

**HELLENIC REPUBLIC
MINISTRY OF ENVIRONMENT
AND ENERGY**

**SUBMISSION OF GREECE OF THE INFORMATION
UNDER ARTICLE 18 OF REGULATION (EU) 2018/1999
concerning the integrated reporting on GHG policies and measures
and on projections**

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1. Introduction

This report constitutes the submission of Greece of the information under the Article 18 of the Regulation on the Governance of the Energy Union and Climate Action (EU) 2018/1999, concerning the integrated reporting on GHG policies and measures and on projections.

2. Mitigation policies and measures, actions and plans

2.1 Policy-making process

The Ministry of Environment and Energy (MEEN) is the main governmental body entrusted with the development and implementation of environmental policy in Greece. MEEN is responsible, among others, for the formulation of policies concerning environmental protection, energy, climate change and forestry, for the coordination of implementation efforts and to ensure compliance with the current legislative framework. For this purpose, MEEN cooperates both with other competent ministries and with regional and local authorities. Other ministries are responsible for integrating environmental policy and climate change targets within their respective fields (see *Table 2.1*).

Table 2.1 *Responsibilities of Ministries concerning issues of environmental policy in Greece*

| Ministries | Responsibilities |
|--|--|
| Ministry of Environment and Energy | Energy policy, Climate change - Control of fuel quality - Management of water resources – Waste management - Industrial pollution — Severe Industrial accidents – Nature conservation - Forest protection and management |
| Ministry of Development and Investments | Economy, infrastructure and industrial development |
| Ministry of Infrastructure and Transport | Infrastructure development and control of transport and networks |
| Ministry of Rural Development and Food | Management of water resources for agricultural use –Implementation of agricultural/environmental measures – Information of farmers on environmental issues |
| Ministry of Foreign Affairs | International environmental obligations |
| Ministry of Labour and Social Affairs | Safety in the environment of work – Risk management in professional places |
| Ministry of Interior | Natural and technological disasters |
| Ministry of Finance | Support of environmental investments - – Energy and Environmental taxation |
| Ministry of Education and Religion Affairs | Environmental education and research |
| Ministry of Tourism | Tourist policy and environment |
| Ministry of Culture and Sports | Conservation of historical and cultural monuments |
| Ministry of Health | Management of environmental risk and hygiene |
| Ministry of Shipping and Island Policy | Environmental management and sustainable development of the islands – Protection of marine environment |

The responsibilities on environmental issues at regional level concern the approval of environmental impact studies and the issuance of decisions on environmental conditions. The responsibilities of regional authorities concern, among others, (a) the development and application of environmental policies and strategies at local level, (b) the adoption of regional Decisions on local environmental issues, and (c) the implementation of the physical planning projects which have been approved by the Ministries. Finally, the municipal and community authorities are responsible for licensing procedures for buildings in urban areas, including specific industrial installations, as well as for issues related to solid waste disposal on land.

Policies and measures, as well as all other issues and actions regarding mitigation were discussed within the framework of an inter-ministerial committee, comprising representatives from all competent Ministries. Final approval of policies and measures related to climate change mitigation rested with the Council of Ministers.

In November 2024, MEEN published the updated Greek National Energy and Climate Plan pursuant to article 3 of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action. The National Energy and Climate Plan (NECP) is the Greek government's strategic plan for climate and energy issues, setting out a detailed roadmap regarding the attainment of specific energy and climate objectives by 2030 and achieving climate neutrality by the year 2050. The NECP stresses Greece's priorities and development potential in terms of energy and addressing climate change and aims to serve as the key tool for drawing up the national energy and climate policy in the next decade, taking into account the Commission's recommendations and the UN sustainable development goals.

2.2 Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures

In response to the emerging evidence that climate change could have a major global impact, the United Nations Framework Convention on Climate Change (henceforth the Convention) was adopted on 9 May 1992 and was opened for signature in Rio de Janeiro in June 1992. Greece signed the Convention in Rio and ratified it in 1994 (Law 2205/94).

In that framework, the third meeting of the Conference of the Parties (COP) to the Convention, held in Kyoto (1-11 December 1997), finalised the negotiations related to the establishment of a legal instrument; the Kyoto Protocol on Climate Change. The Protocol provides a foundation upon which future action can be intensified and introduced, for the first time, legally binding commitments for developed countries to reduce emissions of greenhouse gases. Detailed rules for the implementation of the Protocol were set out at the 7th Conference of the Parties (in Marrakech) and are described in the Marrakech Accords adopted in 2001.

At the first Conference of the Parties serving as the Meeting of the Parties to the Protocol (COP/CMP) held in Montreal (December 2005), the rules for the implementation of the Protocol agreed at COP7 were adopted.

The same COP/CMP established a working group called the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) to discuss future commitments for industrialized countries under the Kyoto Protocol.

The Conference of the Parties (COP) in 2007, by its decision 1/CP.13 (the Bali Action Plan) launched a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012, to be conducted under a subsidiary body under the Convention, the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA).

The Protocol entered into force on 16 February 2005, after its ratification from 141 Parties (with the exception of USA and Australia) including developed countries with a contribution of more than 55% to global CO₂ emissions in 1990.

With respect to the EU target under the 1st commitment period of the Kyoto Protocol (i.e. reduction of emissions at 8% for the period 2008-2012), EU has stated that this will be achieved jointly by EU Member-States under the provisions of Article 4 of the Protocol. The Burden-Sharing agreement between all Member States was finalized during the Environment Council in June 1998 and entered into force with Decision 2002/358/EC concerning the approval, on behalf of the European Community, of the Kyoto Protocol. According to this agreement, Greece is committed to limit its GHG emissions increase for the period 2008 – 2012 to +25% compared to base year emissions (1990 for CO₂, CH₄ and N₂O emissions –

1995 for F - gases). Since the base year emissions of Greece were 106,987,169 t CO₂ eq, the assigned amount was calculated to be 668,669,806 t CO₂ eq ($5 * 1.25 * \text{base year emissions}$). Greece ratified the Kyoto Protocol in 2002 (Law 3017/2002) and adopted a National Programme for achieving its commitment by a decision of the Council of Ministers (DCM5/2003). By Law 3017/2002 the MEEN is designated as the governmental body responsible for the coordination, within its responsibilities, of all other competent ministries and possibly any other public and / or private entities involved, for:

1. the implementation of the provisions of the Kyoto Protocol and
2. the formulation and monitoring of the National Programme for achieving the national targets set under the Kyoto Protocol.

Moreover, with this law it is defined that all issues related to the implementation of the provisions of the Kyoto Protocol, including among others, the establishment of the necessary administrative structures and procedures, enforcement rules, etc. are to be resolved and adopted by Common Ministerial Decisions of MEEN, and other, as appropriate, competent Ministers. The same procedure is to be followed in order to introduce into the national legislation any decisions of the COP and/or CMP or any necessary modifications to the National Programme.

