

“PORTUGAL: Instruments of Climate Mitigation and Energy Transition”

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1. Political Situation Regarding Climate Policies in Portugal

There is consensus among right- and left-wing parties on the need of ambitious climate targets.

One of the possible reasons for consensus is the fact that Portugal is perceived by political parties and by people in general as one of the countries where energy poverty is the highest and also a country prone to climate disasters. Considering the mega-fires, droughts, floods and storms that regularly affect the country at an increasing rate, adaptation to climate change seems to be perceived as more relevant than mitigation.

While the major parties (Socialist Party, and Social Democratic Party) agree on the strategic goals, political friction arises from local opposition to specific projects and the socio-economic impacts of the transition. The small left-wing parties like the Communist Party (PCP) and the Left Bloc (BE) bring this discussion to the light.

The debate focuses on the pace and cost of transition, with pressure from the right-wing parties to slow down regulations perceived as costly for households and traditional industries, framing it as a defence of rural and lower-income voters due to the asymmetric demographic distribution of the country which leads the beneficiaries of public support for energy transition to be concentrated in the larger and more developed urban and coastal areas.

The main political disputes are around specific projects e.g., lithium mining for batteries, new high-voltage power lines, large solar farms, water management (new dams, desalination plants, agricultural efficiency), coastal protection, and territorial planning to reduce fire risk.

1.1. View of EU Climate Policy

Portugal is a supporter and an active promoter of EU climate ambition which is seen as an opportunity for leveraging development.

Official documents, including the PNEC 2030, frame the European Green Deal and the "Fit for 55" package and the Recovery and Resilience Plan (PRR) as the primary investment and modernization framework funding decarbonization investments.

Portugal has approved national goals that are sometimes more ambitious than EU mandate. For example, Portugal brought forward its coal phase-out to 2021, well ahead of schedule, and the Framework Climate Law targets net-zero by 2045, five years before the EU goal.

1.2. Development of National Climate Policy in Recent Years and Prospects for Future Political Developments

The Climate Framework Law (Lei de Bases do Clima, Law 98/2021¹), was approved by a vast majority in Parliament. This law enshrines the goal of carbon neutrality by 2045 (art 18/2), hopefully making it a binding state objective that transcends electoral cycles. A proposal of revision of the Climate Framework Law intended to downgrade its foundations, presented by right wing parties in 2026 was not approved. The Framework Climate Law created an array of legal obligations, including carbon budgets, the creation of a Technical and Independent Commission to monitor it, mandatory sectoral climate action plans for all ministries, a legal duty to assess the carbon impact of all new legislation, etc.

The Portuguese Environment Agency (APA) is the central authority coordinating climate policy, particularly the development of the National Energy and Climate Plan (PNEC 2030²) and the Roadmap for Carbon Neutrality (RNC 2050). The government created an ad hoc organ, the Action Structure for Climate and Sustainability (Estrutura de Missão para a Ação Climática e Sustentabilidade³), to support implementation of the Thematic Programme for Climate Action and Sustainability – Sustainable 2030. Sustainable 2030 is a national programme, funded by the Cohesion Fund (and part of Portugal 2030) with a budget of €3.1 billion, aimed to make a significant contribution to the challenges of the energy and climate transition, aligning with the strategic and policy objectives of the European Union OP2 – A greener Europe and OP3 – A more connected Europe. To meet the demanding challenges of the energy and climate

¹ https://www.pgdlisboa.pt/leis/lei_mostra_articulado.php?nid=3520&tabela=leis&so_miolo

² https://apambiente.pt/sites/default/files/_Clima/Planeamento/20241030_pnec2030_maen.pdf

³ <https://sustentavel2030.gov.pt/>

transition, the Sustainable 2030 program prioritizes Sustainability and Climate Transition, Sustainable Urban Mobility, and Rail Transport Networks (RTN).

The projects supported include coastal protection, the implementation of monitoring systems, civil protection planning and alert systems, risk management, transport networks and railways, among others⁴.

In November 2021 the 2 remaining coal plants (Pego and Sines) were closed, ending coal-fired power generation⁵.

The National Energy and Climate Plan, (PNEC) is the central operational policy document. In December 2024 Portugal updated its PNEC 2030, increasing ambition. Key new targets for 2030 include: 85% of electricity from renewables (up from a previous 80% target), a 55% reduction in greenhouse gas emissions and a 35% reduction in primary energy consumption.

In 2023 a simplification law (environmental SIMPLEX) simplified licensing for several administrative procedures including renewable energy projects, creating "go-to areas" for solar and wind⁶.

The first Carbon Budgets, setting binding five-year emission ceilings were approved in 2025. They were foreseen in the Climate Framework Law and were approved with a delay of 2 years (should have been approved until 2023).

Symbolic implementation of the Framework Law, ex. renaming organs to assume functions and play the role of organs established in the Framework Law. It is the case of the Technical and Independent Commission on Climate Action (whose creation was established by the Framework Law) acting as a parliamentary advisory body and publicly assessing policy adequacy.

In January 2024 Portugal approved the National Strategy for Energy Poverty (2023-2050) linking climate action directly to social policy⁷.

⁴ Full list with 93 projects: https://sustentavel2030.gov.pt/wp-content/uploads/2026/05/Lista-operacoes-30_04_2026.xlsx

⁵ <https://www.sciencedirect.com/science/article/pii/S030142152500165X>

⁶ https://www.pgdlisboa.pt/leis/lei_mostra_articulado.php?nid=3617&tabela=leis

⁷ <https://diariodarepublica.pt/dr/detalhe/resolucao-conselho-ministros/11-2024-836222486>

2. Key Climate Policy Controversies in the National Political Debate

The controversies are not about whether to act on climate, but how and who pays.

1. Renewable Deployment vs. Territory and Landscape: This is the most heated conflict. National ambition for massive solar and wind farms clashes with strong local environmental and civic movements and left-wing parties. The fight is over the cumulative impact on biodiversity and agricultural land, and the lack of local benefit sharing.

