testo Unico FER, entered into force on 30 December 2024. It constitutes the most comprehensive reform to date of the permitting regime for renewable energy installations. The Decree classifies renewable infrastructure as works of public utility, urgent and unavoidable, thereby reinforcing the constitutional principle of energy transition as a strategic interest.

The Decree introduces a three-tiered authorization system:

[20] Judgment No. 9155/2025

- Free activity for low-impact interventions, such as the installation of photovoltaic systems up to 12 MW on existing rooftops, or agrivoltaic systems up to 5 MW, provided they are not located on protected assets or within restricted areas,
- Simplified Authorisation Procedure (PAS) for medium-complexity projects that do not require urban planning changes;
- Single Authorisation (AU) for all other installations, including new constructions, repowering, and infrastructure upgrades.

Furthermore, the Decree restores greater autonomy to regional authorities by reassigning them responsibility for permitting renewable energy projects with a capacity of up to 300 MW, while projects exceeding this threshold fall under State competence. This redistribution is intended to strengthen the connection between project development and territorial context, allowing authorization procedures to be adapted to local specificities and governance frameworks.

In line with RED III, the same decree sets 21 February 2026 as the deadline for Italian Regions to develop specific planning instruments for the identification of RAAs**,** zones particularly suitable for hosting renewable energy projects without causing significant environmental impacts. This measure aims to accelerate a faster energy transition by removing administrative barriers and streamlining authorization procedures.

2.4 Environmental Assessment tools

The environmental assessment of renewable energy projects in Italy is governed by a dual system of procedures: the Environmental Impact Assessment (EIA) and the Strategic Environmental Assessment (SEA). These instruments, derived from EU law and incorporated into national legislation, serve as crucial regulatory tools to reconcile the urgent need for energy transition with the constitutional imperative to safeguard environmental and landscape values.

2.4.1 Environmental Impact Assessment

The Environmental Impact Assessment is the cornerstone procedure for evaluating the environmental implications of individual projects. Introduced at the EU level by Directive 85/337/EEC,[21] EIA was

[21] subsequently codified in Directive 2011/92/EU and amended by Directive 2014/52/EU

transposed into Italian law through Legislative Decree No. 152/2006. Its main objective is to identify, describe, and assess in advance the significant environmental and health effects of a given project.

The EIA procedure encompasses several core principles:

- Prevention: by anticipating adverse environmental impacts and enabling corrective measures before damage occurs.
- Integration: by considering cumulative and interactive effects across environmental media (air, water, soil, biodiversity, landscape).
- Participation: by ensuring that citizens, civil society groups, and public authorities can submit observations and contribute to the decision-making process.

Environmental impacts are assessed through a central document known as the Environmental Impact Study (SIA), prepared by the developer. This includes a detailed description of the project's potential effects and the proposed mitigation or compensation measures. The authority responsible for evaluating the EIA depends on the size and type of the project. National-level projects fall under the Ministry of the Environment and Energy Security (MASE), while regional authorities assess projects within their jurisdiction. In both cases, the relevant technical bodies support the evaluation.

A particularly important element is the Conference of Services, a coordination forum that brings together all competent authorities to issue a unified decision. In projects subject to EIA, this conference cannot be concluded until the environmental evaluation is complete. A tacit consent mechanism applies when participating authorities fail to provide input within the legal timeframe, provided their silence does not relate to mandatory opinions such as landscape clearance.

Italian jurisprudence has clarified the nature and legal force of the EIA process. The Constitutional Court annulled a regional law that attempted to exempt projects from EIA requirements imposed by national legislation.[22] The ruling reaffirmed that environmental protection falls under the exclusive legislative competence of the State and must comply with EU law. Likewise, administrative courts have established that EIA is not a mere technical verification, but a structured decision-making process aimed at balancing the public interest in development with the constitutional duty to protect the environment.[23]

[22] Judgment No. 93/2013
[23] Judgement No.1100/2019; and No. 3434/2022

The 2024 case of Palmadula Solar offers a concrete illustration of this role. The 360 MW agrivoltaic project, covering over 1,000 hectares in Sardinia, was ultimately rejected by the VIA authority due to its unacceptable impact on landscape and biodiversity. The decision, endorsed by the Region and local stakeholders, highlighted the preventive and participatory function of the EIA process, reaffirming that even climate-compatible infrastructure must respect spatial, ecological, and cultural constraints.[24]

2.4.2 Strategic Environmental Assessment

Whereas EIA assesses the impact of individual projects, Strategic Environmental Assessment applies to plans and programmes that set the framework for future development, including regional energy plans and land-use instruments that influence the siting of renewable energy plants. SEA was introduced by Directive 2001/42/EC, transposed into Italy via Legislative Decree No. 152/2006, as amended by Legislative Decree No. 4/2008.

SEA aims to ensure that environmental considerations are integrated upstream in the decision-making process. It contributes to the selection of development alternatives and promotes a holistic assessment of cumulative effects. The SEA procedure consists of several stages:

- Screening: to determine whether SEA is required;
- Scoping: to define the environmental factors and alternatives to be considered;
- Environmental Report: presenting baseline data, predicted impacts, and mitigation proposals;
- Public consultation: involving stakeholders, institutions, and citizens;
- Decision and justification: of how environmental concerns were integrated;
- Monitoring: to ensure compliance and effectiveness of mitigation.

Competence lies with regional and national authorities depending on the scope of the plan or programme. The Ministry for the Environment and Energy Security remains the authority for national plans, while regional departments are responsible for spatial planning and subnational energy frameworks.

The Italian SEA process is broadly aligned with EU requirements, but certain challenges remain, particularly regarding the quality of environmental reports, stakeholder engagement, and

[24] https://www.regione.sardegna.it/notizie/ambiente-parere-negativo-sul-progetto-palmadula-solar-il-piu-grande-impianto-agrivoltaico-d-italia-decisivo-il-ruolo-della-regione-e-dell-assessorato-dell-ambiente-nella-tutela-della-biodiversita-e-del-territorio

the implementation of monitoring measures, which are often weak or inconsistently applied (European Commission, 2022).

Importantly, SEA complements the planning-driven approach required by RED III, whereby environmental and spatial compatibility must be assessed at the strategic level, particularly for the designation of acceleration areas. Anticipating conflicts through SEA allows Member States to meet permitting deadlines without compromising environmental integrity.

Both EIA and SEA reflect a shift from reactive to preventive environmental governance, where public authorities must weigh infrastructure needs against landscape integrity, ecosystem services, and community values. The requirement for public participation enshrined in both procedures is not a formality, but a guarantee of democratic legitimacy and a safeguard against social and legal contestation. It aligns with Article 6 of the Aarhus Convention and Article 191 TFEU, which establish precaution and prevention as pillars of EU environmental law.

In this light, administrative transparency and early-stage environmental planning emerge as essential tools for implementing renewable energy policies. The legal and institutional architecture must be capable of integrating technical, legal, cultural, and ecological criteria to ensure that decarbonization efforts do not compromise long-term sustainability or public trust.

2.5 Agriculture, solar bans and agrivoltaics

The regulatory framework governing the coexistence of renewable energy and agriculture has become increasingly stringent. Legislative Decree No. 63/2024 establishes a general ban on the installation of ground-mounted photovoltaic systems in areas classified as agricultural by local zoning plans. The rule defines such areas as non-suitable for PV deployment, regardless of ownership or land status, with few exceptions limited to degraded, abandoned, or industrially contaminated zones. The rationale behind this restriction is twofold: first, to preserve the agricultural vocation and food security of fertile soils; and second, to avoid landscape fragmentation and conflicts with cultural and ecological values. However, this blanket restriction has drawn criticism from environmental and agricultural stakeholders, particularly when applied to low-value or marginal land, where renewable energy production could offer significant co-benefits (Legambiente, 2024).

In contrast to conventional PV installations, agrivoltaics is designed to integrate energy generation and agricultural production on the same land. According to the Ministerial Guidelines on Agrivoltaics adopted by the MASE, high-quality agrivoltaics must allow continued farming activities underneath the solar modules through raised structures, row spacing, and technological systems that support cultivation or grazing (MASE, 2022). Advanced configurations include bifacial panels, single-axis trackers, and real-time environmental sensors that adapt to plant needs, mitigate microclimatic stress, and improve land-use efficiency. To qualify for national incentives and PNRR funding, agrivoltaic systems must meet the criteria of "advanced agrivoltaics", including elevated modules, full preservation of agricultural activity, and a comprehensive monitoring system. This includes the verification of agricultural yield, microclimate, soil fertility, and irrigation efficiency throughout the operational phase (Vetro and Brugnoli, 2025).

According to technical standards co-developed by CREA and GSE, eligible systems must ensure continuity of agricultural practices, particularly forage production, viticulture, horticulture, and pasture maintenance, without reducing yields or altering the terrain irreversibly (GSE, 2024). These standards have proven successful in practice. According to the First National Agrivoltaics Forum hosted by Legambiente in April 2024, the Italian Environmental Impact Assessment Commission issued 153 EIA opinions on agrivoltaic projects in 2024, of which 78% were favourable, outperforming other RES technologies (Legambiente, 2024).

Pilot studies from the EU-funded Value4Farm project show that under agrivoltaic installations: lettuce yields rose by +10%; forage crops increased by +40%; grape productivity improved by +15–30%; tomato crops used 65% less water; and overall water use efficiency improved by 15% (Rinnovabili.it, 2025). These outcomes highlight the agronomic potential of PV systems designed around ecological and farming needs, supporting an agroecological transition that aligns with climate adaptation and carbon neutrality.

Agrivoltaics contributes to the multifunctional role of agricultural land, combining food production, energy generation, climate mitigation, and ecosystem protection. Elevated PV structures can shade crops during heatwaves, reduce evapotranspiration, and increase resilience against extreme weather events, thereby preserving topsoil quality and biodiversity (MASE, 2022). This integrated land-use model also supports rural development, creating new income streams for farmers while reducing pressure for land

conversion. It reflects a territorial governance vision in which agriculture, energy, and landscape are seen as complementary rather than conflicting functions (MASE, 2023; GSE, 2024).

Several scholars and practitioners have underlined the need for a coordinated update of national and regional planning instruments, including energy, landscape, environmental, and spatial planning, to ensure a consistent and predictable framework for agrivoltaic siting. Without this integrated approach, conflicting interests are likely to persist in local permitting procedures (Vetro and Brugnoli, 2025).

Another risk is the progressive shift towards energy-focused land management, where agricultural land is primarily exploited for its potential to host PV panels rather than for food production, potentially triggering land speculation and undermining long-term soil health and biodiversity goals (Vetro and Brugnoli, 2025).

Nonetheless, regulatory fragmentation and institutional resistance still constrain the large-scale deployment of agrivoltaics. According to Legambiente (2024), bureaucratic delays, opposition by Soprintendenze, and unclear regional guidelines have slowed down several high-potential projects. As a result, despite strong public investment (over €1.1 billion allocated by the PNRR for agrivoltaic schemes), the actual installed capacity remains below national targets (Legambiente, 2024).

A strategic shift is thus required to remove non-technical barriers, harmonize criteria across regions, and promote agrivoltaics as a pillar of the Green Deal, reconciling energy sovereignty, landscape protection, and food security in a changing climate.

2.6 Landscape as territorial assets

The notion of landscape as a static visual background has increasingly been replaced by a dynamic and multidimensional understanding, grounded in the idea of landscape as a form of "territorial capital." This concept, developed in the territorialist school (Magnaghi, 2000), views landscape not merely as a passive object of protection but as an active, systemic expression of a community’s history, values, ecological structures, and socio-economic potential. Landscape, in this sense, is both a cultural artefact and a living infrastructure that mediates the relationship between human activities and territorial ecosystems.