With the Joint Ministerial Decision 54409/2632/2004, the Directive 2003/87/EC “establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC” has been transposed into the Greek legislation. With this Decision, as it was amended lately by the JMD 181478/965/2017 the Division of Climate Change and Air Quality of MEEN is designated as the responsible authority for the implementation of the relative provisions.. This decision also provides for penalties in the case for non-conformity. Any operator who does not surrender sufficient allowances by 30 April of each year to cover its emissions during the preceding year is liable for the payment of an excess emissions penalty. The excess emissions penalty is 100 € for each tonne of carbon dioxide equivalent emitted by that installation, for which the operator has not surrendered allowances. Payment of the excess emissions penalty does not release the operator from the obligation to surrender an amount of allowances equal to those excess emissions when surrendering allowances in relation to the following calendar year. Other penalties such as fines of the range of 3.000 to 15.000 € and / or temporary ban of operation are inflicted to operators applicable to infringements related to GHG emissions permit, emissions monitoring and submission of ETS reports, etc.

In Doha, Qatar, on 8 December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes:

- ✓ New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1 January 2013 to 31 December 2020;
- ✓ A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and
- ✓ Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the first commitment period, 37 industrialized countries and the European Community committed to reduce GHG emissions to an average of five percent against 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020; however, the composition of Parties in the second commitment period is different from the first. The EU and its Member States agreed to a -20% reduction.

With the Law 4345 / 2015, the ratification of Doha Amendment has been transposed to Greek legislation. However, Greece will deposit the instruments of ratification of the Doha Amendment in December 2017, as it was agreed with the other European Union's member states.

Paris Agreement

The Paris Agreement builds upon the Convention and – for the first time – brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort.

The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Additionally, the agreement aims to strengthen the ability of countries to deal with the impacts of climate change. To reach these ambitious goals, appropriate financial flows, a new technology framework and an enhanced capacity building framework will be put in place, thus supporting action by developing countries and the most vulnerable countries, in line with their own national objectives. The Agreement also provides for enhanced transparency of action and support through a more robust transparency framework.

The Paris Agreement requires all Parties to put forward their best efforts through “nationally determined contributions” (NDCs) and to strengthen these efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts.

The EU and its Member States are committed to a binding target of an at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990, to be fulfilled jointly, as set out in the conclusions by the European Council of October 2014.

In 2018, Parties will take stock of the collective efforts in relation to progress towards the goal set in the Paris Agreement and to inform the preparation of NDCs. There will also be a global stocktake every 5 years to assess the collective progress towards achieving the purpose of the Agreement and to inform further individual actions by Parties.

Greece has ratified the Paris Agreement on 13/11/2016 with Law 4426/2016.

In December 2020, as part of the European Green Deal EU leaders have agreed on a more ambitious goal for cutting greenhouse gases - reducing them by 55% by 2030, rather than 40%.

As already mentioned, MEEN is responsible in Greece for the monitoring of the implementation of policies and measures for achieving of the national targets set under the Kyoto Protocol. The general framework for monitoring and evaluation of policies and measures till 2020 was based on the Monitoring Mechanism Regulation of the EU. In May 2013, Regulation No 525/2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change (Monitoring Mechanism Regulation, MMR) was adopted, repealing Decision No 280/2004/EC (Monitoring Mechanism Decision, MMD). The main aims of the new regulation were to improve the quality of the data reported and assist the EU and Member States with the tracking of their progress towards emission targets for 2013 - 2020. The revised mechanism improves the current reporting rules by introducing the following new reporting elements:

- Enhanced information related to GHG inventories;
- Reporting of approximated GHG inventories for the past year by 31 July each year (this will facilitate to obtain an earlier preliminary estimate of GHG emissions of the previous year (year X-1) compared to the regular inventory submission in which the most recent year is X-2)
- The introduction of an EU inventory review;

- The establishment of national and Union systems for the reporting of policies and measures and projections;
- Financial and technical support provided to developing countries;
- Member States' use of revenues from the auctioning of allowances in the EU emissions trading system (EU ETS). Member States have committed to spend at least half of the revenue from such auctions on measures to fight climate change in the EU and third countries.
- Member States' adaptation to climate change.

The MMR was replaced by the Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action for the period 2021-2030. The new Regulation establishes a governance mechanism to:

- (a) implement strategies and measures designed to meet the objectives and targets of the Energy Union and the long- term Union greenhouse gas emissions commitments consistent with the Paris Agreement, and for the first ten-year period, from 2021 to 2030, in particular the Union's 2030 targets for energy and climate;
- (b) stimulate cooperation between Member States, including, where appropriate, at regional level, designed to achieve the objectives and targets of the Energy Union;
- (c) ensure the timeliness, transparency, accuracy, consistency, comparability and completeness of reporting by the Union and its Member States to the UNFCCC and Paris Agreement secretariat;
- (d) contribute to greater regulatory certainty as well as contribute to greater investor certainty and help take full advantage of opportunities for economic development, investment stimulation, job creation and social cohesion.

The Regulation (EU) 2018/1999 contains provisions about the tracking of the progress accomplished towards reaching mitigation targets, including specific templates for the monitoring and evaluation of policies and measures, the reporting of GHG projections, projection parameters and indicators, etc. In addition, it contains provisions for progress reports about the status of integrated national energy and climate plans, national adaptation actions, financial and technology support provided to developing countries, energy security, energy market, energy poverty, research, innovation and competitiveness; and about the monitoring and evaluation of policies and respective targets on renewable energy and energy efficiency.

The main instrument of Greece that sets out a detailed roadmap regarding the attainment of specific energy and climate objectives by 2030 is the National Energy and Climate Plan (NECP). The NECP sets out and describes priorities and policy measures in respect of a wide range of development and economic activities intended to benefit Greek society, and therefore it is a reference text for the forthcoming decade.

The status of ongoing RES projects that are within the first stages of licensing process till operation stage is closely monitored by the Service Department for RES projects investors established at the General Secretariat of Energy and Climate Change of the Ministry of Environment, Energy and Climate Change. Moreover, the monthly production of electricity from renewable sources and installed capacity per RES type is monitored by the National Operator of Electricity Market.

The formulation of climate policy in Greece follows EU policy. A key step towards the formulation and implementation of any EU policy is to carry out an Impact Assessment of the proposed policy or key policy changes. The Impact Assessment outlines a process that prepares evidence for political decision-makers on the advantages and disadvantages of possible policy options. The Impact Assessment is carried out by the Directorate General who takes the lead on a particular policy. The Impact Assessment process is an important element of implementing the EU's commitments under Article 4.2(e) (ii) of the UNFCCC to "identify and periodically review its own policies and practices which encourage activities

that lead to greater levels of anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol than would otherwise occur”.