2. The Lithium Question: The Barroso and Montalegre lithium mining projects, deemed strategic by the Portuguese authorities for the battery value chain, face fierce local and environmental opposition⁸. The controversy is around EU supply sovereignty, (the mines having been classified as strategic for the EU in 2025⁹) against local community rights and environmental conservation, leading to legal battles and political and social confrontation.

3. Cost of Living and Just Transition: The political right and some industry groups increasingly frame climate policy as an elitist agenda. The carbon tax trajectory on fuels, the cost of building renovations, electric mobility subsidies and green hydrogen, are becoming divisive issues, central to a populist climate-skeptic narrative against the green burden.

4. Energy Mix and Mega-Projects: The government's push for new pumped-storage hydropower and green hydrogen megaprojects is contested. A significant debate exists between promoting large-scale industrial decarbonization through hydrogen (supported by the government and industry) and a more decentralized energy model focused on sufficiency and community energy (supported by environmental NGOs and left wing parties).

2.1. Specific Additional National Targets

Portugal established domestic goals that go beyond the EU acquis.

1. The Binding Carbon Budget (Orçamento de Carbono¹⁰) This is the most significant institutional "gold plating." The Framework Climate Law creates a system of binding five-year gross carbon budgets, starting with the 2026-2030 budget. The Technical and Independent

⁸ A documentar was produced on this conflict <https://www.rtp.pt/play/p16585/e923177/a-savana-e-a-montanha>

⁹ https://ec.europa.eu/commission/presscorner/detail/en/ip_25_864

¹⁰ <https://www.sgambiente.gov.pt/wp-content/uploads/2023/12/Orcamentos-de-carbono.pdf>

Commission (CTI) has proposed a budget that requires a linear reduction from -58% to -63% by 2030 compared to 2005, tightening the trajectory.

B. Renewable Gases and Green Hydrogen. Portugal has set a national target for 10-15% of hydrogen in gas grid blending by 2030 and is investing heavily in dedicated hydrogen infrastructure. The target of 5.5 GW of electrolyser capacity by 2030 is explicitly linked to industrial decarbonization.

C. Elimination of Fossil Fuel Subsidies. The Climate Framework Law stipulates the elimination of all tax benefits and subsidies to fossil fuels by 2030. This legal mandate focuses specifically on ending the reduced ISP (fuel tax) for diesel used in agriculture and professional vehicles.

D. Total Decarbonization of Public Transport - Target of a fully zero-emission public bus fleet by 2038 (the city of Lisbon advanced an earlier target for 2034), with a national target of 100% zero-emission public transport vehicle acquisitions by 2035.

E. Negative Emissions While the EU LULUCF target aims for a net sink of 310 Mt CO₂eq by 2030, Portugal's RNC 2050 trajectory targets transforming its land-use sector into a major, robust carbon sink to compensate for residual emissions in agriculture and industry, delivering a sink of over 13 MtCO₂e by 2050 as per the RNC 2050 trajectory.

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2.2. More Ambitious National Targets: National “Gold Plating”

Portugal has set more ambitious targets than the EU in the Climate framework Law and in the updated PNEC 2030

Goal	EU	Portuguese Target	Source
Climate Neutrality	2050	2045	Law 98/2021, Art. 2
Renewables in Electricity (2030)	~69%	85% (aiming for 100% before 2050)	PNEC 2030 (2023 Update)
GHG Reduction (2030 vs. 2005)	-55% (EU Net, Effort Sharing)	-55% (National Gross), with a trajectory to -90% by 2040 vs. 2005	PNEC 2030; RNC 2050 Trajectory
Primary Energy Reduction (2030)	-11.7% (target vs. 2020)	-35% (vs. 2005 baseline)	PNEC 2030 (2023 Update)
Coal Phase-out	2030s	2021 (Achieved)	National Decision, confirmed in PNEC

3/4/5. Portuguese vision of Emission Trading System for Industry (ETS I) and Emission Trading System II (Buildings and Road Transport) and double regulation

Portugal considers the EU ETS appropriate and indispensable, and views it as the cornerstone of Europe's climate and industrial strategy¹¹.

According to the "Energy in Numbers 2025" report by ADENE, the transport sector (which includes road transport) is the largest consumer, accounting for 37% of final energy consumption. The Residential sector (buildings) accounts for 17.5%¹². Buildings and road transport are already part of a national regulatory regime.

Regarding prospects for decarbonizing, transport remains the largest source of emissions (54% in 2024) with an aging and inefficient vehicle fleet. Buildings face high energy poverty rates, and electricity remains more expensive than gas, disincentivizing electrification¹³.

On the over regulation (energy efficiency, pricing of CO₂ emissions, emission limit values in environmental permits) is a concern, mainly for industry that fears losing competitiveness (ex. ceramics, cement, glass) due to carbon leakage and investment paralysis. They claim that instead of decarbonization the risk is “deindustrialization”¹⁴.

6. Effort Sharing

Portugal is actively developing its domestic carbon credit market and has established a voluntary carbon market framework designed to facilitate credit trading¹⁵. Furthermore, after the COP30 Portugal promised to pay 1 million euros to support the tropical forest fund¹⁶, which could enable the generation of credits.

¹¹ https://finlandabroad.fi/en/web/eu/uutiset/-/asset_publisher/omOkBRW9O3yT/content/joint-letter-from-the-prime-ministers-of-denmark-finland-portugal-spain-and-sweden-on-the-eu-emissions-trading-system/384951

¹² <https://www.dgeg.gov.pt/media/b4fhd0lv/dgeg-aen-2025e.pdf>

¹³ <https://www.publico.pt/2026/05/08/azul/noticia/nova-fase-transicao-energetica-exige-urgencia-transportes-industria-edificios-alerta-aie-portugal-2173923>

¹⁴ <https://www.publico.pt/2026/05/05/azul/noticia/governo-apoia-fim-gradual-licencas-gratuitas-carbono-industria-faltam-condicoes-descarbonizacao-desindustrializacao-2172542>

¹⁵ <https://diariodarepublica.pt/dr/detalhe/decreto-lei/4-2024-836117866>

¹⁶ <https://portugal.gov.pt/gc25/comunicacao/noticias/portugal-contribui-com-um-milhao-de-euros-no-fundo-florestas-tropicais>

Regarding Portugal's compliance with the Effort Sharing Regulation (ESR) Portugal is significantly "on track" and is an over-achiever under the Effort Sharing Regulation 2018/842 for the 2021-2030 period¹⁷. During the pre-2021 period (2005-2020) Portugal accumulated a surplus of Annual Emission Allocations (AEAs). Under the old Effort Sharing Decision, Portugal's emissions in the non-ETS sectors (transport, buildings, agriculture, waste, small industry) were consistently below its allocated limit. This generated a large bank of compliance credits. Portugal's official position is neither to sell nor to purchase. The proclaimed strategy is to manage the remaining surplus exclusively as a national compliance buffer. Article 5 of the Climate Framework Law explicitly mandates that environmental policy must be guided by the principle of "non-regression" and "integrity."