This conception builds upon the interpretative approach promoted by the European Landscape Convention, which recognizes landscape as a product of the dynamic interaction between natural and human factors, as previously discussed. The Convention and the Italian legal doctrine that has adopted

its principles, emphasizes the need to consider landscape not as a residual constraint, but as a strategic and proactive component of planning and development policies. Italian jurisprudence, particularly through Constitutional Court decisions, has confirmed this interpretation by elevating landscape protection to a transversal and foundational value in the legal system.[25]

The academic debate reinforces this approach. Ferrario (2018) and Castiglioni (2011) frame landscape as a mediating interface between society and territory, a field of negotiation where conflicts over land use, values, and priorities can be addressed in a democratic and participatory manner. This vision entails not only descriptive or aesthetic assessments but also the recognition of landscape as a political and operational device for governance. In this context, landscape becomes a tool to reconcile ecological sustainability, cultural identity, and economic development within shared spatial strategies.

Such an approach implies a shift from sectoral planning to integrated, place-based governance. As SNPA (2023) notes, coherence between energy planning, landscape protection, environmental assessments, and spatial planning instruments is essential to ensure balanced and legitimate decision-making. This is particularly relevant in the context of renewable energy infrastructures, which often generate spatial and perceptual conflicts due to their visibility, land use intensity, and symbolic impact.

Settis (2010) argues that the erosion of landscape integrity is often the result of fragmented governance and short-term economic priorities. To counter this trend, he calls for a constitutional patriotism grounded in the defence of cultural and landscape heritage, conceived as a common good. In parallel, Marchigiani (2021) propose operational criteria for landscape-sensitive development, including the mapping of perceptual values, participatory planning, and inter-scalar coordination.

Moreover, recent planning experiments, such as landscape observatories and participatory mapping practices, highlight the potential of landscape to serve as a diagnostic and anticipatory tool. These practices, inspired by the ELC's emphasis on public participation, enable communities to articulate their visions, conflicts, and aspirations, fostering a shared territorial intelligence.

In sum, integrating landscape as a form of territorial capital into energy and spatial planning requires more than legal safeguards. It demands a cultural and institutional reorientation capable of recognizing

[25] Judgement No. 367/2007 and No. 178/2018

the landscape's multifunctional values and of managing change rather than merely opposing it. This implies using landscape not only to set limits but to guide sustainable transformations, aligning local identities with long-term ecological and social resilience.

3. Barriers and Governance

3.1 Delays and authorizations bottlenecks

The energy transition in Europe, and particularly in Italy, is increasingly hindered not by a lack of targets or ambition, but by the chronic inability to authorize renewable energy projects in a timely, coordinated, and legally secure manner. The failure to streamline permitting procedures, despite clear obligations under European Union directives, has become one of the principal barriers to achieving decarbonization objectives, increasing the costs of electricity, and discouraging investment in clean energy infrastructure.

RED II, followed by RED III introduced binding obligations for Member States to simplify and accelerate authorization procedures. Specifically, Article 16 of RED II mandates that the entire administrative process for the construction and operation of renewable energy plants should not exceed two years and one year for repowering. RED III, in force since November 2023, further reinforces this obligation by introducing the concept of renewables as an overriding public interest, which should limit the scope for discretionary opposition by local authorities or judicial bodies. It also obliges Member States to implement priority areas, equivalent to Italy's suitable areas, where permitting should occur within 12 months. However, as of mid-2025, no EU Member State has fully implemented these provisions, and Italy ranks among the countries with the most significant deviations (Wind Europe, 2024).

According to Solar Power Europe's 2024 report on RED III implementation, the average authorization time for utility-scale solar projects in the EU remains above 3.5 years, with Italy averaging 3.6 years for solar and 4.8 years for onshore wind (Rinnovabili.it, 2025). These figures are echoed by the Staffetta Quotidiana analysis (2022), which examined a dataset of 143 authorization processes for PV projects and 143 for wind powers. Their findings show that:

- Photovoltaic projects take on average 13.1 months to receive all necessary permits, with cases ranging up to 4 years.
- Onshore wind projects require 25 to 34 months on average, often extending beyond 5 years when legal disputes are involved.

This persistent misalignment with EU timelines has measurable consequences. A report by Wind Europe (2024) estimates that over 80 GW of wind projects in the EU are currently stalled due to permitting issues, of which more than 15 GW are in Italy alone. Moreover, IEA's Renewables (2023) flags Italy as

one of the countries with the largest gap between planned and realized renewable capacity, largely attributable to procedural bottlenecks. According to Giles Dickson, CEO of Wind Europe, the main barriers across Europe are "the failure to properly implement the new permitting rules, delays in grid connections, and the slow pace of electrification" (Reuters, 2025).

The Italian permitting framework suffers from a unique combination of institutional fragmentation, procedural redundancy, and legal uncertainty, which together produce one of the slowest authorization systems in the EU. Five main structural issues can be identified:

1. *Fragmented competences and conflicting mandates*

Italy's multilevel governance structure delegates key powers to regional authorities, which are responsible for spatial planning, landscape protection, and the issuance of Environmental Impact Assessments (EIA), while the central government retains strategic oversight. Moreover, the Soprintendenze possess the authority to issue binding landscape compatibility opinions. This fragmented structure, lacking coordination mechanisms, leads to conflicting decisions and significant delays, particularly near Natura 2000 sites or areas with cultural landscape protections (European Commission, 2024; Banet, et al., 2024; Legambiente, 2024)

2. *Absence of a Functioning One-Stop Shop*

Despite EU requirements under RED II and RED III to establish a single permitting interface, Italy has yet to operationalize a harmonized one-stop-shop system. As a result, project developers are still required to submit parallel applications to multiple authorities, including regional environmental protection agencies (ARPA), municipal planning offices, regional departments, and grid operators. This fragmented and decentralized structure, coupled with limited digitalization, significantly delays the authorization process and undermines procedural transparency (European Commission, 2024)

3. *Redundant and Multi-Level Environmental Assessments*

Italy's environmental permitting system involves three potential levels of assessment: national, regional, and local. For medium-to-large projects, this typically includes:

- Screening by ARPA
- Full Environmental Impact Assessment by the Region

- Landscape impact assessment validated by the Soprintendenza
- Screening under the EU Habitats Directive for Natura 2000 compatibility

These assessments are sequential rather than parallel, creating a chain of procedural dependencies. In many cases, even a favourable EIA may be overturned by a negative landscape opinion. According to the IEA (2023), Italy continues to experience major permitting delays due to overlapping responsibilities and administrative burdens, including environmental assessments. By contrast, countries such as Denmark and the Netherlands have introduced more streamlined procedures and digital tools, which the IEA highlights as examples of faster deployment frameworks.

4. Limited Administrative Capacity and Understaffing

A systemic but often under-discussed factor contributing to authorization delays in Italy is the insufficient administrative capacity of permitting bodies. According to the European Commission's document "Guidance to Member States on good practices to speed up permit-granting procedures for renewable energy and related infrastructure projects" (2024) several Member States, Italy among them, have officially recognized a shortage of adequately trained and available personnel in national, regional, and local permitting authorities. This lack of human capital leads to delays in environmental assessments, difficulties in managing concurrent applications, and reduced institutional responsiveness. As the report notes, "the problem is most acute in countries where procedures remain fragmented across multiple agencies and governance levels," a description that accurately reflects the Italian context (European Commission, 2024).

5. Legal Uncertainty and Risk Aversion

Although administrative litigation remains a common feature of the Italian permitting landscape, recent studies have highlighted that the root cause of delays is not the frequency of legal disputes per se, but rather the lack of clarity, harmonization, and coordination within the regulatory framework. According to CERRE, the Centre on Regulation in Europe, the fragmentation of competences and the absence of streamlined rules lead many public authorities to adopt a risk-averse stance, often blocking projects at an early stage to pre-empt potential legal challenges. This results in what the report defines as a "culture of excessive prudence," which, in turn, exacerbates decision paralysis and undermines deployment targets (Banet,et al. 2024). Furthermore, inconsistencies in permitting procedures across regions contribute to a

climate of legal uncertainty that discourages both public officials and private developers from engaging proactively in the renewable energy transition.

3.2 Regional conflicts and blockages

Italy's multilevel energy governance reveals significant fractures when examining how regional authorities have responded to national and EU mandates for accelerating renewable energy deployment. The Legislative Decree No. 199/2021, further operationalized by the June 2024 decree on "suitable areas," aimed to create a coordinated permitting ecosystem across national and subnational levels. However, the evidence points to an escalating number of regional initiatives that, rather than facilitating, have obstructed renewable energy development.

A paradigmatic case is Sardinia, where public concern over speculative energy development and the perceived lack of local control culminated in the enactment of Regional Law No. 5/2024. This law introduced an 18-month moratorium on the approval of new renewable energy installations across much of the region. The stated rationale was to protect "areas of particular landscape and environmental value" while the region finalized its energy strategy, landscape plan, and sustainable development framework. However, the Italian Council of Ministers challenged the law before the Constitutional Court,[26] arguing that it violates Articles 117 and 41 of the Constitution as well as EU obligations under the Green Deal and Renewable Energy Directive III. The national government particularly objected to the law's retroactive effect, which suspended even those projects whose authorization procedures were already underway, raising issues of legitimate expectation and legal certainty for investors and project developers.

Importantly, Sardinia is not an isolated case. The 2025 report by Legambiente systematically maps the proliferation of legal, procedural, and social obstacles to the deployment of renewable energy across Italy, identifying over 500 blocked or delayed projects. The report attributes the blockages to the following primary causes:

- 52% due to environmental or landscape constraints, such as adverse EIA rulings or opposition from Soprintendenze;
- 22% due to bureaucratic inefficiencies, including coordination failures and procedural delays;

[26] Appeal No. 33/2024 before the Constitutional Court

- 18% due to local social or political opposition, often led by organized committees or sectoral actors;
- 8% due to grid connection issues or market barriers.

The regional distribution of these cases further illustrates the extent of the crisis:

- Sicily accounts for 78 blocked projects, many halted by restrictions embedded in the regional landscape plan;
- Apulia reports 64 cases, often due to landscape constraints and judicial annulments of regional planning norms;
- Sardinia lists 59 blocked cases, reflecting both legislative action and institutional inertia;
- Lazio (45 cases) and Basilicata (41 cases) also emerge as regions with high incidence of procedural or social resistance.

These cases underscore a pattern of institutional and regulatory misalignment. In Apulia, for example, the Regional Territorial Landscape Plan has imposed environmental and visual constraints that effectively bar wind and PV development in vast rural areas. These constraints have been the subject of several constitutional disputes, including Italian Constitutional Court decision No. 69/2018, which struck down abstract regional bans that undermined national energy goals.

In Basilicata, the update to the regional energy plan introduced strict zoning criteria for onshore wind that led to widespread procedural standstills. The GSE and ARERA have criticized the region for failing to meet national planning obligations and contributing to grid imbalances due to project delays.

Campania presents a further layer of complexity: despite the existence of areas formally designated as "suitable" under national criteria, dozens of renewable projects have been blocked due to local-level opposition invoking archaeological and agricultural protections. This has effectively nullified the benefits of the national zoning framework and created a regulatory paradox where "suitability" does not translate into actual feasibility.

The situation is further exacerbated by the chronic delay in regional identification of suitable areas. Despite national deadlines and legal obligations, as of mid-2025, only a handful of regions had finalized their mapping processes. This delay perpetuates a climate of legal uncertainty, which in turn feeds administrative caution and discourages private investment. In its 2025 report, Legambiente underlines

that “Italy is trapped in a permitting limbo, where suitable areas exist only on paper, while projects are blocked by outdated plans and incoherent local decisions”.

What emerges from this panorama is not a problem of isolated inefficiencies, but a systemic governance failure. The absence of a robust coordination mechanism between State, Regions, Superintendencies, and local municipalities has created a fragmented and contradictory policy environment. As the International Energy Agency warned in its 2023 Country Review for Italy, “inter-institutional overlap and regulatory delays are among the most significant barriers to the energy transition in Italy” (IEA, 2023).