Information about policies and measures for the reduction of GHG emissions, GHG inventory and projections, legislative arrangements and enforcement and administrative procedures that are in place to meet the national commitments under the Kyoto Protocol are publicly accessible through the following web links:

1. <https://ypen.gov.gr/> (official website of Ministry of Environment and Energy, containing information about national GHG inventories, legislation, emission trading system, national allocation plans, etc., available in greek language).
2. <https://ypen.gov.gr/energeia/> (official website of Ministry of Environment and Energy, containing information about national strategy and policies about energy, renewable energy sources, biofuels, etc., available in greek language).
3. <https://ec.europa.eu/clima/ets/> (official website of Union Registry).
4. <https://unfccc.int/ghg-inventories-annex-i-parties/20201> (UNFCCC website, containing GHG inventories and NC).
5. Information provided through EU’s websites as
<http://cdr.eionet.europa.eu/gr/eu>
<http://dataservice.eea.europa.eu/PivotApp/pivot.aspx?pivotid=475> .

2.3 Policies and measures and their effect

2.3.1 Overarching and cross-cutting supporting Policies for the restriction of GHG emissions

In this chapter a short overview of the most important overarching and cross-cutting supporting policies and tools which are related with the implementation of measures for the restriction of GHG emissions in Greece is presented. Emphasis is given to the Climate Law of Greece, the National Energy and Climate Plan, the establishment of emissions trading system since 2005, and the financing mechanisms and fiscal measures that have been developed to support the implementation of projects which inter alia also contribute to the restriction of GHG emissions. The individual sectoral policies and measures with a direct – quantifiable mitigation effect are presented in Section 2.3.2 and CTF Table 5.

2.3.1.1 National Climate Law

On the 26th of May the first Climate Law was approved by the Greek parliament (Law 4936 / GG 105 / 27-5-2022). The new law aims to provide the framework for gradually reducing greenhouse gas emissions and achieve carbon neutrality by 2050, which is in line with the climate goals of the EU for becoming the first climate neutral continent. The legislation introduced sets interim targets to cut greenhouse emissions at least 55% by 2030 and 80% by 2040, compared to 1990. Thus until 2050 achieve the final goal of zero net emissions. In addition, it requires to cut of dependency of fossil fuels, such as lignite in electricity production, by 2028. However, this target might be reconsidered to 2025, depending on security supplies.

Among others, the new Climate Law includes provisions about electric mobility. In particular, from 1st January 2024 at least a quarter of new private car leases acquired through leasing or purchase will be purely electric or hybrid electric vehicles. From 2026 all new taxis as well as one third of the new rental vehicles will be zero emission vehicles.

Furthermore, from 1st January 2030 new passenger and light commercial vehicles registered will be only zero - emission vehicles. New provisions for buildings were also introduced, such as the prohibition of installation of heating oil boilers from 1st of January 2025 and from the 1st January 2030, only the sale of heating oil mixed with at least 30% percent by volume of renewable liquid fuels will be allowed.

It should also be mentioned that the new Climate Law determines that from 2023 specific corporations, such as banks, telecoms, power suppliers, water and waste utilities, logistics companies and retail businesses with over 500 employees, will need to submit annual reports for their carbon footprint of the previous year. Moreover, initially the climate bill included an obligatory climate risk insurance for new buildings which considered to be located in high-risk areas, meaning areas that can be damaged from fire or floods. However, prior to the law's enactment, the leadership of the Ministry of Environment and Energy proceeded to improvements of the law, accepting some objections that had been expressed. One of the changes was the withdrawal of the article 23 of the compulsory insurance of the buildings located in vulnerable zones.

The Climate Law also includes the creation, in 2024, of a five-year budget for the sectors of power production, industry, transportation, agriculture, buildings, forestry and waste and land use. It is planned that more than 10 billion euros will be invested in expanding the country's power grid by 2030 and in parallel accelerate the development of the sector of renewable energy. In addition, the government, due to the energy crisis, has decided to release to vulnerable citizens a one-off grant for power and gas bills with a total cost of 4 billion euros. The new law also indicates that the country will cover the increases in power bills of the households.

The new Law sets a more ambitious target for 2030 compared to the NECP. The target is set to a total 55% reduction in GHG emissions in Greece in 2030 compared to 1990, instead of 40% according to NECP. The scenarios and the policy contribution to achieve the new target have not been defined, yet. Currently, the NECP is being updated in order to reflect the new target. The new NECP is expected to be published in 2025. Consequently, the estimated effect of mitigation actions and the projections scenarios reported in NC8 and BR5 did not reflect the new more ambitious targets of the Climate Law.

2.3.1.2 National Energy and Climate Plan

The Greek government aims to leverage the National Energy and Climate Plan (NECP) as a cornerstone for shaping the country's energy and climate policy over the next decade, aligning with EU recommendations and the UN Sustainable Development Goals. The NECP outlines priorities and developmental opportunities for addressing energy challenges and climate change, providing a detailed roadmap to achieve specific quantitative and qualitative goals. This roadmap includes targeted policy measures across diverse sectors of the economy, focusing on maximizing benefits for society.

Strategic Goals and Vision

The primary objective of the NECP is to design, plan, and implement socially, environmentally, and economically effective policies to achieve Greece's medium- and long-term energy and climate targets. The plan seeks to drive economic development while addressing key challenges, such as reducing energy costs and protecting consumers from volatile energy prices. The long-term goal is to achieve a climate-neutral economy by 2050, in line with the European Union's vision for a sustainable and resilient energy system. Greece's national targets for 2030 serve as intermediate steps, aligning with EU directives and reflecting the specific characteristics of the national energy system, local technology development potential, and socio-economic conditions.

Pathway to Climate Neutrality by 2050

The NECP emphasizes a transition toward a net-zero energy system by 2050, with near-zero CO₂ emissions from fossil fuels. This includes:

- Balancing greenhouse gas emissions with carbon absorption from natural systems like forests, soil, and seas.
- Achieving interim milestones for 2030, guided by EU frameworks targeting emissions reduction, energy efficiency, and renewable energy integration.

Economic Growth and Social Benefits

The plan envisions enhancing Greece's economic competitiveness, creating new jobs, and empowering consumers through access to competitive energy markets. Investments in green technologies and sustainable practices are expected to deliver long-term economic and social returns.

Priority Areas and Key Actions

1. Accelerating Renewable Energy Deployment

- Expansion of solar and wind energy (including offshore wind farms), aiming to add ~12 GW by 2030, doubling current capacity.
- Utilizing remaining hydropower potential and promoting energy communities led by local governments.
- Strategic development of offshore wind projects, supported by infrastructure and spatial planning.