According to the April 2024 APA projections submitted in the draft National Energy and Climate Plan (PNEC 2030) update, Portugal expects to meet its Effort Sharing Regulation - ESR targets for the entire 2021-2030 period. The official trajectory published by APA shows emissions from the ESR sectors are currently projected to fall below the linear binding trajectory from 2021 to 2030¹⁸.

While aggregate compliance over the whole 2021-2030 period is assured, there are warning signals for specific years towards the end of the decade, particularly if the transport and agriculture sectors do not decarbonize as modelled¹⁹.

The PNEC 2030 and the Roadmap for Carbon Neutrality (RNC 2050) frame the Effort Sharing Regulation - ESR surplus not as a surplus to be sold, but as a contingency reserve to absorb potential shocks from sectors that are particularly difficult to decarbonize in a peripheral economy (namely, the rise in emissions from diesel use in agriculture and the growth of road transport activity linked to tourism and exports). The Independent Technical Commission (CTI) supports this cautious approach, warning that the ESR's new scope (including all buildings) and the phase-out of free allocations in ETS-linked sectors make the post-2030 period much more challenging. Portugal's export-oriented economy and geography make road freight emissions notoriously difficult to abate. GDP growth is directly coupled to diesel consumption in heavy goods vehicles. Record tourism numbers increase emissions from aviation, maritime,

¹⁷ https://climate.ec.europa.eu/eu-action/effort-sharing-member-states-emission-targets/effort-sharing-2021-2030-targets-and-flexibilities_en

¹⁸ https://apambiente.pt/sites/default/files/Clima/Planeamento/20241030_pnec2030_maen.pdf

¹⁹ https://apambiente.pt/sites/default/files/Clima/Planeamento/20241030_pnec2030_maen.pdf

and road traffic. The PNEC 2030 acknowledges that the accelerated growth of tourism-driven mobility is a major risk variable.

Emissions from cattle and agricultural soils have remained practically flat for a decade. Portugal lacks a politically viable strategy to reduce the cattle herd without severely impacting the already fragile rural economy and the "Montado" ecosystem being one of the weakest points in the ESR compliance chain.

- The poor energy performance of the building stock (high heating and cooling demand leading to increased indirect emissions from electricity and direct emissions from gas boilers) poses a new challenge.

7. Renewable Energy

The early coal phase-out in 2021 was a landmark moment, making Portugal one of the first carbon-free power generation systems in Southern Europe.

As of the end of 2023, renewable energy sources accounted for 61% of total electricity consumption, one of the highest shares in Europe. For specific periods (e.g., winter months of 2024), the country has run on 100% renewable electricity for several consecutive days.

7.1. Energy mix

Total Energy Mix (2022/2023 Final Energy Consumption Data)²⁰:

Oil and Petroleum Products: Still the dominant source at ~44% , overwhelmingly used in road transport, aviation, and maritime.

Electricity (Decarbonized): ~28% , with renewables (hydro, wind, solar, biomass) dominating generation, backed by natural gas.

Natural Gas (Direct Use): ~15% , primarily for industrial high-temperature heat and residential heating/cooking.

²⁰ <https://rea.apambiente.pt/content/produ%C3%A7%C3%A3o-e-consumo-de-energia>

Biomass and Renewable Heat: ~10% , crucial for residential heating (pellet stoves and traditional fireplaces) and some industrial processes like cork and ceramics.

Other Renewables (Solar Thermal, Geothermal, Biofuels): ~3% , with solar thermal panels widely deployed for domestic hot water and biofuels blended into road transport.

7.2. Projections Up to 2050

The trajectory is legally defined by the Framework Climate Law and operationalized by the updated PNEC 2030 and RNC 2050²¹.

Targets for Renewable Energy	2030 Target (PNEC 2030)	2045/2050 Target (RNC 2050 & Law 98/2021)
Gross Final Energy Consumption	49%	~100% (Climate Neutrality)
Electricity Generation	85% (aiming for 93-100% in favourable years)	100% (with natural gas plants running exclusively on green hydrogen or biomethane, or fitted with CCS for residual use)
Heating and Cooling	~38%	Predominant electrification via heat pumps, supplemented by solar thermal, biomass, and green gas grids.
Transport	20%	Near-complete electrification of light-duty vehicles, with green hydrogen and advanced biofuels addressing aviation, maritime, and heavy-duty road freight.

7.3. The Electricity Market

The electricity market has undergone a rapid growth due to the attraction of large international consortia financed through Power Purchase Agreements (PPAs) and contracts-for-differences (CfDs) via public auctions.

²¹

https://apambiente.pt/sites/default/files/Clima/Mitiga%C3%A7%C3%A3o/RNBC/RNBC_RESUMO_2050_V03.indd.pdf

The Electricity Market is grid-centric and relies on large-scale infrastructure dominated by massive new solar photovoltaic parks, wind farm, and a new pumped-storage hydropower cycle.

The debate is about managing surplus production, investing in storage (batteries and pumping).

The broader energy market is diffuse, and slow to change.

The transformation requires replacing individual household gas boilers and inefficient wood-burning stoves.

High-temperature industrial heat electrification (ceramics, cement, glass) is technically feasible but too expensive without massive subsidies.

The transport market is slow to replace old petrol cars with electrical ones.