3.3 Social resistance and local actors

3.3.1 Coldiretti and agricultural opposition

Among the actors that have most actively shaped the political discourse and territorial resistance to renewable energy in Italy is Coldiretti, the country’s largest agricultural union. While claiming to defend food sovereignty and landscape heritage, Coldiretti has consistently mobilized against large-scale photovoltaic and wind projects, particularly those located on agricultural land. These campaigns frequently frame the issue as a binary conflict agriculture versus energy, a narrative that has been criticized for oversimplifying land-use dynamics.

In a press release dated 22 April 2023, Coldiretti warned of “a new speculative assault, risking to cover fertile lands with photovoltaic panels, driven by foreign capital and real estate funds that endanger our food independence” (Coldiretti, 2023). More recently, on 5 July 2024, the union denounced the national regulation on suitable areas as “a Trojan horse for a photovoltaic invasion of our countryside”, calling for “a halt to the conversion of agricultural fields into electricity deserts” (Coldiretti, 2024).

This narrative has been actively echoed by regional branches, most notably in Sardinia, Veneto, and Lazio, and has influenced both public opinion and regional legislative initiatives. In Sardinia, Coldiretti emerged as a leading advocate of Regional Law No. 5/2024, which introduced a temporary moratorium on new renewable energy projects. At the national level, the union has also played a prominent role in shaping parliamentary debates on restrictions to ground-mounted PV on agricultural land (Legambiente, 2025).

However, as reported by Alterini (2024), data from GSE shows that only 0.13% of Italy’s 12.8 million hectares of agricultural land currently hosts photovoltaic systems, approximately 16,000 hectares in

total. Regional variations range from 0.1% to 0.2%, confirming the minimal spatial footprint of utility-scale solar energy.

Furthermore, a study by the Joint Research Centre (JRC) of the European Commission confirms that agrivoltaics alone could meet Italy's 2030 solar deployment targets. According to Elettricità Futura, achieving the 84 GW goal set under REPowerEU would require just 0.5% of agricultural land, while tripling national renewable capacity to 140 GW, as pledged at the G7, would require less than 1%, explicitly excluding high-value agricultural soils (Alterini, 2024).

Despite such evidence, Coldiretti's lobbying has contributed to restrictive legislation, culminating in the Legislative Decree No. 63/2024, which introduced a general ban on ground-mounted PV systems in agricultural areas, with the sole exception of certified agrivoltaic installations.

This outcome was hailed by Coldiretti as the fruit of its mobilization. In a statement, the union declared: "Stopping a dangerous speculation was a crucial goal and it has been achieved" (Coldiretti Toscana, 2024). However, the decree has since drawn sharp criticism from industry associations, environmental NGOs, and scientific institutions, which have condemned it as a regressive policy that undermines Italy's decarbonization commitments.

In this light, Coldiretti's position appears increasingly political, aiming to assert ideological and electoral control over land-use narratives. As Legambiente notes, "the instrumentalisation of agriculture against renewables fosters misinformation, delays the ecological transition, and undermines multifunctional land-use models" (Legambiente, 2025).

3.3.2 Citizens' committee and participation

Local opposition to renewable energy infrastructures in Italy has become a widespread phenomenon, encompassing a diversity of actors, concerns, and discourses. While the NIMBY ("Not In My Back Yard") dynamic is present, the phenomenon cannot be simplistically dismissed as selfish or reactionary. In many territories, opposition movements express legitimate concerns about landscape degradation, territorial exclusion, biodiversity loss, and inequitable distribution of benefits and costs (Farris, 2021).

According to Legambiente's 2025 report, there are at least 38 active citizen committees in Sardinia alone, and dozens more across regions such as Lazio, Campania, Calabria, Apulia, and Veneto. These groups

contest both specific projects and the broader governance framework, often accusing public authorities of acting in concert with multinational developers and marginalising local voices (Legambiente, 2025).

Examples include the "Comitato Civico di Irpinia Sud", which mobilized against a wind cluster near historical villages in Campania; the **"**Coordinamento Stop Pale Eoliche Selvagge in Calabria", which contested projects near protected Natura 2000 areas; and the "Comitato Fermare il Fotovoltaico a Terra nel Viterbese", active against several large-scale solar parks on fertile land (Legambiente, 2025).

As highlighted by Farris (2021), many of these movements can be interpreted through the lens of "territorial environmental citizenship": a form of collective action that demands not only protection from harm, but also democratic participation in energy governance. The focus is not solely on stopping projects, but on reclaiming control over local development trajectories.

Sociological literature typically distinguishes between reactive opposition, based on perceived aesthetic or symbolic degradation (commonly associated with "NIMBY" dynamics) and claim-based opposition, characterized by concerns over procedural justice, territorial equity, and transparency in governance (Segreto et al., 2020)

One of the most emblematic recent cases is the **"**Non Bruciamoci il Futuro" coordination in Sardinia, which unites dozens of local committees. Their demands include local prioritization of energy uses, mandatory benefit-sharing mechanisms, respect for cultural and landscape identity, and community co-ownership of energy assets (Legambiente, 2025).

These positions culminated in the citizen legislative initiative "Pratobello 2024", which collected over 210,000 signatures. The proposal seeks stronger guarantees for territorial governance, public consent, and anti-speculative safeguards, drawing symbolic continuity from Sardinia's anti-military mobilizations in the 1970s.

3.4 High electricity prices and RES delays

Italy's persistent delays in deploying renewable energy sources have had profound consequences not only for climate objectives but also for electricity prices. As detailed in the previous sections, permitting bottlenecks, regulatory uncertainty, and grid saturation have significantly slowed RES deployment, preventing the country from fully leveraging its high solar and wind potential. One of the direct macroeconomic consequences of this lag is Italy's continued reliance on fossil fuels within its energy

mix, which structurally increases the national electricity price under the current EU marginal pricing system.

The marginal pricing system is used across the European Union. Under this system, all electricity is sold at the price of the most expensive marginal unit needed to meet demand during a given trading interval. In practice, this means that even if most electricity is generated from cheaper sources such as solar or wind, the market price is often set by gas-fired power plants, especially during peak hours (ACER, 2022). Therefore, countries like Italy, where gas plays a dominant role in power generation, are particularly exposed to price volatility and fossil fuel cost spikes.

Recent data (Low Carbon Power, 2025) clearly illustrate the structural divergence in energy mixes between Italy and its major European peers:

- Italy: Gas accounts for 41.7% of electricity generation, followed by hydro (16.7%), solar (12.2%), wind (8.4%), and coal (3%). Only 42% of Italy's electricity comes from low-carbon sources.
- France: 97% low-carbon share, dominated by nuclear (68.6%) and hydro (13%), with gas representing only 3.2%.
- Germany: 61% low-carbon, with strong contributions from wind (27.6%), solar (15.7%), hydro (8.6%), and biofuels (9.2%), and gas limited to 12.and coal (23.6%).
- Spain: 80% low-carbon, primarily wind (21.2.6%), solar (18.8%), hydro (18.3%), and gas (%) as the main fossil source.

This data highlights how Italy's electricity mix is disproportionately reliant on natural gas compared to France, Germany, and Spain. Consequently, when gas prices rise due to geopolitical shocks, as happened during the war in Ukraine, Italy experiences steeper electricity price surges.

According to recent data published by SkyTG24 (2025) based on Statista – Ember statistics in April 2025 the wholesale prices for electricity among the 4 biggest countries in Europe was as following:

- 121€/Mwh in Italy
- 78 €/Mwh in Germany
- 43 €/Mwh in France
- 35€/Mwh in Spain

These differences are not marginal. Italy consistently records some of the highest retail electricity prices in Europe, a structural disadvantage for consumers and industrial competitiveness. While taxes and levies partially explain the gap, a core driver remains the composition of the energy mix and Italy's systemic exposure to gas-fired marginal pricing.

Italy's slower RES deployment has not only environmental but also economic costs. The delay in reducing fossil dependency has made Italy more vulnerable to marginal pricing distortions. In contrast, France's heavy reliance on nuclear and Spain's and Germany's aggressive RES growth have shielded their markets from extreme gas-driven price spikes. As noted by Eurelectric (2024), accelerating RES deployment and grid integration is not merely a climate imperative but a strategic economic policy.

Without urgent reforms to streamline permitting, accelerate grid expansion, and increase RES integration, Italy will continue to suffer from the marginal pricing trap. The country’s pathway to energy sovereignty and affordable electricity necessarily passes through a faster, coordinated, and more ambitious rollout of renewable energy infrastructure.

4. Case studies

4.1 Case study selection

The comparative analysis conducted in this chapter builds upon a clear methodological framework designed to ensure that the selected case studies are not only relevant but also analytically comparable. The choice of Sardinia (Italy), the Canary Islands (Spain), and the Alentejo (Portugal) was guided by a set of structured criteria, grounded in both theoretical considerations and pragmatic concerns related to data availability, governance complexity, and the interplay between renewable energy deployment and territorial protection.

These three territories were selected because they share structural similarities that make them particularly suitable for comparative analysis. In particular, they are characterized by:

- Geographic and socio-economic comparability: Sardinia and the Canary Islands are both large islands with high levels of energy dependency and structural isolation from continental energy grids, while Alentejo, though a continental region, presents similar features of low population density, vast rural areas, and strong exposure to land-use conflicts around energy infrastructures.
- Dual challenges: all three territories face the task of exploiting high renewable energy potential (solar irradiation and wind resources) while safeguarding valuable landscapes, biodiversity, and cultural heritage.
- Governance diversity: each case represents a testing ground for the implementation of EU renewable energy directives, while at the same time exemplifying different governance architectures.

Another key factor was the existence of official documentation and reliable datasets, complemented by multi-lingual sources and a rich body of scientific literature, which ensures that the comparative analysis rests on solid empirical ground.

To ensure comparability and analytical clarity, the three case studies are examined through a common five-lens framework:

1. Geographic and socio-economic context;
2. Renewable energy development: targets vs reality;
3. Planning and permitting framework;

4. Governance dynamics and conflicts;
5. Landscape protection and participatory tools.

The ultimate goal of this selection is not merely descriptive but explanatory and prescriptive. By comparing Sardinia with two external cases, one insular (Canary Islands) and one continental but rural (Alentejo), the analysis identifies key enabling factors, common barriers, and transferable good practices. This comparative framework ensures that the findings go beyond descriptive regional narratives, providing policy-relevant lessons for Italy, and for Sardinia in particular, where renewable energy governance has been marked by uncertainty and conflict.

4.2 Sardinia

4.2.1 Geographic and socio-economic context

Sardinia is the second-largest island in the Mediterranean and the third-largest Italian region by surface area, with over 24,000 km² of territory, equal to the 8% of the Italian territory. It is characterized by a predominantly mountainous and hilly morphology, extensive rural areas, low population density, with approximately 66 inhabitants per km², and a strong presence archeological heritage and natural parks and protected landscapes, accounting for the 19,9% of the territory (Sardegna 2030, 2022). Despite its abundant solar and wind resources, among the highest in Europe per km², its potential is highly unexpressed, both in terms of energy infrastructure and socio-economic development.

The island faces demographic decline, population ageing, and significant internal migration, especially among younger generations. Economically, its GDP per capita remains below the national average (USD 29.504, vs USD 40.898) and its economy relies heavily on tourism, agriculture, public administration,

and small-scale industrial production (OECD, 2025). The combination of natural richness and socio-economic fragility makes Sardinia a paradigmatic example of the tensions between energy transition imperatives and the need to preserve identity, ecosystems, and landscape value.

As an island with no interconnections to the continental grid, Sardinia depends on localized electricity generation and has historically relied on fossil fuels, notably coal and diesel. The decommissioning of coal plants by 2025, enforced by Italy's decarbonization strategy, requires the rapid deployment of large-scale renewables and grid flexibility solutions. However, the island's physical insularity is compounded by a governance insularity, marked by fragmented planning, institutional disputes, and a protectionist approach to land use and landscape management.