2. Energy Storage Solutions

- Integrating energy storage systems, such as batteries and pumped hydro, to manage surplus renewable energy, stabilize the grid, and ensure energy adequacy.
- Utilizing demand response systems for added flexibility and grid balancing.

3. Energy Efficiency and Building Renovations

- Scaling up building upgrades, both in pace and scope, with financial facilitation to support deeper renovations.
- Promoting smart energy management systems and behavioral changes to reduce energy demand.
- Industrial commitments to improve energy efficiency and reduce carbon footprints, supported by sector-specific programs for heat pumps, device replacements, and public sector building retrofits.

4. Electrification of Transport

- Expanding electric vehicle (EV) adoption, supported by a nationwide charging network and smart interaction with the grid.
- Transitioning to electrified railways, ports, and airport infrastructure, promoting zero-emission technologies across transportation sectors.

5. Promoting Climate-Neutral Fuels

- Supporting domestic production of sustainable fuels for sectors like shipping and aviation, where electrification is less viable.
- Developing biofuels and biogas production to support decarbonized transport.

6. Green Hydrogen Development

- Establishing infrastructure for renewable hydrogen production, prioritizing its use in heavy industry and transport.

- Promoting hydrogen as a clean alternative for energy storage and industrial processes.

7. Adapting Gas Infrastructure

Ensuring that natural gas networks are progressively adapted for renewable gas integration, avoiding stranded investments while decarbonizing supply chains.

8. Carbon Capture, Utilization, and Storage (CCUS)

- Investing in carbon capture technologies for industries such as cement and petroleum refining.
- Exploring geological CO₂ storage and its use in synthetic fuel production.

9. Driving Innovation and Domestic Industry

- Supporting local industries to develop green technologies and create value chains for renewable energy, hydrogen, and advanced biofuels.
- Providing incentives for industries to reduce their carbon footprint and energy costs.

10. Digitalization and Grid Modernization

- Upgrading electricity grids to manage increased renewable energy penetration, improve resilience, and enhance operational efficiency.
- Implementing digital solutions and smart infrastructure for optimal energy distribution.

11. Adaptation to Climate Change

- Ensuring that energy systems remain resilient to future climate conditions while reducing greenhouse gas emissions.
- Promoting a robust and adaptable energy infrastructure capable of withstanding climate-related disruptions.

Interim Milestones and Policy Framework

The NECP's interim targets for 2030 align with EU legislation, encompassing all energy sectors to drastically reduce greenhouse gas emissions. Regulations and standards aim to guide investments and technological changes, enabling Greece to accelerate decarbonization post-2030. A key intermediate milestone is set for 2040 under Greece's Climate Law, despite the absence of corresponding EU-wide targets for that year.

Broad Societal Impact

The NECP emphasizes collaboration with local governments, industries, and consumers to ensure a just and inclusive energy transition. The government is committed to:

- Enhancing energy security.
- Fostering innovation and competitiveness.
- Supporting consumer rights and affordability.
- Driving Greece toward a sustainable and climate-resilient future.

2.3.1.3 Emissions trading system – aviation – marine bunker fuels

In 2005 the European CO₂ emissions trading system (EU-ETS) started operating. It covers a number of industrial and energy sector installations which exceed specific capacity limits set by Community Directive 2003/87/EC. The major objective of EU-ETS is to help the EU

Member States to achieve their obligations in the frame of the Kyoto Protocol in terms of economic efficiency.

In brief, the basic functional characteristics of the emissions trading system include: (a) the determination of a number of emissions allowances which are allocated a priori in the liable installations based on specific rules, while the above mentioned installations are obliged to hand over emissions allowances in annual base equal to the CO₂ emissions that emitted in the previous year, (b) the total number of allowances for distribution is lower than the emissions that the indebted installations would emit if the trading system did not exist, so that the created closeness of allowances constitutes an incentive for emissions reductions, (c) in the first and second implementation period (2005-2007 & 2008-2012) the trading of allowances is limited to CO₂ and in installations of specific industrial sectors which exceed the predetermined capacity limits (in the future according to Directive 29/2009/EC amending Directive 2003/87/EC the system will include also other gases and sectors), (d) the distribution of emissions allowances is made on the basis of a National allocation plan which is formulated, placed on consultation and is completed before the beginning of the trading period, (e) a strict framework for monitoring and compliance enforcement of the liable installations is put in place which provides for substantial fines in case on non-compliance, and (f) all the transactions of emissions allowances are recorded in national and interconnected community-wide Registries.

In Greece, the trading system for the period 2008-2012 comprises 140 industrial installations (power plants, refineries, cement plants etc.). An allowance reserve is also created which is intended to cover possible unknown new entrants in the period. According to the 2nd National Allocation Plan (NAP), the allowances of CO₂ emissions that are to be allocated to installations included in the EU-ETS (including the reserve) were fixed to 341.547.710 t CO₂, which requires a considerable decrease of emissions by the enterprises that participate in the system. It is estimated that this decrease of emissions or, with other words, the effect of ETS supporting policy is a 16.7% reduction or 69.2 Mt of CO₂ emissions of ETS installations for the period 2008-2012. Since ETS is a supporting policy, the emissions reduction target is implemented by applying other policies and measures as NG use, RES, CHP etc. So, its effect is not additional to the sum of the other policies and measures.

In 2013, the EU ETS moved in its third phase, running from 2013 to 2020. A major revision in order to strengthen the system means the third phase is significantly different from phases one and two and is based on rules which are far more harmonized than before. The main changes are:

- A single, EU-wide cap on emissions applies in place of the previous system of 27 national caps of each EU Member State;
- Auctioning, not free allocation, is now the default method for allocating allowances. In 2013 more than 40% of allowances will be auctioned, and this share will rise progressively each year. In Greece no free allowances will be allocated to the power sector;
- For those allowances still given away for free, harmonised allocation rules apply which are based on ambitious EU-wide benchmarks of emissions performance. Manufacturing industry will receive 80% of its allowances for free in 2013, a proportion that will decrease in linear fashion each year to 30% in 2020. Sectors facing carbon leakage will receive higher share of free allowances. According to “Benchmarking Decision” 2011/278/EU, installations that meet the benchmarks, i.e. they are among the most efficient in the EU, will in principle receive all the allowances they need. Those that do not reach the benchmarks will receive fewer allowances than they need. These installations will therefore have to reduce their emissions, or buy additional allowances or credits to cover their emissions, or combine these two options. The continued provision of some free allowances limits costs for EU industries in relation to international competitors. Sectors and sub-sectors facing competition from industries outside the EU which are not subject to

comparable climate legislation will receive a higher share of free allowances than those which are not at risk of such “carbon leakage.”