7.4. Major National Regulatory Instruments

The Simplified Environmental Licensing regime ²² ("Environmental Simplex") creates "go-to areas" for solar and wind where environmental impact assessment is streamlined or substituted, alongside a strictly digital one-stop-shop for renewable energy projects.

Solar PV Auctions and contracts-for-differences (CfDs) are system of state-organized tenders guaranteeing a stable price for developers and requiring them to contribute to grid stabilization via a contribution to the National Electric System.²³

The legal regime of Self-Consumption and Renewable Energy Communities²⁴ is fundamental for the energy transition of diffuse production/consumption. It fully transposes the EU RED II, eliminating registration fees for small systems, enabling collective self-consumption in apartment blocks, and allowing energy sharing within geographical proximity, a model being heavily piloted in social housing projects²⁵.

²² https://www.pgdlisboa.pt/leis/lei_mostra_articulado.php?nid=3617&tabela=leis (article 17)

²³ https://www.pgdlisboa.pt/leis/lei_mostra_articulado.php?nid=3536&tabela=leis .

²⁴ <https://www.adene.pt/wp-content/uploads/2022/11/Manual-Digital-Autoconsumo-e-Comunidade-de-Energia-Renovavel-Guia-Legislativo.pdf>

²⁵ https://www.pgdlisboa.pt/leis/lei_mostra_articulado.php?nid=3536&tabela=leis (article 86)

Energy Efficiency Voucher²⁶ is a direct grant programme under the Environmental Fund that gives €1,600 upfront to energy-poor households to install heat pumps or solar PV overcoming the investment barrier in the building sector.

7.5. Major Obstacles to a Faster Transition

1. The grid's transport capacity and licensing delays (the "gridlock"). The high-voltage network (RNT) managed by the National electric network (REN) is not expanding fast enough to absorb the avalanche of gigawatts already licensed in concentrated geographic zones. Investors face a multi-year queue for a grid injection point²⁷.
2. The concentration of large solar parks in the low-density, depopulated regions (such as Alentejo) and wind farms in the northern mountains has generated territorial injustice and strong frictions with local populations. Municipalities and civic movements argue they bear the aesthetic, biodiversity, and land-use costs while the energy and profits flow to the coastal urban regions. A lack of a legally mandated, structured local benefit-sharing model (beyond minor municipal fees) is a major political obstacle now slowing new project approvals.
3. Shortage of specialized installation labor. The national construction and technical services sector lacks qualified installers for heat pumps, PV on rooftops, and advanced insulation systems.

7.6. Adjustments to the EU regulatory framework

Acceleration of Infrastructure Interconnections: Portugal highlights the "punishing delay" in European energy interconnections, particularly for the Iberian Peninsula. The official position stresses that increasing interconnection capacity is essential to reduce energy isolation, improve grid stability, reduce dependence on fossil fuels, and achieve a more resilient, cost-effective energy market²⁸.

²⁶ <https://www.fundoambiental.pt/vale-eficiencia-2-fase/documentacao/regulamento1.aspx>

²⁷ <https://www.aman-alliance.org/Home/ContentDetail/102944>

²⁸ https://ec.europa.eu/commission/presscorner/detail/sk/memo_18_4622

- 2. Reform of State Aid Rules for H2Med project²⁹ wants a specific exemption or a dedicated IPCEI (Important Project of Common European Interest) clause³⁰ that allows joint contracts-for-difference for hydrogen, without being classed as illegal double-subsidization.
- 3. Portugal is starting to advocate for an EU-level structured framework and financial instruments for the phasing-down and decommissioning of natural gas distribution grids³¹.

8. Land use

The main sources of information on the LULUCF sector in Portugal are the official inventories submitted to the UNFCCC³² by the Portuguese Environment Agency (APA)³³, the National Strategy for Forests³⁴, and the Roadmap for Carbon Neutrality (RNC 2050)³⁵.

The Portuguese Environment Agency (APA) is the main body responsible for the inventory. The National System for the Inventory of Emissions by Sources and Removals by Sinks (SNIERPA)³⁶, managed by APA, is the central coordinating entity. For Recording National Emissions Portugal follows the methodologies established by the Intergovernmental Panel on Climate Change (IPCC). The national inventory uses standard of methods and redundant approaches to ensure accuracy. The inventory includes carbon stock changes in various pools, such as biomass, deadwood, litter, and soil organic matter. The National Forestry Accounting Plan Portugal 2021-2025³⁷ proposes a “Forest Reference Level” to be used for accounting of managed forests in Portugal and in the period 2021-2025.

Portugal is sui generis with regard to forest ownership. In fact, only about 3% of the forest land is owned by the State and other Public Administration agencies, the remainder being held by local communities (the “commons” or “baldios” in Portuguese), with about 6%, largely subject to the compulsory Forest Regime Act, and by private owners (92%, 4% of which are managed by industrial companies). The

²⁹ <https://h2medproject.com/the-h2med-project-2/>

³⁰ https://competition-policy.ec.europa.eu/state-aid/ipcei_en

³¹ <https://stagfundmanagement.com/media/how-portugals-energy-transition-serves-impact-investors/>

³² <https://unfccc.int/ghg-inventories-annex-i-parties/2025>

³³ https://apambiente.pt/sites/default/files/Clima/Inventarios/20250509/nid2025_15march.pdf (page 459)

³⁴ <https://files.diariodarepublica.pt/gratuitos/1s/2015/02/02401.pdf>

³⁵ <https://diariodarepublica.pt/dr/detalhe/resolucao-conselho-ministros/107-2019-122777644>

³⁶ <https://apambiente.pt/clima/inventario-nacional-de-emissoes-por-fontes-e-remocao-por-sumidouros-de-poluente-atmosfericos>

³⁷

https://apambiente.pt/sites/default/files/Clima/Mitiga%C3%A7%C3%A3o/Plano%20Contabilidade%20Florestal%20Nacional%202021-2025/National%20Forestry%20Accounting%20Plan_Revised%20version%20january%202020.pdf

family forest holdings number several hundred thousand. These numbers are in strike contrast with the remaining EU Members³⁸.