4.2.2 Renewable energy development: Targets vs Reality

According to the Ministerial Decree 21 July 2024, Sardinia is required to install an additional 6.264 MW of renewable capacity between 2021 and 2030. This represents one of the most ambitious targets in absolute terms, justified by the island's decarbonization urgency and high resource availability.

As of October 2024, Sardinia had a total installed power capacity of approximately 8200 MW, of which 3,509 MW came from renewable sources (Terna, 2024). However, only 857 MW were added since 2021, representing just 13.7% of the 2030 target (Legambiente, 2024). Within this, solar photovoltaic accounted for 1,978 MW (24.1% of the total mix), and wind power for 1,531 MW (18.7%), while thermal plants, mostly fossil-based—still exceeded 57% of the region's installed capacity.

Growth since 2020 has primarily come from rooftop photovoltaic and small-scale self-consumption projects, with no significant utility-scale developments (Legambiente, 2024). This severely hampers progress towards national and European climate goals. Moreover, the regulatory uncertainty, first with the 2023 regional moratorium, and now with the highly restrictive Regional Law No. 20/2024, has created a chilling effect on new project pipelines.

According to Legambiente (2024), the regional strategy outlined in Regional Law 20/2024 estimates only 4.917 MW of new renewable capacity by 2030, well below the 6.264 GW assigned by MASE. This mismatch reflects inflated baselines and overreliance on micro-generation, putting compliance at risk. Of the planned additions, 4,789 MW (54%) should come from solar PV and 4,116 MW (46%) from wind, implying a need to install 5,396 MW in just six years.

In terms of actual energy generation, renewables covered only 29.4% of Sardinia's electricity demand in 2023, significantly below the national average (36%) Official planning documents expect Sardinia expected to reach at least 65–70% renewable electricity coverage by 2030 (PNIEC, 2023; Decreto Aree Idonee, 2024). This implies not only a dramatic scale-up in capacity, but also a transition toward large-scale, grid-integrated renewable systems.

Compounding the issue is the lack of grid readiness, especially in rural inland areas where transmission infrastructure is week or nonexistent. Grid access remains a persistent bottleneck, resulting in lengthy delays and fostering speculative congestion around the few remaining "open" zones (Legambiente 2024, Decreto Aree Idonee, 2024).

4.2.3 Planning and permitting framework

The permitting and spatial planning framework for renewable energy deployment in Sardinia has undergone a complex and controversial evolution, marked by delays, legislative discontinuities, and a fundamental tension between environmental protection and energy transition goals. While the island was the first Italian region to formally adopt a regional law implementing the national Legislative Decree No. 199/2021 on suitable areas, the content and structure of this Regional Law No. 5/2024 have raised serious concerns among stakeholders, national regulators, and observers alike. The law, while nominally aimed at harmonizing renewable energy development with landscape and territorial protection, is in practice perceived as a new barrier to utility-scale projects, undermining the very purpose of the European and national legal framework.

The Ministerial Decree 21 July 2024 defines the legal and technical criteria for the identification of suitable and unsuitable areas for renewable energy development, in implementation of Article 20 of Legislative Decree No. 199/2021. This Decree, long delayed and awaited by the sector, formalizes a twofold obligation: to map areas where renewable plants are to be incentivized and fast-tracked, and to clearly delimit areas that are subject to exclusion or restriction. Crucially, the decree reaffirms that regional planning must follow objective, proportionate, and transparent criteria, in line with EU law, and cannot be used arbitrarily to block projects based on generic aesthetic or cultural objections.

Despite this, Sardinia's transposition of the decree into regional law has taken a markedly restrictive turn. With Regional Law No. 20/2024, the Sardinian Regional Council abrogated the previous 18-month

moratorium law which had been challenged by the national government, but introduced a framework that is in many ways even more problematic.

Regional Law No. 20/2024 introduces a complex system of classifications, thresholds, and spatial exclusions that, in practice, render the 99% of the Sardinian territory unsuitable for renewable energy development (Il Sole24Ore, 2024).

According to Regional Law No. 5/2024, the identification of suitable areas (Annex F and G) is limited to:

- disused industrial zones (excluded large-scale wind power plants),
- inactive quarries and landfills, for small and medium PV and wind power plants (only in the external service areas and provided that safety requirements are met),
- marginal infrastructure spaces (railways, ports, airports, subject to national and regional plans).
- Rooftop PV, subject to the urban, environmental and landscape law.

The law distinguishes between small, medium, and large-scale installations for different technologies, based on capacity for photovoltaic systems, height for wind power plants and other technical parameters for additional technologies.

Small-scale renewable energy plants, with a capacity of up to 1 MW, are typically deployed in local contexts and for small-scale purposes, such as self-consumption or limited distribution networks. Medium-scale plants, ranging from 1 MW to 10 MW, are generally implemented in intermediate projects, often aimed at meeting the energy needs of communities or industrial districts. Large-scale plants, exceeding 10 MW, are conceived to provide a substantial contribution to the national electricity grid.

For wind power plants, small-scale plants do not exceed 20 meters, medium-scale plants have a height between 20 and 100 meters, while large-scale plants exceed 100 meters.

The law also defines gross surface area metrics, accounting for not only panels or turbines but also ancillary infrastructure like service roads, fencing, and substations. While such technical definitions could in theory facilitate transparency and standardization, their application within the law is restrictive rather than enabling.

A controversial aspect of the law is its retroactive application**.** In fact, the law introduces the notion of irreversible modification of the site*,* which is considered to occur once specific objective thresholds have been reached. This means that projects which have already met such thresholds cannot be subjected to the retroactive application of the new restrictions.

Specifically:

- Economic progress of works: if at least 20% of the project's total economic value has been completed, the site is deemed irreversibly modified.
- Surface infrastructuring: if at least 30% of the total project area has been infrastructured, the transformation is considered irreversible.
- Additional criterion for wind power: in addition to the 30% infrastructuring threshold, at least 30% of the wind turbines foreseen in the project must have been installed for irreversibility to be recognized.

All projects that do not meet these conditions are subject to the new classification of areas as unsuitable, which may result in the invalidation of previously granted permits or the obligation to restart the permitting process under stricter rules. This undermines legal certainty and has already led to administrative appeals and investor withdrawals.

Moreover, the revamping and repowering of existing wind farms is prohibited if it entails any increase in turbine height, even if minor and justified by updated technology. This effectively blocks the modernization of outdated facilities, contradicting EU best practices.

4.2.4 Governance dynamics and conflicts

The dysfunctions in Sardinia's renewable energy governance are not merely technical or legal in nature, they are deeply rooted in institutional fragmentation, political ambivalence, and territorial conflict. The interaction between the regional administration, national ministries, local municipalities, cultural heritage offices, and environmental authorities is often marked by unclear mandates, contradictory interpretations of planning norms, and overlapping competences.

The adoption of Regional Law No. 5/2024, which effectively froze all new renewable energy authorizations, was a clear manifestation of institutional resistance to large-scale energy development. Although the law was later repealed and replaced by Regional Law No. 20/2024, the underlying political

message and restrictive approach to land use planning remain. The new law identifies suitable and unsuitable areas for renewable energy deployment but does so through extremely exclusionary criteria, often detached from technical feasibility or national decarbonization goals. As such, most operators and observers view it as a disguised continuation of the moratorium.

This position was strongly challenged by the Italian Constitutional Court in its ruling No. 28/2025, which declared the original moratorium unconstitutional. The Court found that the Sardinian Region had violated several provisions of national and EU law by:

- Imposing a generalized moratorium, in violation of Article 20(6) of Legislative Decree No. 199/2021, which explicitly prohibits suspensions of permitting procedures while suitable areas are being designated.
- Undermining national and EU decarbonization targets, by halting authorizations and thereby jeopardizing the regional contribution to the 2030 renewable energy capacity assigned under the PNIEC and the Suitable Areas Decree.
- Violating the principle of legal certainty and the freedom to conduct business, by applying retroactive restrictions to ongoing procedures and eroding investor confidence.
- Exceeding the 180-day deadline set by national law for the approval of regional laws on suitable areas, thus delaying compliance with the national planning timeline (Colicchia and Berra, 2025).

In light of this ruling, attention has now shifted to Regional Law No. 20/2024, which is the subject of a pending constitutional challenge by the national government. The core claims include that the law:

- Restricts suitable areas too drastically, rendering a large majority of the regional territory effectively unavailable for utility-scale renewable energy deployment.
- Applies retroactive rules to already authorized or pending projects, violating legitimate expectations and legal certainty.
- Imposes categorical bans without case-by-case assessments or balancing of public interests, thus breaching consolidated constitutional jurisprudence.
- Interferes with national competence in energy matters, exceeding the limits of the Region's legislative powers under the Statute of Autonomy (Colicchia and Berra, 2025).

The matter will now pass to the Constitutional Court, which will be called upon to assess the draft law put forward by the region.

These disputes reveal a deeper problem of misalignment between regional planning instruments and national energy policy. The regional energy and environmental plan, last updated in 2016, is no longer aligned with current national or EU frameworks. A new version is under development but has not yet been approved. As of July 2025, the preliminary strategic environmental assessment process was only just initiated. In the meantime, the absence of an up-to-date regional energy plan has further weakened the Region's capacity to coordinate with national priorities and has increased the legal vulnerability of its regulatory interventions.

Furthermore, local opposition movements have capitalized on these institutional ambiguities to demand stricter land use control. This contributes to a highly polarized landscape, where energy development is framed as an external imposition, and where no shared territorial vision has been constructed.

All of this takes place within an institutional framework that, as analyzed in the previous chapters, already suffers from structural weaknesses, including significant delays and overlapping competences.

4.2.5 Landscape protection and participatory tools

Sardinia's landscape is one of its most valuable and contested assets. With over 1,200 km of coastline, vast protected areas, and thousands of archaeological and rural heritage sites, the island holds a unique position in Italy's cultural and environmental identity. However, this richness has become a double-edged sword in the energy transition.

Under Regional Law No. 20/2024, landscape protection is operationalized primarily through exclusion zones and buffer areas, rather than proactive or adaptive planning. Notably, of the law's approximately 50 pages, about 45 are devoted to defining unsuitable areas, while only around 5 address the designation of suitable ones.

Key features established by Regional Law No. 20/2024 (Annex A, B and C) are:

- 7-kilometer buffer around UNESCO sites under nomination, pending the definition of official protection zones.
- 3-kilometer exclusion zone from monumental trees, old-growth forests, archaeological areas, and cultural or historical assets.
- 2-kilometer buffer from caves and caverns, applied in a straight line from the protected perimeter.

- 150-meter setback from rivers, streams, and watercourses, measured from each riverbank.
- 1,000-meter distance from the urban perimeter of towns and villages, which can only be reduced to 500 meters through specific municipal planning.
- Exclusion of areas used for certified agricultural production, including DOP, IGP, and organic farming zones.
- Prohibition in rural heritage landscapes, as well as in land managed by irrigation consortia or designated for agricultural reclamation.
- Ban in areas affected by wildfires within the past 15 years, regardless of actual environmental recovery.
- Restrictions on terrains located above 1,200 meters above sea level, especially in mountainous and high-altitude zones.
- Limitations on project size, with many exclusion zones allowing only small-scale installations or excluding even those, especially for agrivoltaics.
- Prohibition of the construction of all renewable energy plants in the 20 municipalities that encompass areas of interest for the Einstein Telescope, in contradiction with the ongoing feasibility study, which instead considers the development of renewable energy installations as a means to ensure the climate neutrality of the infrastructure, an important strength for the candidacy of the Sardinian site.

Due to the cumulative and overlapping nature of the exclusion criteria, multiple constraints often apply simultaneously to the same area. For instance, a single agricultural plot may fall within 1 km of a town, lie 150 m from a riverbank, be subject to irrigation consortia regulations, fall within a designated rural heritage landscape, and be located at an elevation above a given threshold. In such cases, the combined application of multiple restrictions significantly reduces the availability of land suitable for renewable energy development.