- Some more sectors and gases are included, as nitrous oxide emissions from the production of certain acids (i.e. nitric, adipic, glyoxal and glyoxylic acids) and emissions of perfluorocarbons from aluminum production.
- Monitoring and reporting: the reform to the EU ETS in Phase III has resulted in important changes with regards to domestic institutional arrangements for the monitoring and reporting of GHG emissions under the EU ETS. EU ETS MRV will be required to comply with two new Commission Regulations from the Phase III of the EU ETS onwards, one specific to monitoring and reporting and the other to verification and accreditation. The latter introduces a framework of rules for the accreditation of verifiers to ensure that the verification of operator’s or aircraft operator’s reports in the framework of the Union’s greenhouse gas emission allowance trading scheme is carried out by verifiers that possess the technical competence to perform the entrusted task in an independent and impartial manner and in conformity with the requirements and principles set out in this Regulation. These regulations have direct legal effect in the Member States as there is no need to transpose and implement in national legislation since the provisions apply directly to operators or aircraft operators, verifiers, and accreditation parties. The regulations provide clarity on the roles and responsibilities of all parties (i.e. industrial installations and aircraft operators are required to have an approved monitoring plan) which will strengthen the compliance chain.

The European Commission adopted in March 2018 the Directive (EU) 2018/410 in order to revise the EU emissions trading system (EU ETS) for the period after 2020. This is the first step in delivering on the EU's target to reduce greenhouse gas emissions by at least 40% domestically by 2030 in line with the 2030 climate and energy policy framework and as part of its contribution to the Paris Agreement.

To achieve the at least 40% EU target, the sectors covered by the ETS have to reduce their emissions by 43% compared to 2005. To this end, the overall number of emission allowances will decline at an annual rate of 2.2% from 2021 onwards, compared to 1.74% currently. This amounts to an additional emissions reduction in the sectors covered by the ETS of some 556 million tonnes over the decade – equivalent to the annual emissions of the UK.

The Market Stability Reserve (MSR) - the mechanism established by the EU to reduce the surplus of emission allowances in the carbon market and to improve the EU ETS's resilience to future shocks – will be substantially reinforced. Between 2019 and 2023, the amount of allowances put in the reserve will double to 24% of the allowances in circulation. The regular feeding rate of 12% will be restored as of 2024. As a long-term measure to improve the functioning of the EU ETS, and unless otherwise decided in the first review of the MSR in 2021, from 2023 onwards the number of allowances held in the reserve will be limited to the auction volume of the previous year. Holdings above that amount will lose their validity.

The revised EU ETS Directive provides predictable, robust and fair rules to address the risk of carbon leakage. The system of free allocation will be prolonged for another decade and has been revised to focus on sectors at the highest risk of relocating their production outside of the EU. These sectors will receive 100% of their allocation for free. For less exposed sectors, free allocation is foreseen to be phased out after 2026 from a maximum of 30% to 0 at the end of phase 4 (2030). A considerable number of free allowances will be set aside for new and growing installations. This number consists of allowances that were not allocated from the total amount available for free allocation by the end of phase 3 (2020) and 200 million allowances from the MSR.

More flexible rules have been set to better align the level of free allocation with actual production levels:

- ✓ Allocations to individual installations may be adjusted annually to reflect relevant increases and decreases in production. The threshold for adjustments was set at 15%

and will be assessed on the basis of a rolling average of two years. To prevent manipulation and abuse of the allocation adjustment system, the Commission may adopt implementing acts to define further arrangements for the adjustments.

- ✓ The list of installations covered by the Directive and eligible for free allocation will be updated every 5 years.
- ✓ The 54 benchmark values determining the level of free allocation to each installation will be updated twice in phase 4 to avoid windfall profits and reflect technological progress since 2008.

Overall, more than 6 billion allowances are expected to be allocated to industry for free over the period 2021-2030.

Several low-carbon funding mechanisms will be set up to help energy-intensive industrial sectors and the power sector meet the innovation and investment challenges of the transition to a low-carbon economy. These include two new funds:

- ✓ The Innovation Fund will support the demonstration of innovative technologies and breakthrough innovation in industry. It will extend existing support under the NER300 programme. The amount of funding available will correspond to the market value of at least 450 million emission allowances.
- ✓ The Modernisation Fund will support investments in modernising the power sector and wider energy systems, boosting energy efficiency, and facilitating a just transition in carbon-dependent regions in 10 lower-income Member States.

As part of the 2023 revisions to the ETS Directive, a new emissions trading system, ETS2, was introduced, operating separately from the existing EU ETS. This system targets CO₂ emissions from fuel combustion in buildings, road transport, and smaller industries not covered by the original EU ETS, addressing sectors where emission reductions have been insufficient to support the EU's 2050 climate neutrality goals.

ETS2 is designed to complement the policies of the European Green Deal and assist Member States in achieving their obligations under the Effort Sharing Regulation (ESR). By introducing a carbon price in these sectors, ETS2 creates a market incentive for investments in energy-efficient building renovations and low-emission mobility solutions, contributing to long-term decarbonization.

Scheduled to become fully operational in 2027, ETS2 will function as a cap-and-trade system but will focus on upstream emissions. Fuel suppliers, rather than end users such as households or car owners, will be responsible for monitoring, reporting, and offsetting their emissions by purchasing allowances at auction and surrendering enough to cover their output. The cap is set to reduce emissions by 42% by 2030 compared to 2005 levels.

All emission allowances under ETS2 will be auctioned, with a portion of the revenues allocated to a dedicated Social Climate Fund (SCF) to support vulnerable households and micro-enterprises. Member States must direct the remaining revenues to climate and social initiatives and are required to report on their expenditure to ensure accountability. By integrating these mechanisms, ETS2 aims to drive significant emission reductions while supporting a fair and inclusive energy transition.

Aviation

To tackle aviation emissions, Greece is implementing and planning a range of technical and operational measures. These include the adoption of sustainable aviation fuels, advancements in airframe and engine technology, and optimizations in operational efficiency. Additionally, efforts to shift to less emission-intensive modes of transport, such as rail, and initiatives to reduce the demand for travel—such as promoting videoconferencing—are pivotal in curbing emission growth. Together, these strategies aim to significantly reduce emissions over the next decade, aligning with and contributing to the EU's broader climate neutrality goals.

All sectors, including aviation, must contribute to achieving the EU's ambitious climate targets. Since 2012, the EU Emissions Trading System (ETS) has included aviation, requiring airlines operating in Europe, both European and non-European, to monitor, report, and verify their emissions while surrendering allowances to cover them. These allowances, which are tradeable, are allocated annually to cover a portion of their emissions, with the rest acquired through auctions.