The National Forest Inventory (IFN) is conducted by the Institute for Nature Conservation and Forests (ICNF) every 10 years (the IFN6 being the most recent baseline, published in 2019³⁹, with IFN7 currently in progress), and provides a georeferenced, statistically robust, plot-by-plot measurement of tree species, diameter at breast height, and biomass across thousands of permanent sampling points. APA uses the carbon stock-difference method on IFN cycles to calculate net removals from forests.

Regarding Land Cover and Land Use Change the COS (Carta de Uso e Ocupação do Solo⁴⁰ is a highly detailed, digital land cover map produced by the Directorate-General for Territory (DGT) since 1995. The 2018 and 2023 COS series, with a Minimum Mapping Unit of 1 hectare, is the primary input for tracking deforestation, afforestation, and urban expansion. APA cross-references COS with the IFN statistically to generate the Activity Data for the UNFCCC inventory.

Emissions from forest fires are calculated mapping the burned area directly from the European Forest Fire Information System (EFFIS) and national MODIS satellite imagery. The greenhouse gas emissions and removals in land and forests reveals that 2017 was an extraordinary year due to the extraordinary fires⁴¹.

The National Statistics Institute (INE) provides the agricultural census data and crop area estimates⁴², and the State laboratory that conducts research activities in the areas of agriculture, veterinary, forestry and rural Development (INIAV) provides soil organic carbon sampling⁴³ from long-term experiments⁴⁴.

³⁸

https://apambiente.pt/sites/default/files/_Clima/Mitiga%C3%A7%C3%A3o/Plano%20Contabilidade%20Forestal%20Nacional%202021-2025/National%20Forestry%20Accounting%20Plan_Revised%20version%20january%202020.pdf

³⁹ <https://www.icnf.pt/api/file/doc/c8cc40b3b7ec8541>

⁴⁰ <https://smos.dgterritorio.gov.pt/cartografia-de-uso-e-ocupacao-do-solo>

⁴¹ <https://www.eea.europa.eu/en/europe-environment-2025/countries/portugal/lulucf-emissions/#footer>

⁴²

https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0004086&selTab=tab0&xlang=pt

⁴³ <https://projects.inia.pt/infosolo/>

⁴⁴ <https://inia.pt/divulgacao-mobile/publicacoes/publicacoes-bd/satellite-based-estimation-of-soil-organic-carbon-in-portuguese-grasslands>

8.1. Key Trends from National Data

The LULUCF profile in Portugal is very instable alternating between being a huge carbon sink and a gigantic carbon source, depending on precipitation and fire.

In catastrophic years—2003, 2005, but especially 2017—the LULUCF sector changed from a net sink to a net source of over 10 million tonnes of CO₂ equivalent (MtCO₂e), entirely nullifying all mitigation gains from the energy and industry sectors in that specific year.

The expansion of *Eucalyptus* plantations (occupying 26% of all forest area) improves the sink in the short-term IFN data. However, this is a distorted carbon sink signal. In practice, as a highly combustible monoculture, *Eucalyptus* creates a systemic risk, acting as a carbon pool waiting to be volatilized.

Urban sprawl and soil sealing in the "peri-urban" areas shows a chronic, relentless trend of converting agricultural land and mixed woodland into urban fragmented land⁴⁵. The data shows a growing rate of permanent land conversion due to tourism development and coastal/suburban sprawl, is eroding the land sink capacity⁴⁶.

8.2. National Strategies to Strengthen the LULUCF Sector

Portugal's compliance strategy under the LULUCF Regulation (2018/841) is moving from passive forest protection to active, interventionist state management. The creation of the Integrated Fire Management System (SGIFR⁴⁷) in 2021⁴⁸ was presented as a paradigm shift. The primary national climate policy for LULUCF is wildfire prevention but now the strategy moved from a reactive, aircraft-based fire-fighting model to a proactive, structural model.

National Rural Fire Management Plan 20-30⁴⁹ is based on planning system and a network of priority areas⁵⁰. The "Fuel Management Network" compels private and state landowners to

⁴⁵ <https://www.dgterritorio.gov.pt/Uso-e-ocupacao-do-solo-em-Portugal-continental-1995-2018>

⁴⁶ https://www.dgterritorio.gov.pt/sites/default/files/ficheiros-artigos/folheto_cos_lq.pdf

⁴⁷ <https://www.sgifr.gov.pt/>

⁴⁸ <https://diariodarepublica.pt/dr/legislacao-consolidada/decreto-lei/2021-172745166>

⁴⁹ <https://www.agif.pt/pt/plano-nacional-de-gestao-integrada-de-fogos-rurais-20-30>

⁵⁰ <https://www.agif.pt/pt/cartografia-das-redes-de-defesa>

create mosaic landscapes of vegetation cuts and prescribed burning corridors around all habitations and roads. This is a direct regulatory intervention to reduce the contiguous biomass.

The primary, secondary and tertiary networks, and the strategic fuel management mosaic areas, are defined by a regulation issued by the ICNF. The minimal stripes to be cut for forest fire prevention are: For buildings: minimum 50m strip from the building; for population agglomerations: minimum 100m outer protection strip; for roads: minimum 10m side strip adjoining the road; for railways: minimum 10m strip from outer rails.

The Landscape Transformation Program⁵¹ is the most ambitious land-use structural reform. It targets the so called "territorial abandonment" that fuels megafires. It is based on integrated Landscape Management Areas (AIGP) in the most fire-prone, and depopulated central and northern regions. Within an AIGP, the state can mediate the forcible aggregation of 10, 20, or 100 absentee micro-owners into a single management entity. The state then offers long-term tax exemptions, direct payments, and risk-capital public support to these entities to replace eucalyptus monoculture with a diversified mosaic of native oak (*Quercus*), cork oak, chestnut, and permanent pasture. The legal innovation is the partial suspension of the extreme fragmentation of "minifúndio" land rights in the name of fire resilience.

For agricultural land (crops and pastures), the national Common Agricultural Policy Strategic Plan (PEPAC 2023-2027⁵²) transposes the LULUCF compliance into income support based on Carbon Farming and Soil Carbon Sequestration. An Eco-scheme for "Soil and Carbon" pays farmers per hectare for adopting conservation agriculture (direct seeding, cover crops, crop rotation with legumes) specifically modelled to increase the soil organic carbon stock in the 0-30cm layer. This is the operational tool to achieve the "no-debit" rule for mineral soils under the EU Regulation.