Coherently with the provisions of Regional Law No. 20/2024, the Regional Government adopted Resolution No. 45/1 on 28 August 2025, initiating the proposal of a regional plan for the identification of RAAs for the deployment of renewable energy production and storage systems. The proposed zoning focuses exclusively on ground-mounted photovoltaic installations and related storage systems.

In accordance with national legislation, the plan is subject to strategic environmental assessment, which requires an extensive public consultation process. This includes the submission of formal observations

by citizens and relevant stakeholders, public hearings, and roundtable discussions aimed at ensuring broad-based participation by affected communities. The process concludes with the publication of a summary report detailing how public input has been incorporated.

The draft regional plan identifies the following categories as suitable acceleration zones:

- Existing industrial areas (mandatory minimum requirement under Ministerial Decree 21 Giugno 2024);
- Artificial and built-up surfaces;
- Parking lots;
- Locally zoned industrial areas.

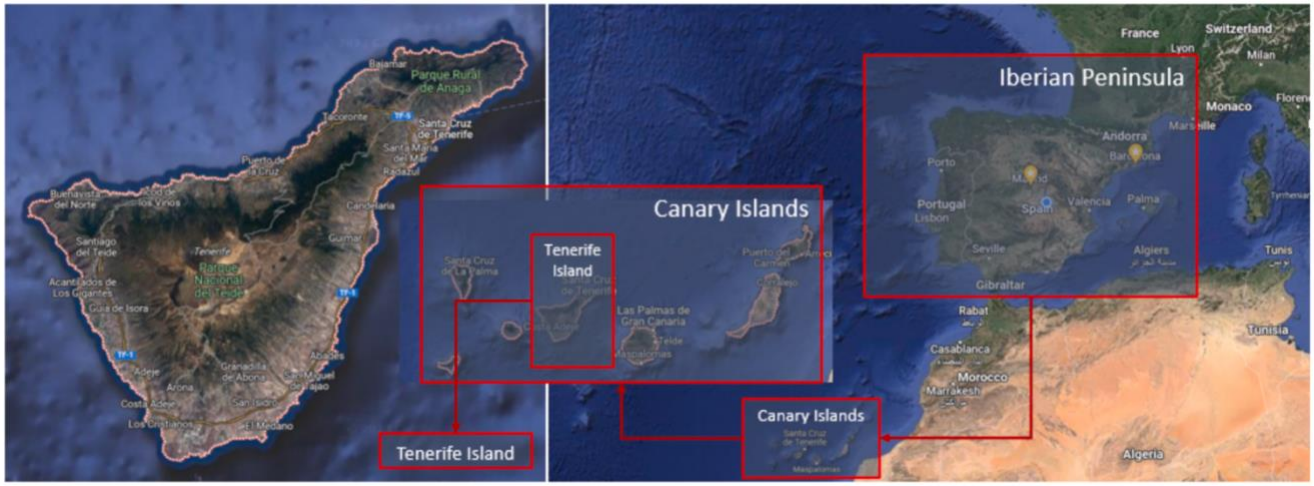
Under national regulation, the deadline for the plan's final approval is February 2026. However, as of September 2025, no official GIS-based mapping of the proposed suitable and unsuitable areas has been made publicly available. The annexes to the regional law remain descriptive in nature and lack cartographic representation, further limiting transparency and stakeholder engagement.

As noted by Giacchetti (2024), "blocking almost all solar and wind energy projects does not protect the territory, it rather undermines sustainable development and compromises the path towards energy independence. Sardinia's decision sets a dangerous precedent, showing how far local resistance can go."

In this context, local communities have not been engaged as active partners in the transition process, with the aim of ensuring transparency and building trust through accessible, high-quality information. Instead, participatory tools appear to have been instrumentalized to justify restrictive policies, often shaped by pressure from local opposition committees.

The governance approach adopted by the Sardinian Region does not appear to be oriented towards enabling the energy transition, but rather towards shielding the territory from any form of transformation. Landscape protection is framed not as a shared**,** co-constructed value, but as a negative filter, a logic of "zero impact" that freezes the landscape, delegitimizes innovation, and overlooks the potential of viewing the landscape as a living infrastructure. This regulatory stance results in a form of territorial paralysis, where planning instruments function less as enablers of balanced development and more as tools for institutional disengagement.

4.3 Canary Islands



4.3.1 Geographic and socio-economic context

The Canary Islands constitute one of the outermost regions of the European Union and the only Spanish region not connected to the continental electricity grid (PTECan 2030). Located between 100 and 300 km off the Moroccan coast and approximately 1,500 km from mainland Europe, the archipelago is composed of eight main islands, with a total surface area of approximately 7,500 km² and a population exceeding 2.2 million inhabitants. The majority of the population is concentrated in the two largest islands, Tenerife and Gran Canaria, which together account for nearly 90% of the total (Gobierno de Canarias, 2022).

With a population density of 298 inhabitants/km², well above the Spanish average of 93 inhabitants/km², the islands face significant pressures on land use and infrastructure. These challenges are further intensified by the massive presence of tourism: over 13 million visitors per year, who on average consume 2 to 3 times more water and energy than residents (Universidad de Verano de Maspalomas 2021). This influx increases the demand for public services and places additional strain on the territory's energy and water systems.

Economically, the Canary Islands rely heavily on the tourism sector, which accounts for over 30% of regional GDP, followed by services and a smaller but growing agri-food sector. Despite their economic vitality, the islands remain severely dependent on imported fossil fuels. In 2020, 96% of primary energy and 94% of final energy consumption came from fossil sources, while renewable energy covered only 4–6% of the total (Blanco et al., 2023).

This structural dependence is mirrored in the electricity sector, which is fragmented into seven isolated and technically complex subsystems. Only Fuerteventura and Lanzarote are interconnected, while the rest operate as stand-alone electrical grids. The generation park remains largely obsolete and dominated by fuel oil-based thermal plants. These systems have historically prioritized reliability through fossil generation, resulting in a limited penetration of renewables (PIOT Lanzarote, 2023).

At the same time, the Canary Islands enjoy favourable climatic conditions for renewable energy: abundant solar radiation and stable wind regimes, particularly in Fuerteventura, Lanzarote, and El Hierro. Nearly 40% of terrestrial territory is protected, including 4 national parks and around 150 protected natural areas (ITC, 2022). While this ecological richness limits available land for infrastructure, it also justifies the region's strong emphasis on spatial and landscape planning.

The archipelago's peculiar conditions, insularity, environmental sensitivity, and demographic asymmetries, make it a challenging yet strategic testing ground for climate-neutral energy systems.

4.3.2 Renewable energy development: Targets vs Reality

The energy transition in the Canary Islands is guided by the overarching objective of achieving full decarbonization of the regional economy by 2040, with an indicative target of 2035 where feasible (PTECan, 2023). This target is more ambitious than Spain's national objectives and reflects the region's vulnerability to climate change as well as its energy insularity. The Canary Island Energy Transition Plan (PTECan), initiated in 2021, outlines a pathway to net-zero through the expansion of renewables, electrification of demand, energy efficiency, and development of storage and hydrogen infrastructure.

As of 2024, the Canary Islands had reached a total installed capacity of approximately 964 MW from renewable sources, with 648 MW from wind and 296 MW from solar photovoltaic systems (REE, 2024). These capacities represented a notable increase from 2023, solar PV grew by +25%, while wind expanded by +1% (REE, 2024). Despite this progress, the share of electricity generation from renewables in 2024 remained limited to 28,7% of total output, well below the levels required to meet the decarbonization goals, but strongly increased compared to the 4-6% of 4 years earlier.

In terms of gross production, wind energy accounted for approximately 1,409 GWh, while photovoltaic solar produced 405 GWh (REE, 2024). These outputs reflect positive year-on-year trends, largely driven

by improved permitting conditions, better grid connection planning, and specific investment schemes supported by both the regional government and national programmes (REE, 2024).

The PTECan sets intermediate targets for 2030, aiming to cover at least 58% of the internal electricity demand through renewable energy production, including the deployment of:

- 1,800 MW of wind capacity
- 1,200 MW of solar PV
- Full integration of renewable electricity with flexible demand, storage systems, and hydrogen production (PTECan, 2023).

Additionally, the Plan prioritizes the decarbonization of specific sectors, including transport (via electrification and green hydrogen), the replacement of fossil-based generation on isolated islands, and the promotion of energy communities and self-consumption. It also forecasts the deployment of more than 500 MW of energy storage to guarantee system stability in isolated grids.

However, beyond technical development, the region continues to face systemic barriers, including:

- Limited interconnection between island subsystems,
- High costs of system balancing in isolated grids,
- Delays in national-level auctions and grid access reforms,
- Land availability restrictions due to conservation and landscape values.

These constraints highlight the need for a governance model that makes progress in integrating spatial planning, grid management, and environmental protection in order to meet the 2030 targets.

4.3.3 Planning and permitting framework

The planning and permitting system in the Canary Islands is structured around a multilayered framework that aligns energy transition objectives with environmental protection, spatial planning, and governance coordination. At the core of this system lies the Law 6/2022, the regional Climate Change and Energy Transition Law, which mandates the development of the PTECan and ensures its alignment with regional, insular, and municipal planning instruments.

As stated earlier, the PTECan, launched in 2021 and currently under final approval, is the principal strategic document defining the region's pathway to decarbonization by 2040. Its development followed a full Strategic Environmental Assessment, finalized in 2022, which includes:

- A comprehensive diagnosis of the territory,
- Sensitivity mapping of land use and biodiversity,
- Clear criteria for the localization of renewable energy infrastructure,
- Definition of exclusion zones and compatibility layers.

Based on these findings, a set of spatial and environmental constraints and opportunities was defined for renewable energy siting. (PTECan, 2023).

A key innovation within the permitting framework is the designation of the renewable acceleration areas, first introduced in the PTECan and progressively implemented since 2022.

These areas, designated based on low environmental conflict, favourable technical conditions, such as maximum slope below 15%, solar irradiation exceeding 5 kWh/m² per day, average annual wind speed above 6 m/s, and proximity grid (less than 3km), were identified through the sophisticated use of GIS (Geographic Information System) tools. These tools integrate data on biodiversity, landscape visibility, land use classifications, infrastructure networks, hydrography and soil types (Resumen No Técnico, 2023).

According to Gobierno de Canarias (2024), over 85 renewable energy projects have been proposed within RAAs, primarily located in the islands of Lanzarote and Tenerife. The introduction of such areas has resulted in a marked improvement in permitting times: procedures that previously took 30 months on average have been streamlined to less than 12 months within these zones, significantly accelerating project implementation (Gobierno de Canarias, 2024; PTECan, 2023).

In parallel, each island maintains its own territorial plan, known as PIOT, which acts as the primary land use planning instrument. PIOTs are legally binding and directly affect the siting of energy projects, especially in areas with high landscape value or dense urbanization. Projects incompatible with PIOT norms must be re-located or significantly redesigned.

4.3.4 Governance Dynamics and Conflicts

The energy transition in the Canary Islands is governed through a multilevel institutional architecture that balances regional leadership with local implementation. The main coordinating authority is the Consejería de Transición Ecológica y Energía del Gobierno de Canarias, which holds legislative, strategic, and regulatory competences. This body is responsible for drafting and updating the PTECan, managing the RAAs framework, and overseeing regional implementation of national and EU directives.

At the island level, each island councils play a central role in land-use planning and project authorization. Each island's PIOT provides the legal foundation for spatial and landscape governance. These plans establish zoning rules, visual and cumulative impact thresholds, and integration requirements, thereby influencing project siting, form, and scale. The councils also act as permitting authorities for small to medium-sized projects and participate in the review of strategic plans and SEAs for larger developments.