In 2019, the EU launched the European Green Deal, committing Europe to climate neutrality by 2050. Achieving this goal requires a 90% reduction in transport emissions by mid-century compared to 1990 levels. Aviation plays a key role in this effort. During the third ETS trading period (2013-2020), the sector helped reduce emissions in other industries by approximately 160 million tonnes, with compliance rates exceeding 99.5%.

Initially, the ETS covered emissions from all flights to, from, and within the European Economic Area (EEA). However, to support the development of the International Civil Aviation Organisation's (ICAO) global measure, CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation), the EU temporarily limited the ETS to intra-EEA flights. This limitation has been extended several times, with the latest extension lasting until 2027. By mid-2026, the European Commission will evaluate whether additional measures are needed for flights to and from Europe, potentially expanding the ETS scope or maintaining its current focus if CORSIA proves effective and widely implemented.

The EU has also linked its ETS with Switzerland's system under a "one-stop-shop" approach, streamlining compliance for airlines operating in both systems. Flights arriving from Switzerland and the UK are exempt from the EU ETS, as they fall under their respective national systems. Adjustments have been made to free allocation and administrative oversight to align these systems seamlessly.

In 2021, the European Commission proposed a revision of the ETS for aviation to align with the EU's intermediate goal of reducing greenhouse gas emissions by 55% by 2030 compared to 1990 levels. This revision includes phasing out free allowances, moving to full auctioning by 2026, and strengthening the linear reduction factor to cut emissions more rapidly. Free allocations will decrease by 25% in 2024 and 50% in 2025, with the remaining distributed based on 2023 emissions.

To support the use of sustainable aviation fuels (SAFs), 20 million ETS allowances (equivalent to €1.6 billion at €80 per allowance) will be allocated from January 2024 to offset the price gap between conventional and alternative fuels. Levels of support vary, covering up to 100% of the price difference for SAFs uplifted at small airports or remote regions, and offering 50-95% support for fuels uplifted elsewhere. Only fuels used on flights subject to ETS obligations qualify for this funding.

Marine bunker fuels

Since January 2024, the EU Emissions Trading System (EU ETS) has been extended to include CO₂ emissions from all large ships (5,000 gross tonnage and above) entering EU ports, regardless of their flag. This expansion aims to address the environmental impact of maritime transport and aligns the sector with the EU's climate objectives.

The system applies to:

- 50% of emissions from voyages starting or ending outside the EU, allowing non-EU countries to decide on measures for the remaining emissions.
- 100% of emissions from voyages between EU ports and emissions generated within EU ports.

Initially covering only CO₂ emissions, the system will also include methane (CH₄) and nitrous oxide (N₂O) emissions starting in 2026. Maritime emissions are incorporated into the broader ETS cap, which limits the total greenhouse gases permissible under the system. This cap decreases over time, incentivizing energy efficiency, adoption of low-carbon solutions, and narrowing the cost gap between alternative and conventional fuels.

The maritime extension builds on established ETS provisions and the revised EU Monitoring, Reporting, and Verification (MRV) Regulation for maritime transport. Shipping companies are required to purchase and surrender ETS allowances for each tonne of CO₂-equivalent emissions within the system's scope. EU Member States' authorities are responsible for ensuring compliance, following rules similar to other ETS sectors.

To facilitate a smooth transition, shipping companies will initially surrender allowances for only a portion of their emissions:

- 40% of emissions reported for 2024, with the first compliance deadline in September 2025.
- 70% of emissions reported for 2025.
- 100% of emissions from 2026 onwards.

A reporting and review clause ensures ongoing monitoring of the system's implementation and considers developments at the International Maritime Organization (IMO). These regulations were formally adopted on 16 May 2023 and came into force on 5 June 2023, marking a significant step in integrating maritime transport into the EU's comprehensive emissions trading framework.

In addition to the EU-ETS, the International Maritime Organization (IMO) revised its greenhouse gas (GHG) emissions reduction strategy in July 2023, significantly increasing its ambition compared to the 2018 framework. The new 2023 strategy sets a goal of achieving net-zero emissions from ships "by or around 2050," a notable shift from the previous target of a 50% reduction by mid-century.

The revised strategy establishes a clear trajectory with key milestones: GHG emissions from ships are to be reduced by at least 20% (striving for 30%) by 2030 and at least 70% (striving for 80%) by 2040, compared to 2008 levels. Additionally, it includes a target for the uptake of zero- or near-zero GHG emission technologies, fuels, and energy sources, aiming for at least 5% adoption (striving for 10%) by 2030.

This enhanced strategy considers the full lifecycle GHG emissions of marine fuels, aiming to reduce emissions across the entire energy system of international shipping. To achieve these ambitious targets, the IMO has committed to adopting additional measures by 2025. These measures will include a standard to progressively reduce the GHG intensity of marine fuels and the introduction of a maritime GHG emissions pricing mechanism.

The development of these measures will be guided by a comprehensive impact assessment to ensure their effectiveness in reducing emissions, while fostering a level playing field and a fair, inclusive transition that leaves no stakeholders behind.

2.3.1.4 Financing mechanisms

A key instrument supporting the investments outlined in the NECP plan, particularly in specific categories, is the 2021-2027 programming period. This framework prioritizes and designs appropriate financial programs based on available resources. The "**Partnership Agreement for Regional Development 2021-2027**" (ESPA 2021-2027) reflects the new priorities of the European Commission and Greece's developmental goals for the coming years. Approved by the European Commission on July 29, 2021, ESPA is governed by Law 4914/2022, which outlines management, monitoring, and implementation provisions for the 2021-2027 programming period. Total available resources amount to €26.2 billion, with €20.9 billion from EU funding and €5.3 billion from national contributions, distributed across the European Social Fund, the European Regional Development Fund (ERDF), the Cohesion Fund, and the European Territorial Cooperation Fund.

For countries with gross national income below 75% of the EU average, at least 30% of ERDF resources are allocated to "Policy Objective 2," which addresses energy, climate, and environmental goals. Additionally, 6% of ERDF funds will support sustainable urban development, while 37% of Cohesion Fund resources are earmarked for Policy Objective 2.

Under ESPA, public resources (EU and national) allocated to Policy Objective 2 for 2024-2030 are estimated at €7.5 billion.

Projects and actions in the energy and climate change sector fall predominantly under Policy Objective 2. Key investment priorities supported by the ERDF and the Cohesion Fund include:

1. Promoting energy efficiency.
2. Expanding renewable energy sources (RES).
3. Developing smart energy systems, grids, and local storage solutions.
4. Advancing climate change adaptation and disaster resilience.
5. Enhancing sustainable water management.
6. Fostering the transition to a circular economy.
7. Protecting biodiversity, developing green infrastructure, and reducing pollution.