Portugal is pioneering the explicit accounting blue carbon⁵³ in coastal ecosystems⁵⁴. A national Blue Carbon Strategy maps the carbon stocks in the Sado, Tejo, and Ria Formosa seagrass

⁵¹ <https://diariodarepublica.pt/dr/legislacao-consolidada/resolucao-conselho-ministros/2020-207414766>

⁵² <https://www.gpp.pt/index.php/pepac/pepac-regulamentacao>

⁵³ <https://carbonoazul.pt/>

⁵⁴ <https://www.sciencedirect.com/science/article/abs/pii/S0025326X26003577>

<https://gulbenkian.pt/en/publications/relatorio-cientifico-i-avaliacao-dos-ecossistemas-de-carbono-azul-em-portugal-continental/>

<https://gulbenkian.pt/en/publications/carbono-azul-roteiro-para-um-mercado-voluntario-em-portugal/>

meadows and salt marshes⁵⁵. The strategy aims to make the restoration of these high-density, non-combustible carbon sinks eligible as a formal contribution to offsetting the LULUCF wildfire volatility (although an EU-recognized methodology for trading or fully crediting this toward ESR/LULUCF compliance is still a negotiation priority for Portugal in Brussels).

9. Special National Strategies, Programmes, and Ideas

Beyond the instruments already discussed, Portugal is pursuing a distinct set of national strategies that justified by its peripheral geography, and the social effects of the economic crisis.

9.1. The Green Hydrogen and H2Med Corridor

The EN-H2 (National Hydrogen Strategy⁵⁶) positions Portugal as a hydrogen producer and a European hub for competitive green hydrogen, making use of its renewable electricity surplus. The strategy targets 5.5 GW of electrolyser capacity by 2030, with major production clusters in Sines, Leixões, and Figueira da Foz.

This is tightly integrated with EU policy through the H2Med corridor, a Project of Common Interest (PCI) connecting Portugal-Spain-France-Germany. For Portugal, this is a strategic mechanism to end the historical "energy island" status. The national lobbying focus is on securing EU funding (Connecting Europe Facility⁵⁷, Innovation Fund⁵⁸) and a special Important Project of Common European Interest -IPCEI⁵⁹ status for the Sines energy hub to produce green steel and green ammonia for maritime bunkering.

The explicit link to the European Critical Raw Materials Act: the Sines hydrogen hub⁶⁰ is planned as an integrated industrial cluster where cheap green H2 is directly consumed on-site to process and refine Portuguese and Iberian lithium, creating a Southern European nexus for the EU's battery value chain.

⁵⁵ https://cdn.gulbenkian.pt/wp-content/uploads/2024/06/FCG_BueCarbon_Report-II.pdf

⁵⁶ <https://diariodarepublica.pt/dr/detalhe/resolucao-conselho-ministros/63-2020-140346286>

⁵⁷ <https://projects.research-and-innovation.ec.europa.eu/en/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/restore-our-ocean-and-waters/connecting-europe-facility-cef>

⁵⁸ https://ec.europa.eu/assets/cinea/project_fiches/innovation_fund/101133265.pdf

⁵⁹ https://competition-policy.ec.europa.eu/state-aid/ipcei_en

⁶⁰ <https://www.greenh2atlantic.com/project>

9.2. The "Vale Eficiência" 2.0 and National Energy Poverty Strategy

While many EU states have housing renovation programmes, the Portuguese “Efficiency Voucher” is a particular regulatory concept which decouples the subsidy from the household's co-financing capacity.

A direct grant of up to €1,600 (and in the new phase, covering up to 100% of the cost) given upfront to families in energy poverty to purchase and install heat pumps, solar PV, or advanced insulation. The regulatory innovation is that the state pays the installer directly, bypassing the family's cash-flow constraint entirely. This was massively scaled up under the Recovery and Resilience Plan (PRR).

This is primary implementation tool for the EU's Social Climate Fund and the Renovation Wave in Portugal. The Portuguese delegations in the EU institutions consistently argue that EU funding for energy efficiency in Southern Europe must accommodate this "zero household contribution" model, as the banking system and credit culture in the low-income residential sector do not support loan-based renovation models prevalent in Northern Europe⁶¹.

The integration with the National Energy Poverty Strategy (ENPE 2023-2050)⁶², which legally mandates that public investment in building decarbonization must be geographically targeted, using an "Energy Poverty Vulnerability Index" down to the local level (parish), rather than making it universally accessible.

9.3. The Forest and Territorial "Condominium" and Integrated Landscape Management

To address the LULUCF discussion, the Integrated area of landscape management (AIGP - Área Integrada de Gestão da Paisagem⁶³) is an innovative approach to fragmentation of rural land (very small scale of rural properties). In high-fire-risk, fragmented territories the State creates a legal "condominium" of owners. A single management entity is appointed, with the

⁶¹ <https://portugal.gov.pt/en/gc25/communication/news/european-commission-points-europe-as-an-example-in-energy-renovation-and-fighting-energy-poverty-und>

⁶² <https://www.dgeg.gov.pt/pt/areas-transversais/relacoes-institucionais-e-de-mercado/politica-energetica/estrategia-nacional-de-longo-prazo-para-o-combate-a-pobreza-energetica/>

⁶³ <https://www.dgterritorio.gov.pt/atividades/paisagem/ptp/aigp>

legal power to manage the land of *absent* owners. In return, the state offers an exemption from property taxes (IMI, IMT), free technical projects, and carbon credit revenue sharing.

Relation to EU Policy: This is Portugal's domestic regulatory instrument to achieve the "no-debit" rule of the LULUCF Regulation and the targets of the EU Forest Strategy 2030. It directly tackles the land fragmentation ("minifúndio") problem that makes EU-wide rural development funds ineffective.

The legislation explicitly allows the management entity to aggregate the carbon sink performance of thousands of micro-plots and sell the resulting verified carbon credits on the voluntary market, creating a direct revenue stream for rural areas⁶⁴ and confirming the formal nexus between territorial management and carbon markets.