At the municipal level, local authorities manage urban planning instruments and issue building permits. While they have limited jurisdiction on large-scale energy projects, their participation is critical for distributed generation, rooftop PV, and community energy schemes. Some municipalities have also launched pilot projects on energy efficiency, public building retrofitting, and citizen co-investment in renewables (Gobierno de Canarias, 2024).

To streamline these overlapping competences, Law 6/2022 introduced vertical and horizontal coordination mechanisms, including:

- A regional monitoring committee for the energy transition,
- The integration of the PTECan with spatial and environmental instruments,
- Mandatory inter-institutional consultations during the permitting process,
- Interoperability of GIS and planning tools between administrative levels.

A key example of participatory and context-sensitive governance is the Gorona del Viento project on El Hierro. This pioneering hybrid wind-hydro system was designed and implemented through a partnership between:

- The Council of El Hierro (majority shareholder),
- The regional utility Endesa,
- The Instituto Tecnológico de Canarias (ITC).

Gorona del Viento is considered a model of adaptive and public-driven governance, combining technical innovation with institutional consensus. The project enabled the island to operate on 100% renewable electricity for extended periods, exceeding 10,000 cumulative hours by 2023, and has achieved international recognition for its replicability and alignment with the EU Green Deal (Zurita et al., 2024).

This case contrasts with other islands where top-down deployment models have led to social opposition. Indeed, some friction points remain. In particular, conflicts between conservation priorities and large-scale renewables have arisen in ecologically sensitive islands like La Palma and Lanzarote; tourism stakeholders have opposed certain wind or solar plants near scenic routes or cultural landmarks, and local resistance has emerged when communities perceive projects as externally imposed or inadequately integrated into the landscape (PTECan, 2023).

4.3.5 Landscape protection and participatory tools

Recognizing the territory's unique ecological, cultural, and aesthetic value, the Canary Islands have adopted a landscape-centred approach to spatial planning and energy development. These protections are fully embedded into both regional and island-level planning instruments and constitute hard constraints for the localization of renewable energy infrastructure.

With this objective, the PTECan (2023) identifies non-suitable areas for renewable energy installations, which include:

- Natura 2000 sites,
- National parks and natural reserves,
- Hydrographic networks and flood-prone zones,
- Archaeological sites and cultural heritage landscapes,
- Scenic viewpoints and protected visual corridors,
- Coastal protection strips, particularly near dunes, beaches, and cliffs,
- Agricultural areas of high cultural or productive value, especially terraced farming landscapes.

The buffer zones around these areas are clearly defined and enforced. As stated in the PTECan (2023) the main constraints are:

- 500 meters from residential clusters,
- 100 meters from rivers or hydrographic features,

- 1 kilometer from officially recognized protected viewsheds and landscape corridors,
- 500 to 1000 meters from major heritage complexes or landscape designated as cultural landmarks,
- 100 to 200 meters from archeological sites or minor protected elements,
- A minimum of 2 kilometers from the Maspalomas Dunes (Gran Canaria),

In addition, each regional PIOT, based on the specific characteristics of its territory, may establish stricter measures, such as:

- 500 to 1000 meters in the presence of vulnerable coastal habitats, dunes, cliffs, cultural landscapes, or climate-related risks such as erosion and salinization (PIOT La Palma, Lanzarote, Fuerteventura),
- 300 meters around traditional terraced agricultural areas (PIOT La Gomera),
- 100 to 250 meters along the hiking trails included in the Catálogo de Senderos (PIOT La Palma)

These exclusions are mapped using advanced GIS tools, particularly though the IDECANARIAS and GRAFCAN platforms. These systems are fully interoperable with the planning offices of each regional council and are used by both technicians and developers to pre-screen project viability. Public users can also access these maps to verify whether their land or community is affected by planned energy infrastructures, improving transparency and trust (Resumen No Técnico, 2023).

Participation is a further cornerstone of the Canary planning model. The strategic environmental assessment process for the PTECan was designed to ensure early and meaningful involvement of civil society. According to the Resumen No Técnico (2023), the participatory process included:

- Two formal phases of public consultation: the first during the initial scoping stage (2021) and the second following the draft SEA and PTECan publication (2022);
- A total of 252 individuals and entities participated actively in the consultation, including: local municipalities, NGOs, RES associations, professional engineering and architecture bodies, academics and researchers, private citizens submitting individual contributions.

The regional government received 318 formal submissions, of which:

- 103 included specific spatial suggestions for refining the RAAs boundaries or excluding high conflict areas,

- 57 focused on biodiversity and species protection,
- 41 raised concerns about visual and cumulative impacts,
- The remaining addressed topics such as procedural transparency, community benefits, and landscape aesthetics.

Island-level planning has also integrated public feedback mechanisms (Resumen No Técnico, 2023). For instance, the PIOT of Lanzarote underwent a revision process with extensive citizen involvement, particularly from environmental groups, heritage advocates, and tourism-related stakeholders. As a result, the PIOT introduced stricter visibility analysis, maximum size thresholds for PV plants, and enforced cumulative impact modelling.

Overall, the Canary Islands are developing a coherent, transparent, and participatory framework aimed at harmonizing renewable energy development with the protection of unique landscapes and ecosystems. The Resumen No Técnico (2023) states that in contrast to the previous centrally planning governance, the current model seeks to engage citizens, provide open access to planning materials and enhance community awareness. By embedding landscape considerations into zoning processes, leveraging GIS for ex-ante screening, and institutionalizing public dialogue, the region has established the foundations for a socially and environmentally resilient energy transition.

4.4 Alentejo

4.4.1 Geographic and socio-economic context

The Alentejo region, located in southern Portugal, is the largest region in the country, with a territorial extension of 31,605 km², covering 34,3% of the national territory but housing only about 5% of the population. It is characterized by low population density, extensive agricultural land, and a high solar irradiation potential, making it one of the most promising areas in Europe for renewable energy deployment, particularly solar photovoltaic and, to a lesser extent, onshore wind power.

Demographically, the region faces significant challenges of depopulation, ageing, and economic stagnation in many of its rural areas. These trends are especially marked in the interior districts such as Beja and Évora, while the southern coastal municipalities as Sines and Odemira display more dynamic socio-economic profiles due to port infrastructure, logistics, and tourism. Agricultural activity remains a dominant land use, and the region hosts several areas designated under the National Agricultural Reserve (RAN) and National Ecological Reserve (REN), which play a crucial role in land-use planning and environmental protection.

Despite these constraints, the region's extensive land availability, flat topography, and abundant solar resource have attracted significant interest from renewable energy developers. Moreover, the proximity

to strategic transmission infrastructure, especially the REN substations and high-voltage lines near Sines, enhances its suitability for large-scale energy projects.

The region's territorial features, large underused areas, renewable potential, and structural challenges, make it a key testing ground for balancing energy transition and landscape preservation in Portugal.

4.4.2 Renewable energy development: Targets vs. Reality

Portugal's updated PNEC 2030 establishes ambitious national targets to decarbonize the energy sector, aiming for 85% of electricity generation from renewables by 2030, which foresees 42 GW of RES with 20.4 GW of installed solar PV capacity, 10.4 GW of wind, and 5.5 GW of storage (PNEC 2030, 2024). Within this national framework, Alentejo plays a pivotal role due to its favorable technical and spatial characteristics.

Indeed, according to LNEG's mapping of less environmentally sensitive areas, vast swaths of Alentejo are suitable for solar and wind energy development, particularly in the districts of Évora, Beja, and Portalegre (LNEG, 2023).

Alentejo stands out as one of Portugal's most solar-rich regions, benefiting from high irradiation levels, low population density, and abundant available land. These characteristics have facilitated substantial deployment of renewable energy technologies, particularly large-scale photovoltaic projects.

As of 2024, Alentejo hosts 1,850 MW of installed solar PV capacity, from 1,066 MW in 2023, accounting for about 31% of Portugal's total solar deployment. This figure reflects a steep growth in recent years, driven largely by utility-scale solar farms located in areas such as Évora, Ourique, and Santiago do Cacém. In contrast, onshore wind capacity remains relatively modest, with around 222 MW currently operational, as much as in 2023, primarily distributed across northern parts of the region (DGEG, 2024).

Under the updated National Energy and Climate Plan (PNEC 2030) and the Alentejo 2030 Regional Programme, the region is expected to reach by the end of the decade 3,000–3,500 MW of solar photovoltaic capacity and 800–1,000 MW of onshore wind capacity. These figures are consistent with projections outlined in the Legislative Decree No. 99/2024, which partially transposes RED III and sets explicit guidelines for accelerating deployment in low-conflict areas.

Despite Alentejo's strong solar and wind potential, the region faces growing limitations in terms of grid readiness. According to data from REN (2024) and the updated PNEC 2030, several inland zone,

particularly in the districts of Beja and Évora, suffer from limited transmission capacity and constrained access to the national electricity network. This issue has become a structural bottleneck, delaying or preventing the connection of new renewable energy projects to the grid.

The need for upgrades to substations, high-voltage lines, and transformer infrastructure is frequently cited in environmental and technical assessments, which often recommend a better alignment between grid planning and renewable energy zoning. The lack of such alignment not only increases the risk of speculative congestion but also discourages project development in areas where resource availability is high, but network access remains restricted (REN, 2024).

4.4.3 Planning and permitting framework

The deployment of renewable energy infrastructure in Alentejo is framed by a multilevel governance structure that integrates national legislation with regional spatial planning instruments. Recent regulatory reforms have sought to streamline permitting procedures while embedding stronger territorial compatibility criteria. At the national level, Legislative Decree No. 15/2022 established a unified licensing regime for renewable energy production, storage, and self-consumption. This legal framework was further enhanced by Legislative Decree No. 99/2024, which partially transposes the EU RED III directive and introduces mechanisms to accelerate deployment, such as simplified environmental screening, dynamic grid allocation, and the identification of acceleration areas with low territorial conflict.

In parallel, the PROT Alentejo (PROTA)**,** the regional spatial plan, plays a central role in defining land use compatibility for renewable energy projects. The plan includes a set of binding provisions, which articulate zoning criteria for energy infrastructure, integrating environmental, agricultural, and landscape constraints. Key legal instruments include the Reserva Agrícola Nacional and Reserva Ecológica Nacional**,** which impose stringent restrictions on development in ecologically sensitive or high-value agricultural lands. These restrictions are further reinforced by the Natura 2000 network, which designates core biodiversity areas protected under EU law (ICNF, 2023).

A non-binding technical milestone in the region's spatial energy planning is the mapping of the areas of lower sensitivity developed by the National Laboratory for Energy and Geology (LNEG)**.** This mapping exercise, published in 2023, employs a multi-criteria evaluation methodology to identify solar and wind development zones with lower environmental and social conflicts. The criteria include:

- Location within 2-5 kilometers of Natura 2000 sites;
- Exclusion of lands designated as RAN/REN;
- Proximity within 1 kilometer of protected monuments or cultural heritage sites,
- Slope exceeding 15% for solar PV and 25% for wind power installations;
- Distance of less than 3 kilometers from high- or medium-voltage transmission lines,
- Absence of visual exposure from panoramic viewpoints or listed cultural assets.

These spatial filters are operationalized through GIS-based mapping tools, which enable local authorities and developers to preliminarily assess project compatibility. A particularly illustrative example is provided by the municipality of Ourique, located in southern Alentejo, which has become a national hotspot for utility-scale solar PV projects. Anticipating increasing pressure on land and the risk of social opposition, the local administration adopted a GIS-based multi-criteria evaluation approach to proactively delineate internally coherent energy zoning. This method integrated spatial datasets on slope, proximity to the grid, land use restrictions (RAN and REN), landscape visibility, and the presence of Natura 2000 habitats. The methodology was not imposed by any national legal requirement but applied voluntarily by the municipality as part of a proactive planning strategy to avoid conflicts, optimize land use, and anticipate future licensing requests. This bottom-up spatial planning model serves as a replicable example of how municipalities can establish clear, objective criteria to guide project siting, reduce legal and social conflicts, and enhance territorial legitimacy for the energy transition (Martins et al., 2021)

Although these instruments provide a solid technical and legal framework, the region has yet to officially designate any renewable acceleration areas under the RED III transposition. Indeed, as established by Legislative Decree No. 99/2024 the deadline for each region to define RAAs is set for March 2026. However, the technical and environmental basis for doing so is already partially available and the law requires the use of tools such as SEA, GIS data, environmental and territorial criteria, and evaluative methodologies to justify the identification or exclusion of specific zones. The integration of environmental and energy objectives is not merely declarative but operationalized through concrete methodologies, spatial data, and legal instruments.