Certain restrictions, as outlined in Article 6 of the ERDF and Cohesion Fund regulations, exclude funding for investments related to fossil fuel production, processing, distribution, or combustion. The focus is instead on projects contributing to a low-carbon economy, such as energy efficiency in buildings, renewable energy projects (solar, wind, biomass, marine, and geothermal), smart energy distribution systems, high-efficiency cogeneration, and district heating and cooling. Additionally, measures to mitigate climate-related risks, manage water resources, promote waste recycling, and support circular economy initiatives are included.

Infrastructure projects for electricity transmission, particularly island interconnections, are prioritized to facilitate RES development. Interventions also promote the just transition of lignite regions and support circular economy advancements. Under Policy Objective 3, investments in "clean urban transport infrastructure," including urban e-mobility solutions, are also encouraged, contributing to a broader, sustainable development framework.

As part of the EU's long-term budget for 2021-2027, the **InvestEU program**, under its "Sustainable Infrastructure" policy area, provides funding opportunities for energy-related projects. These funds, which support loans and guarantees, are expected to continue leveraging resources significantly in the 2025-2030 period. Energy sector investments can also be supported under *Policy Objective 1*, which covers research and innovation (e.g., advanced energy storage systems, new materials), entrepreneurship (e.g., energy upgrades for SMEs), and information and communication technologies (e.g., digital energy data enterprises).

National resources from the **Public Investment Program (PIP)** are another funding source for the National Energy and Climate Plan (NECP). The *National Development Program (NDP)* prioritizes energy and climate projects within the framework of Greece's developmental goals, ensuring complementarity with EU co-financed interventions and alignment with Greece's commitments.

Additional funding for energy and climate actions is also available through the Agricultural Policy Program (CAP). The reformed **Common Agricultural Policy (CAP)**, effective January 1, 2023, supports a fairer and greener agriculture sector in line with the European Green Deal, Farm-to-Fork Strategy, and Biodiversity Strategy. Greece's 2023-2027 *National Strategic Plan for CAP*, approved on November 21, 2022, emphasizes sustainable agriculture and forestry practices, aiming to mitigate climate change, manage natural resources effectively, and protect biodiversity. The CAP allocates €3.1 billion for 2025-2030 investments, focusing on measures such as optimizing fertilizer use, promoting organic farming, and improving livestock feed.

The **Connecting Europe Facility (CEF)** mechanism also supports significant energy infrastructure projects, including Projects of Common Interest (PCIs). Future expansions of eligible projects will include cross-border renewable energy collaboration and smart grid applications, further enhancing energy sector integration.

Tax policy will play a key role in the green transition, reflecting the true cost of resources while addressing social and environmental externalities. By internalizing these costs and

encouraging behavioral changes, tax reforms aim to promote fair and sustainable competition, supporting Greece's path to a green economy.

The **Recovery and Resilience Facility (RRF)** is the EU's largest financial program to date, designed to mitigate the socio-economic impact of the COVID-19 pandemic. With a budget of up to €723.8 billion in grants and loans to be disbursed by 2026, it supports member states' recovery plans. Greece's *National Recovery and Resilience Plan*, titled *Greece 2.0*, was approved on July 13, 2021, and includes 106 investments and 68 reforms across four pillars: Green Transition, Digital Transformation, Employment-Skills-Social Cohesion, and Private Investment-Economic Transformation. It mobilizes €31.16 billion in funding (€30.5 billion from EU resources), aiming to generate €60 billion in total investments by 2026. The *Green Pillar* alone has secured €6.2 billion in grants, with an additional €9 billion in energy-related investment loans, supported by €3.7 billion from the RRF. Notably, 60% of submitted loan projects—totaling €18.5 billion—come from SMEs, broadening the scope and accessibility of funding.

The *REPowerEU* initiative, introduced in 2022, aims to reduce the EU's dependence on Russian fossil fuels, with a €20 billion budget through 2027. Greece submitted its revised *Greece 2.0* plan to the European Commission on August 31, 2023, incorporating new investments and reforms under REPowerEU. This revision includes €795 million in EU funding and a request for an additional €5 billion in loans to meet high private sector demand. The updated plan emphasizes energy efficiency for households, businesses, and public institutions; renewable energy storage; and innovative projects such as biomethane, green hydrogen production, and carbon capture and storage (CCS) technologies. Additional reforms target land-use optimization for renewable energy development, increased grid capacity, and energy storage expansion, fostering greater energy autonomy and climate resilience.

As part of Greece's 2030 climate goals, the Ministry of Environment and Energy, in collaboration with DG Clima and the European Investment Bank (EIB), established the **Decarbonization Fund for Islands**. This financing mechanism utilizes revenues from the auctioning of 25 million tons of unallocated CO₂ allowances. It supports the transition of non-interconnected islands to cleaner energy systems through projects such as hybrid renewable energy installations with storage, accelerated electrification and grid interconnection, multi-purpose dams and reservoirs, and infrastructure for electric vehicle charging and shore-side power for docked ships. The fund aligns with the *National Climate Law* (Law 4936/2022) and will provide approximately €2.3 billion in funding from 2024 to 2030, with an estimated total expenditure of €5.6 billion depending on carbon prices.

The **Just Transition Fund**, part of the EU Green Deal, aims to ensure an equitable green transition by mobilizing at least €100 billion between 2021 and 2027. It supports workers and citizens in regions heavily affected by the shift away from high-carbon activities. In Greece, the *Just Development Transition Plan* (JDTP) focuses on lignite-dependent regions like Western Macedonia and the Municipality of Megalopolis, fostering economic regeneration and job creation. Funding, including private resource leverage, exceeds €5 billion from EU and national sources, supporting investments in renewable energy, energy efficiency, and job creation to build resilient local economies.

The **Social Climate Fund** aims to support vulnerable households, micro-enterprises, and public transport users in mitigating the expected rise in energy and transport costs following the expansion of the EU ETS to these sectors. Active between 2026 and 2032, Greece will access approximately €3.37 billion by submitting a *Social Climate Plan* outlining measures and investments to alleviate social impacts. The fund focuses on reducing dependency on fossil fuels through building energy efficiency improvements, decarbonizing heating and cooling systems, and promoting low- or zero-emission mobility solutions.

The **Innovation Fund** is one of the EU's largest programs supporting low-carbon technologies. It funds projects in innovative industrial processes, carbon capture and utilization (CCU), carbon capture and storage (CCS), renewable energy, energy storage, and

zero-emission mobility. The fund is financed by auctioning ETS allowances, potentially reaching €38 billion depending on carbon prices. Enhancements in 2023 include expanding its scope to new sectors like shipping and aviation, introducing medium-scale projects, and adopting the *Do No Significant Harm* principle from 2025. This fund is pivotal for achieving carbon neutrality by 2050 and aligning with the Paris Agreement goals.