9.4. Carbon Capture and Storage (CCS) Programme

Portugal does not have a classic offshore North Sea-style geological CCS programme. A national CCS strategy is being actively developed, focused on a different technological choice based on geology.

Portugal does not have large, accessible depleted oil and gas reservoirs or saline aquifers suitable for CCS as in other countries.

The APA and the National Laboratory of Energy and Geology (LNEG) are advancing a pioneering programme focused on the Sines and Alentejo ultramafic massifs. These rock formations (peridotites and serpentinites) react naturally and permanently with atmospheric CO₂ to form solid carbonate minerals⁶⁵. In-Situ Carbon Mineralization (The "Peridotite Strategy") will be driven by a specific project, the "C4G - Centre for Geological Carbon Capture and Storage", to assess the effect of the injection of CO₂-laden water into these rocks, where it will mineralize into solid rock within years.

The PNEC 2030 update includes, for the first time, a chapter acknowledging that post-2045 climate neutrality will require a "residual, negative emissions capacity" from BECCS (Biomass

⁶⁴ <https://www.icnf.pt/noticias/constituicao-de-areas-de-gestao-integradas-a-paisagem-2021>

⁶⁵ <https://www.dgeg.gov.pt/en/vertical-areas/geology/petroleum-co2-geological-storage/carbon-dioxide-geological-storage/>

Energy with Carbon Capture) and direct carbon mineralization to offset agriculture's non-CO2 emissions⁶⁶.

10. Social and Regional Compensation Mechanisms

Portugal has developed some social and regional compensation mechanisms based on targeted subsidies. The subsidy goes to the *solution* (the heat pump, the electric vehicle, the insulated roof) benefiting for vulnerable groups.

The system combines EU-funded instruments with national legal funds.

10.1. The Efficiency Voucher

This is a decarbonization subsidy for buildings, managed by the Environmental Fund. It is not a cash payment to the families but a payment to certified installers of heat pumps, solar PV panels or roof/wall insulation materials for an energy-poor household. The household first applies, then receives a digital voucher, selects an approved technical solution, and the state pays the company directly. The first phase received many criticism because the households had to support the full investment and only later be granted the subsidy provided that all the process was complete and in order. It was not unusual that the families did not receive the reimbursement because the pictures of the roof before and after the intervention were had not been taken. Besides, the certified installers practiced higher prices making the service less affordable. Finally, the public support would cover only a percentage of the cost with the direct consequence that only the rich families could afford to use the efficiency subsidy. In the second phase (2023-2025, supported by the Recovery and resilience plan) raised the voucher to €1,600 and expanded eligibility to cover 100% of the installation cost for the most vulnerable beneficiaries.

Access to the subsidy depends on the vulnerability matrix which relates the social security income data (on the benefits: solidarity elderly complement⁶⁷, and social insertion income) with the Energy Performance Certificate⁶⁸ of the building (classes D or lower).

⁶⁶ https://apambiente.pt/sites/default/files/Clima/20241118_pnec2030_para_aprov_ar.pdf (page 123)

⁶⁷ <https://www.seg-social.pt/ptss/pssd/menu/acao-social/apoios-respostas-sociais/complemento-solidario-idosos>

⁶⁸ <https://www.dgeg.gov.pt/en/vertical-areas/energy/energy-efficiency/sce-energy-certification-system-for-buildings/sce-energy-certification-system-for-buildings/>

10.2. “Reuse” of the revenue generated by the national carbon tax on road fuels

A percentage of the public income generated by the national carbon tax on road fuels is used to fund the "Efficiency check" free public transport passes, and the scrappage scheme for old vehicles.

10.3. The National Energy Poverty Strategy (ENPE 2023-2050)

This strategy, approved in 2023, creates a legal framework for poverty compensation, and establishing a National Energy Poverty Observatory⁶⁹ and local "One-Stop Shops for Energy" in all intermunicipal communities. These are physical offices where citizens can receive integrated services: social tariff application, energy audit, voucher application, and retrofit project management. The ENPE introduced a georeferenced Municipal Energy Poverty Vulnerability Index, which ranks all 308 municipalities by heating/cooling need, building stock quality, and income⁷⁰. This index guides the allocation of public climate investment, effectively creating a regional compensation mechanism that prioritizes the interior and mountainous regions over the richest coastal regions.

10.4. The Scrappage Scheme for Old Vehicles and "Free Public Transport"

The Environmental Fund pays a direct grant (up to €5,000) for the scrapping of a vehicle older than 10-15 years and its replacement with a new or used 100% electric vehicle or a non-motorized alternative.

In major cities (Lisbon, Porto, and now extended to many medium cities), the state has introduced free public transport passes for young people (up to 23 years old, and students up to 26) and senior citizens (65+).

⁶⁹ <https://onpe.pt/>

⁷⁰ <https://onpe.pt/numeros/mapa/>

10.5. The Social Tariff for Energy

The Social Tariff on electric energy and gas⁷¹, is an automatic discount on the electricity and gas bills, applied to all households on minimum social benefits or low incomes (approximately 800,000 households). The objective is to absorb the regressive impact of carbon costs embedded in electricity (via the EU ETS). The Climate Framework Law mandates that this discount must be maintained and extended proportionally as electricity prices incorporate more of the transition cost.

11. Adaptation

Portugal has a multi-level adaptation governance system starting from national strategy and going down to the local regulations. The current framework submitted to the UN in 2021⁷² is the second generation of adaptation strategy, significantly upgraded after the lessons of the 2017 mega-fires⁷³.

11.1. National Adaptation Strategy (ENAA 2020-2030)

The National Strategy for Adaptation to Climate Change (ENAA 2020-2030⁷⁴), was approved by Council of Ministers Resolution 56/2015 updated in 2020 for the period up to 2030⁷⁵ by the Council of Ministers Resolution 53/2020. It is a coordination and knowledge framework. It organizes adaptation across nine priority sectors: Agriculture, Biodiversity, Economy, Energy, Forests, Human Health, Water Resources, Coastal Zone and Transport. For each sector, a dedicated technical working group, coordinated by the relevant ministry and APA, develops specific action lines and indicators.