4.4.4 Governance dynamics and conflicts

The governance of renewable energy in Alentejo is embedded within a complex multi-level institutional architecture that involves national directives, regional planning tools, and municipal responsibilities. While Portugal has made significant strides in transposing the EU Renewable Energy Directive III

directive through national legislation, the implementation at regional and local levels reveals both progress and structural limitations.

At the national level, two key legal instruments shape the permitting and spatial planning regime are Legislative Decree No. 15/2022, which consolidates the licensing framework for renewable energy projects, and Legislative Decree No. 99/2024, which transposes core elements of the revised RED III.

This has resulted in a fragmented approach where projects are assessed on a case-by-case basis, without a coherent territorial vision, contributing to legal uncertainty and public opposition.

The regional level is governed by two primary instruments:

- PROT Alentejo: a binding territorial plan that defines land-use regulations, environmental constraints, and spatial compatibility criteria for infrastructures, including renewables. PROT is directly linked to national laws and guides the development of local urban plans.
- Alentejo 2030 Regional Programme: a strategic non-binding programme co-financed by EU funds that integrates objectives for renewable deployment, climate adaptation, sustainable agriculture, and territorial cohesion. It emphasizes synergies between energy transition and local development.

According to national legislation, the Directorate-General for Energy and Geology (DGEG) is the competent authority for issuing permits for large-scale renewable energy projects. However, the Portuguese Environment Agency (APA) is responsible for coordinating the Environmental Impact Assessment process, while landscape compatibility is assessed through the Directorate-General for Culture (DRC) and the Institute for Nature Conservation and Forests (ICNF) in case of Natura 2000 and ecological zones.

This results in a multi-actor governance system where:

- The national government defines legal norms and issues strategic targets (via PNEC 2030);
- Regional bodies, as the Alentejo Regional Coordination and Development Commission (CCDR-A) coordinate planning and cohesion policies;
- Municipalities are responsible for identifying suitable areas and updating local urban plans;
- APA, ICNF, and DRC provide sectoral opinions on environmental and landscape compatibility;

- DGEG grants final authorization for construction and grid connection.

This distribution of responsibilities often leads to delays, conflicting interpretations of norms, and overlapping procedural steps (EEB, 2025). As a result, Alentejo currently finds itself in a transitional phase: rich in spatial and solar potential, equipped with strategic objectives and partial technical tools, but constrained by institutional fragmentation, procedural opacity, and limited community involvement in early planning stages. Addressing these issues is crucial not only for legitimacy, but also for accelerating the energy transition without exacerbating local resistance.

4.4.5 Landscape protection and participatory tools

In Alentejo, the operationalization of participatory and environmental evaluation tools presents both opportunities and structural limitations.

For regional and municipal plans, the applicable evaluation tool is the Strategic Environmental Assessment. SEA enables early-stage stakeholder engagement, public consultation, and cross-sectoral coordination for spatial planning instruments. In the case of the Alentejo 2030 Regional Programme, the SEA included participatory phases open to municipalities, civil society, and economic actors (APA, 2023), yet literature reports limited active engagement and awareness at local level (Wallace et al., 2025).

By contrast, the Environmental Impact Assessment applies to large-scale individual projects (solar PV over 50 MW and wind farms over 20 turbines), under Legislative Decree No. 151-B/2013. These projects undergo structured public consultation and require scoping opinions from environmental agencies (APA) and regional authorities (CCDR-A). However, as reported by LNEG (2023), the majority of PV installations in Alentejo are below the EIA thresholds, resulting in a systemic exclusion of community involvement and environmental scrutiny.

Small and medium-sized renewable projects are subject only to simplified licensing under the municipal procedure as established by Legislative Decree No. 15/2022. These pre-verification steps verify compliance with local zoning, REN/RAN restrictions, and building code parameters. However, they do not require formal public hearings, nor do they ensure independent landscape impact assessments unless voluntarily requested.

As confirmed by CCDR (2022) this simplified regime has led to planning fragmentation, especially where municipalities lack expertise or dedicated technical staff. Municipalities often lack the capacity to

evaluate visual or cumulative impacts, relying on “checklist-style” administrative approvals rather than holistic territorial assessment.

Academic literature also points to a lack of procedural justice in current governance. As shown in the case of the project of Cercal do Alentejo, the APA held a public information session only two days before the end of the mandatory consultation period in May 2021. The meeting, disorganized and conducted under COVID-19 restrictions, incited public anger toward representatives of APA, the local parish council, and the developer. Residents were dismayed that everything seemed to have already been decided and that the public representatives seemed to be on the side of the developer (Wallace et al., 2025). Although civic engagement is formally guaranteed, it remains minimal in practice due to technical complexity, absence of mediation platforms, and low transparency of planning documents.

The LNEG areas of lower sensitivity tool, while non-binding, offers a GIS-based mapping of environmentally compatible zones for renewable energy development, and has been increasingly used by municipalities and regional authorities to guide project siting and inform the future identification of RAAs. However, for this to happen, stronger coordination is needed between municipalities, CCDR-A, APA, and the Ministry of Environment. The designation of the RAAs by March 2026, could serve as pilot spaces for improved governance, able to conciliate renewable development with adequate social and environmental engagement.

5 Comparative assessment and Policy lessons

The comparative analysis of Sardinia, the Canary Islands and Alentejo reveals significant variation in the effectiveness of renewable energy deployment, especially in relation to spatial planning, administrative coordination, landscape protection and public engagement. Despite differences in geography and institutional setting, clear patterns emerge regarding what enables or hinders progress.

Sardinia

Sardinia offers a paradigmatic example of how regulatory overreach, institutional fragmentation, and reactive planning can severely constrain renewable energy deployment. Despite high national targets and abundant natural resources, the region has adopted restrictive policies such as broad exclusion zones, multiple moratoria, and retroactive limits on authorized plants. These measures have triggered intense legal conflict, including a ruling of unconstitutionality against Regional Law No. 5/2024. Moreover, the current suitability framework under Regional Law No. 20/2024 is so stringent and broadly defined that it has rendered much of the territory effectively unavailable for utility-scale projects. Combined with the long-standing delay in updating the Regional Energy and Environmental Plan, the absence of digital multicriteria planning tools, and the lack of effective public engagement, this configuration exemplifies how political resistance and administrative risk aversion can undermine the strategic governance of renewable siting at the territorial level.

Canary Islands

In contrast, the Canary Islands show how proactive, GIS-based planning and early public participation can facilitate renewable deployment in sensitive environments. The region has mapped and approved renewable acceleration areas through Strategic Environmental Assessment, ensuring that excluded areas are clearly justified, such as dunes, terraced agriculture, and Natura 2000 sites, while compatible areas are explicitly delineated. The alignment between the island-level PIOTs, the regional PTECan 2030 roadmap, and national energy goals has produced a coherent multi-level framework. Though some friction remains, particularly with tourism stakeholders, the overall process has yielded shorter permitting times, reduced litigation, and a pipeline of viable projects compatible with landscape constraints. Notably, early-stage public engagement and the availability of spatial and procedural data have strengthened the social acceptability of projects, paving the way for a low-conflict renewable transition in the archipelago.

Alentejo

Alentejo, on the other hand, illustrates a third governance pathway, characterized by a relatively streamlined administrative framework and a strong national role in spatial coordination, but facing structural gaps in local governance, grid integration and participatory planning. The region benefits from Portugal's centralized mapping of "low-sensitivity areas", which provides a national-level reference for renewable siting based on exclusion and compatibility criteria. However, citizen engagement remains limited, due to technical complexity, the absence of mediation platforms, and the low transparency of planning documents. In addition, most projects are classified as small or medium-sized and do not require mandatory public hearings, nor do they ensure independent landscape impact assessments unless voluntarily requested. Moreover, permitting remains exposed to procedural fragmentation across agencies, and significant uncertainty persists due to insufficient alignment between siting decisions and actual grid capacity. While these spatial instruments offer a coherent conceptual framework, their implementation is weakened by limited integration with energy infrastructure planning and the absence of structured mechanisms for public oversight.

5.1 Interpreting the Cases through Governance Paradigms

The comparative analysis of the three case studies reveals seven recurring governance paradigms that help explain why some regions succeed in deploying renewables while others face systematic delays or resistance. These paradigms reflect core dimensions of territorial energy governance, including planning, participation, legal certainty, and infrastructure readiness. While not mutually exclusive, the presence or absence of enabling conditions within each paradigm correlates strongly with the outcomes observed in Sardinia, the Canary Islands, and Alentejo.

1. *Planning and Siting*

Effective renewable siting requires not only national ambition but also coherent spatial tools that balance environmental constraints and development needs. In the Canary Islands, acceleration zones were designated through SEA-informed planning and GIS-based exclusion criteria, allowing early conflict anticipation and procedural clarity.

In contrast, Sardinia adopted broad and overlapping exclusion criteria and outright bans in large rural zones, often affecting areas that could have been assessed on a case-by-case basis. These restrictions, applied cumulatively and without differentiated spatial analysis, have rendered the vast majority of the

regional territory de facto unsuitable for renewable siting. Introduced reactively and without public consultation, these provisions lacked technical justification and were ultimately challenged in court, resulting in legal invalidation and planning paralysis.

2. Institutional Coordination

Streamlined governance relies on clear mandates, interoperable platforms, and coordinated permitting flows. While the Canary Islands appears to have ad advanced governance framework, institutional complexity remains a challenge. As noted by Alberto Hernandez Suarez, Director General for Energy of the Government of the Canary Islands, "We have three layers of government: regional, island councils, and municipalities. Each has its own competences and coordination is extremely difficult" (Lardizabal, 2025). Conversely, both Sardinia and Alentejo suffer from fragmented institutional setup. Overlapping competences between regional departments, environmental authorities, and heritage agencies generate inconsistent reviews, delays, and conflicting interpretations of site suitability. The absence of unified platforms and procedural harmonization further complicates cross-agency coordination, undermining the efficiency and predictability of permitting processes.

3. Public Participation

Participation processes can either defuse conflict or deepen mistrust depending on how and when they are activated. In the Canary Islands, participation is embedded early in the planning phase through SEA and island-level consultations, making citizens actively involved in the decision-making process. As confirmed by Suarez in fact, "Our goal is to make renewable energy not just a technological shift, but a social and territorial one, built with consensus, citizen participation, and long-term planning" (Lardizabal, 2025). In contrast, in Alentejo, participation tends to be procedural and reactive, often limited to late-stage EIA hearings or omitted entirely for small-to-medium projects, which are increasingly common. These fuels perceptions of top-down imposition and erodes social acceptance.

In Sardinia, the situation is further exacerbated by a political climate in which regional authorities often echo or amplify local opposition, rather than engaging in proactive dialogue. Instead of facilitating structured mediation between community concerns and development objectives, institutions tend to adopt reactive postures, which reinforces polarization and undermines efforts to design context-sensitive energy transitions.

4 Landscape Approach

A modern governance of the landscape goes beyond preservation by integrating aesthetic, ecological and productive values. In Portugal and Spain, emerging tools such as agrivoltaics, visual mitigation requirements, and design guidelines help frame renewables as compatible with landscape heritage. By contrast, Sardinia often invokes a static vision of landscape protection, where visual intrusion alone is treated as a sufficient reason for denial, with little room for mitigation or negotiation.

5 Grid and Storage Integration

Grid saturation has become the number one bottleneck for renewables. Renewable projects depend on more than land: they require timely connection to the grid. The Canary Islands are investing in mapping hosting capacity and planning grid upgrades alongside deployment targets. In Sardinia and Alentejo, by contrast, siting decisions have often outpaced grid readiness, leading to curtailments, project queues, and uncertainty.

This challenge is not unique: according to Wind Europe (2024), over 500 GW of wind energy projects are currently waiting for a grid connection permit, 190 GW in Italy alone, delaying implementation and increasing uncertainty. Grid connection queues are often caused by misaligned planning, speculative projects, and a lack of anticipatory investments. As Wind Europe CEO Giles Dickson put it, "Grid access is the new permitting", underscoring how the lack of coordinated, forward-looking grid expansion is holding back renewable deployment and compromising energy security.

6 Legal and Regulatory Clarity

A transparent and stable legal framework is critical to reduce risk for investors and institutions. In Portugal and the Canary Islands, recent reforms have clarified licensing thresholds and defined priority zones, offering greater predictability and alignment with national energy targets.

In Italy, by contrast, regulatory clarity remains a major gap. The national decree tasked with defining suitable and non-suitable areas for renewable energy siting was recently annulled by the Regional Administrative Court due to an excess of delegation to the Regions and the lack of uniform criteria across the country. Sardinia's regional laws have further contributed to legal uncertainty by introducing successive moratoria, retroactive constraints, and vague definitions of non-suitable areas. These measures have triggered constitutional litigation and generated significant mistrust among developers, ultimately undermining long-term planning and deterring investment.

7 Transparency and Data Access

Public access to accurate, interoperable spatial and procedural data fosters accountability and informed participation. In the Canary Islands, tools such as IDECanarias and GRAFCAN provide open access to suitability maps, grid layers, and permitting status, enabling citizens and stakeholders to follow and understand planning decisions.

In Alentejo and Sardinia, by contrast, spatial data are fragmented, inconsistently updated, and rarely integrated with energy governance platforms, making participation harder and slowing down decisions. This lack of transparency not only hampers institutional efficiency but also erodes public trust and denies citizens the tools needed to engage meaningfully and constructively in shaping the future of their territories.

5.2 A taxonomy of solutions

To address these systemic challenges, this section presents a structured taxonomy of practical and transferable solutions. Each category reflects a key area of intervention: planning, procedures, participation, infrastructure, law, and data, and includes concrete mechanisms designed to reduce risks, enhance coherence, and unlock investment, while safeguarding territorial, environmental, and social sustainability.

No.	Challenges	Best practices
1	Planning instruments	Strategic planning
2	Administrative procedures	One-Stop-Shop model
3	Participatory mechanisms	Community engagement
4	Infrastructure and grid solutions	OPI principle and prioritization criteria
5	Legal and normative reforms	A clear, proportionate, and legally grounded system
6	Transparency and data tools	A centralized digital repository system

1 Planning Instrument

Effective renewable energy deployment requires not only responsive spatial planning but also a forward-looking approach capable of anticipating technological evolution, infrastructure needs, and socio-territorial dynamics. As underlined by the World Economic Forum (2023), strategic planning must move beyond short-term bottleneck mitigation to proactively shape the conditions for a resilient and efficient energy transition. This includes aligning renewable siting with system-wide considerations, acknowledging that areas with high generation potential often do not coincide with zones of high

electricity demand. Therefore, integrated, and anticipatory territorial planning is essential to optimize land use, infrastructure deployment, and energy balancing across regions.

Building on this, it should progressively abandon rigid exclusion logics and adopt compatibility-based zoning frameworks that allow for context-specific assessment rather than blanket prohibitions. Agricultural areas provide a telling example: rather than banning ground-mounted solar entirely, regions could introduce conditional eligibility based on agronomic evaluations and multifunctional design, as done under the Veneto Regional Law No. 17/2022 for agrivoltaics. Here, projects must demonstrate their capacity to maintain or enhance agricultural productivity while hosting energy infrastructure, allowing both functions to coexist.

To support these frameworks, advanced GIS-based digital planning tools should be developed and institutionalized. These platforms should integrate multiple spatial layers, environmental constraints, landscape sensitivity, infrastructure proximity, and legal protections, into an interactive and publicly accessible interface. Such multi-criteria decision-support systems would enhance transparency, reduce conflicts, and provide clear, ex-ante guidance to both project developers and permitting authorities. In doing so, they also facilitate early-stage community engagement and strategic alignment across governance levels.

Overall, moving from static, reactive planning toward adaptive, data-driven, and compatibility-based spatial instruments offers a concrete pathway to reconcile development objectives with landscape protection, reduce legal uncertainty, and unlock territorial potential in a socially and environmentally balanced way.

2 Administrative procedures

A central challenge across Member States is the fragmentation of permitting responsibilities. To address this, a concrete and proven solution is the One-Stop-Shop model, as implemented by the Danish Energy Agency for offshore wind. In this model, a single public body is legally mandated to coordinate all required authorizations, across environmental, cultural, maritime, and defense ministries, on behalf of the developer, providing a single point of contact and reducing procedural uncertainty (WEF, 2023).

Digitalizing the One-Stop-Shop process is essential to unlock its full potential. As highlighted by Wind Europe (2024) and World Economic Forum (2023), emerging digital permitting platforms can automate

document checks, provide real-time updates, and consolidate data in one interface. This significantly reduces manual processing time, by up to 80%, and allows permitting authorities to focus on substantive evaluation rather than administrative bottlenecks.

By combining centralization and digitalization**,** the One-Stop-Shop enhances transparency, shortens permitting timelines, and increases accountability, especially when embedded in law and accompanied by clear deadlines, as recommended in the revised Renewable Energy Directive.

3 Participatory mechanism

Effective public participation can either accelerate or hinder renewable energy deployment. As highlighted by the World Economic Forum (2024), engaging communities early, particularly during spatial planning and Strategic Environmental Assessment, can significantly reduce legal disputes, dispel misinformation, and foster social buy-in. Innovative tools such as digital consultation platforms, social listening technologies, and interactive visualizations, such as digital twins or augmented reality, can enhance transparency and inclusiveness, enabling citizens to meaningfully contribute to project development.

A particularly noteworthy initiative is the 20% citizen participation rule implemented in the Canary Islands, which requires that all new renewable energy projects allocate at least 20% of their ownership to local residents through equity shares or crowdfunding mechanisms (Strategic Energy Europe, 2025). This approach moves beyond formal consultation by embedding material benefits and democratic ownership directly into project structures. By granting communities a tangible stake in renewable energy developments, the model addresses one of the most recurrent sources of opposition: the perception that external developers exploit local territories while offering little or no return to the populations affected. Such a mechanism transforms participation from a procedural formality into a genuine lever for empowerment and territorial justice.

4 Infrastructure and Grid Solutions

As documented by Wind Europe (2024), grid saturation has now overtaken permitting as the primary bottleneck to the expansion of renewable energy. The problem stems from a fundamental misalignment between project siting and grid infrastructure readiness, compounded by the persistence of the inefficient "first come, first served" model for grid access allocation.

To overcome this, Member States should extend the application of the Overriding Public Interest (OPI) principle, already used for renewables in countries like Germany, to grid infrastructure as well. This would allow transmission upgrades and new connections to benefit from accelerated permitting timelines and greater legal protection from local opposition or administrative delays.

Moreover, static queuing systems should be replaced by dynamic queue management based on milestone achievements. Countries such as Spain and the UK have introduced filtering criteria, such as financial guarantees and documented permitting progress, to prioritize projects that are mature, technically integrated, and equipped with advanced grid support functionalities. This shift not only improves the efficiency and fairness of capacity allocation, but also helps avoid speculative congestion and ensures that strategic clean energy technologies, including hybrid systems and storage, gain timely access to limited grid resources.

5 Legal and Normative Reforms

Legal uncertainty continues to obstruct renewable energy deployment, especially when legislative changes are introduced reactively, without clear technical justification or stakeholder consultation. Italy offers a paradigmatic example of this challenge.

To address these barriers, two key reforms are essential.

First, the national government must establish clear and legally consistent definitions of suitable and non-suitable areas, in line with the principles of legal certainty and proportionality. At the same time, regional governments should avoid ideologically driven or arbitrary zoning approaches, and instead adopt criteria aligned with spatial compatibility framework. These provisions must also avoid retroactive application, which severely undermines investor confidence and planning stability. Ensuring vertical coherence between national and regional norms is critical to prevent regulatory fragmentation and contradictory interpretations.

Second, legal frameworks should explicitly support the repowering and technological upgrading of existing plants, by introducing streamlined procedures and prioritized permitting channels. Under current rules, repowered installations are often treated as entirely new projects, facing the same lengthy approval timelines and legal risks, despite their lower environmental footprint and strategic value. Dedicated legal

pathways for repowering would not only accelerate decarbonization, but also reduce land pressure and visual impact, thereby easing integration into sensitive landscapes.

Ultimately, predictability and coherence in legal frameworks are indispensable, not only for attracting long-term private investment, but also for ensuring that renewable deployment remains compatible with broader territorial, environmental, and social objectives. Legal instability, whether stemming from political shifts, judicial annulments, or reactive bans, erodes trust, delays projects, and weakens the credibility of long-term planning.

6 Transparency and Data Tools

Lack of public access to spatial, procedural, and environmental information remains a barrier to both participation and effective decision-making. According to both Wind Europe (2024) and the World Economic Forum (2023), transparency in permitting can be significantly enhanced by the development of centralized digital repositories for all project applications, maps, impact assessments, and permitting status.

Platforms such as IDECANARIAS and GRAFCAN already provide open access to multi-layered geospatial datasets in the Canary Islands, helping to clarify siting constraints, available capacity, and procedural steps. These tools should be replicated across Member States and integrated with planning systems to ensure traceability and consistency.

Furthermore, real-time dashboards for permitting performance and grid status can improve accountability, support public oversight, and foster institutional learning. Clear and accessible data empower citizens, reduce conflict, and ensure that no stakeholder is excluded from shaping their energy future.

5.3 Conclusions

This thesis has explored the complex relationship between renewable energy deployment and landscape protection, with a specific focus on how governance frameworks can either facilitate or obstruct the energy transition. Through the comparative analysis of Sardinia, the Canary Islands, and Alentejo, it becomes clear that barriers to deployment often stem from systemic shortcomings, such as fragmented planning, regulatory opacity, institutional misalignment, and insufficient citizen engagement, rather than technological or physical constraints. Yet these challenges are not insurmountable. On the contrary, the

case studies analyzed demonstrate that where institutions adopt integrated planning tools, streamline procedures, and involve communities early and meaningfully, renewable energy can be developed in ways that are not only efficient but also socially accepted and territorially rooted. To support this shift, the thesis has proposed a taxonomy of six solution areas, planning instruments, administrative procedures, participatory mechanisms, infrastructure and grid integration, legal reforms, and transparency tools, each linked to concrete practices already tested across Europe. These are not abstract recommendations, but actionable strategies aimed at increasing coordination, legal certainty, and public trust. The solutions outlined in this taxonomy point to a broader transformation: the energy transition demands not only new capacities and rules, but also new ways of governing. It calls for a shift from short-term crisis management to anticipatory design; from fragmented competences to multilevel coherence; and from hierarchical decision-making to inclusive co-responsibility. The experiences of Sardinia, the Canary Islands, and Alentejo make one point abundantly clear: accelerating the energy transition does not require sacrificing landscape integrity or democratic accountability. On the contrary, progress is most durable when it is rooted in territorial intelligence, institutional transparency, and shared vision. Well-designed processes, anchored in clarity, dialogue, and proportionality, can reconcile development imperatives with environmental and social values. In conclusion, the transition to renewable energy is not simply a technical or environmental project, but a governance challenge of the highest order. This thesis has aimed to contribute to its advancement by offering a framework of comparative evidence and operational solutions capable of informing more effective, equitable, and context-sensitive energy policies.

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