Besides, all sectoral climate action plans, legally required under the Framework Climate Law, include a mandatory adaptation chapter.

At a lower level, the <https://www.adapt-local.pt/> Portal, is a national online platform fully integrated with the European Climate-ADAPT

⁷¹ <https://www.dgeg.gov.pt/pt/areas-transversais/politicas-de-protecao-ao-consumidor-de-energia/tarifa-social-de-energia/>

⁷² https://unfccc.int/sites/default/files/resource/2021%20Portugal%20ADCOM_UNFCCC.pdf

⁷³ <https://apambiente.pt/clima/politicas-e-medidas-de-adaptacao>

⁷⁴ <https://apambiente.pt/clima/estrategia-nacional-de-adaptacao-alteracoes-climaticas>

⁷⁵ <https://files.diariodarepublica.pt/1s/2020/07/13300/0000200158.pdf>

11.2. Other national frameworks

The National Soil, Territorial and Urban Planning Law (LBPPSOTU) functions as a regulatory adaptation instrument, establishing legally binding land-use restrictions.

The National Ecological Reserve (REN)⁷⁶ Law now includes climate adaptation goals regarding floodplains, aquifer recharge zones, and unstable slopes.

Regional authorities (APA and the CCDRs) have the power to suspend or veto new urbanizations in these zones, a direct command-and-control adaptation measure.

Municipal Master Plans (PDM) must now be revised to incorporate climate adaptation strategies and measures.

Municipal Adaptation Strategies (EMAAC) and Municipal Climate Action Plans have as well been adopted, in accordance with the Portuguese Environmental Agency – APA Guidelines for Municipal Climate Action Plans⁷⁷ and methodological guide for the development of municipal adaptation strategies to climate change⁷⁸.

These are locally specific plans that translate national climate projections into local decisions, such as redesigning stormwater drainage, planting urban cooling corridors, and defining no-build zones in wildfire interface areas.

Intermunicipal Communities (CIMs) are responsible for drafting Intermunicipal Adaptation Plans, which pool resources for transboundary risks (a shared river basin, a continuous mountain for fire risk). This intermediate governance layer is the national innovation, bridging the municipality and the national strategy. The status of adoption of municipal and

⁷⁶ https://www.pgdlisboa.pt/leis/lei_mostra_articulado.php?nid=1058&tabela=leis

⁷⁷

https://apambiente.pt/sites/default/files/_Clima/Planeamento/LBC_Orientacoes_Planos_Municipais_Accao_Climate.pdf

⁷⁸

https://apambiente.pt/sites/default/files/_Clima/Adapta%C3%A7%C3%A3o/0ClimAdaPTLocalManualGuiaMetodologico.pdf

intermunicipal adaptation plans for 200 municipalities and 21 intermunicipal communities can be found here⁷⁹.

There are as well specific operational instruments for water, given that drought is Portugal's most immediate and economically damaging adaptation challenge.

National Water Plan (PNA- AGUA) is a legally binding plan under the Water Law (Lei da Água) that defines ecological flows, inter-basin water transfer rules, and drought contingency hierarchies, giving priority to human consumption over agriculture over irrigation of golf courses⁸⁰.

Desalination and Reuse Programme is a specific investment projects for regions affected by water shortage as the Algarve. A controversial desalination plant⁸¹ was currently under construction but has been suspended recently⁸². The Water Reuse Plant, said to be the largest in Europe⁸³, is also under construction. Both projects have been classified as "adaptation projects of national interest," bypassing normal municipal permitting to accelerate construction.

11.3. Should the EU Develop Adaptation Programmes, or Remain a Member State Responsibility?

From the Portuguese national perspective, articulated in official position papers to the Council and in the PNEC 2030⁸⁴, the EU must develop a substantially more robust and funded adaptation programme, to operate in complementarity with strong national responsibility.

The arguments for stronger EU adaptation action are

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https://apambiente.pt/sites/default/files/_Clima/Adapta%C3%A7%C3%A3o/levantamento%20pmaac_piaac_0.pdf

⁸⁰ <https://apambiente.pt/agua/plano-nacional-da-agua>

⁸¹ <https://aguasdoalgarve.pt/content/estacao-de-dessalinizacao-de-agua-do-mar-edam>

<https://portugal.gov.pt/gc25/comunicacao/noticias/dessalinizadora-de-agua-do-mar-do-algarve-criado-grupo-de-acompanhamento-e-definidas-regras-para-a-sua-utilizacao>

⁸² <https://www.publico.pt/2026/05/04/azul/noticia/providencia-cautelar-suspende-construcao-dessalinizadora-algarve-2173450>

⁸³ <https://www.facebook.com/61559120734751/posts/-a-ministra-do-ambiente-e-energia-visitou-hoje-as-obras-da-%F0%9D%90%84%F0%9D%90%93%F0%9D%90%80%F0%9D%90%91-%F0%9D%90%9D%F0%9D%90%9E-%F0%9D%90%95%F0%9D%90%A2%F0%9D%90%A5%F0%9D%90%9A%F0%9D%90%A6%F0%9D%90%A8%F0%9D%90%AE%F0%9D%90%AB%F0%9D%90%9A-a-m/122217334154304024/>

⁸⁴ https://apambiente.pt/sites/default/files/_Clima/20241118_pnec2030_para_aprov_ar.pdf

1. transboundary risks requiring EU Governance for transboundary river basins. An EU mandate for joint drought management plans for the shared Iberian river basins, enforced by the Commission. The Albufeira Convention with Spain is insufficient without binding EU-level upstream monitoring and agreed minimum ecological flow delivery rules.

2. Adaptation as a Cohesion Policy Imperative: purely national adaptation strategies are insufficient to face escalating climate risks (desertification, megafires, coastal retreat) that their local economies and insurance markets cannot respond to. The position of the Portuguese government is that the EU should create a dedicated "European Adaptation Fund" beyond existing funds⁸⁵ under the next 2028-2034 Multiannual Financial Framework, modelled on a Just Transition Fund logic.

⁸⁵ <https://climate-adapt.eea.europa.eu/pt/eu-adaptation-policy/funding>