Part of the EU's *Fit for 55* package, the **Modernization Fund** supports energy system upgrades and efficiency improvements in member states with lower per capita GDP. Greece, now eligible for this fund, will receive 10.1% of its total allocation, equivalent to €1.85 billion from 2024 to 2030. It finances renewable energy investments, energy efficiency projects, storage solutions, and grid development, while fostering a just transition in carbon-intensive regions. Investment proposals submitted to the European Investment Bank (EIB) and a designated committee will be evaluated for funding, ensuring alignment with state aid rules.

The integration of national programs, such as the *Electra Program* and the *National Development Program* (Law 4635/2019), with European funding mechanisms creates a comprehensive framework for supporting Greece's transition to a low-carbon economy. These programs fund complementary actions in energy efficiency, renewable energy sources (RES), and energy infrastructure. Additionally, market mechanisms, such as Green Pools, bilateral power purchase agreements (PPAs), on-bill financing, regulatory frameworks, and energy-saving auctions, further mobilize resources for related projects.

Public funding remains a cornerstone for decarbonization and energy transition efforts, offering financing opportunities to both public and private sectors. The implementation of the updated National Energy and Climate Plan (NECP) accelerates the activation of targeted funds, emphasizes alignment with set goals, and fosters synergy between funding sources to maximize the utilization of European funds. Simultaneously, mobilizing private sector resources—including contributions from foreign investors and international financial institutions—through innovative financing mechanisms such as green bonds and loans, plays a pivotal role in achieving sustainability goals.

The design and development of new financing tools outlined in the revised NECP, combined with optimal leverage of available resources and private capital mobilization, are expected to generate significantly higher investment volumes than those provided solely through public funding. This approach is crucial for meeting Greece's energy and climate policy targets, driving substantial progress in sustainable development and the green transition.

The **revenues generated from the auctioning of emissions allowances under the EU Emissions Trading System (ETS)** for stationary installations, aviation, and shipping (ETS 1), along with the upcoming extension to buildings and transport sectors (ETS 2), are expected to significantly bolster Greece's energy transition efforts during the 2025-2030 period.

The revised EU Directive 2023/959 mandates that 100% of ETS auction revenues must be allocated to climate and energy objectives, ensuring investments directly support the green transition. Greece consistently complies with this requirement, directing all ETS revenues to areas such as renewable energy, energy efficiency, electric mobility, climate adaptation, skills development, and the just transition of regions affected by lignite phaseout. These funds also support businesses vulnerable to carbon leakage and ETS management. Estimated revenues from ETS 1 auctions are projected at €6.9 billion during 2025-2030, assuming an average carbon price of €80 per ton of CO₂ equivalent.

The new ETS 2 system, set to launch in 2027 (or 2028 under some scenarios), extends coverage to buildings, road transport, and additional sectors. Revenues from ETS 2 are expected to total €2.1 billion for 2027-2030, or €1.8 billion if delayed to 2028, based on an average carbon price of €45 per ton. These funds will serve similar purposes as ETS 1 revenues but will prioritize addressing the social impacts of the new system. The allocation of ETS 2 revenues will be further detailed through the development of Greece's *National Social Climate Plan*.

The **Green Fund** is an idea that was implemented by Law 3889/2010 and aims to raise funds for the environment. More specifically, this fund aims to enhance development through environmental protection, enhancement and restoration of the environment, climate change and support of the national environmental policy.

2.3.1.5 Fiscal measures

In Greece, taxation on energy products, vehicle registration and usage, and corporate income is structured to align with both national policies and European Union directives, with an emphasis on promoting environmental sustainability and renewable energy.

Energy products are taxed under the EU Energy Taxation Directive (Directive 2003/96/EC), transposed into Greek law through Law 3336/2005 and the National Customs Code (Law 2960/2001). Current tax rates on energy products exceed the EU's minimum thresholds. Fuels used for electricity generation are also taxed, except for coal, lignite, coke, and natural gas. Revisions to this directive are planned under the European Green Deal to further encourage sustainability.

For vehicles, registration tax is based on the taxable price, CO₂ emissions, and anti-pollution technology. Hybrid vehicles pay 50% of the registration tax, while electric vehicles are fully exempt. Road tax, levied annually, is determined by engine capacity for vehicles registered before October 31, 2010, and CO₂ emissions for those registered afterward. Hybrid vehicles registered before this date are exempt up to 1,549 cc and subject to 60% of the road tax for conventional vehicles if over this threshold.

Corporate income tax includes exemptions aimed at fostering renewable energy and waste management. Organizations classified as "Alternative Management Systems," involved in the reuse and recycling of materials, enjoy tax exemptions on specific revenues. Additionally, income from selling electricity produced by small photovoltaic systems under the "Special Program for Photovoltaic Systems" is exempt. The new development law (4399/2016) provides investment subsidies for renewable energy projects, including small hydro plants, high-efficiency co-generation, and district heating and cooling systems. These measures aim to promote low-carbon technologies and renewable energy development in Greece.

More information could be found in the NC8 of Greece.

2.3.1.6 Local authorities contribution to mitigation of climate change adverse effects

Local authorities have a key role in mitigating climate change, since:

- Over half of greenhouse gas emissions are created in and by cities.
- 80% of the population lives and works in cities, where up to 80% of energy is consumed.
- Local authorities, being the closest administration to the citizens are ideally positioned to understand their concerns.

For that reason, the European Commission commenced an ambitious initiative and/or voluntary effort, named "The Covenant of Mayors", which gives the lead to Europe's pioneering cities to mitigate climate change through the implementation of intelligent local sustainable energy policies that create stable local jobs, increase citizens' quality of life and address crucial social issues. The Covenant of Mayors constitutes a formal commitment to go beyond the EU objectives in terms of CO₂ reduction, through the implementation of sustainable energy action plans with concrete measures.

Signatories to the Covenant commit to submitting their local Sustainable Energy Action Plans (SEAPs) within the year following adhesion. These cities are then expected to provide periodic public reports outlining the progress of their Action Plans. Cities also commit to allocating sufficient human resources to the tasks, mobilising society in their geographical areas to take part in the implementation of the action plan, including organisation of local energy days, and networking with other cities.

More information about the “The Covenant of Mayors” can be found at the link: <http://www.eumayors.eu/>. As concerns Greece, till now more than 230 greek cities (among others Aigaleo, Ios, Kea, Korthi, Lamia, Likovrisi, Lipsi, Milos, Moudros, Nisyros, Oia, Patras, Poseidonia, Ptolemaida, Serres, Skyros, Sykies, Thermi, Trikala) and 1 supporting network of cities (Network of Aegean Islands for Sustainability, DAFNI) have joined the Covenant.

The mitigation actions of climate change that are planned and executed at a local authority level comprise of:

- Traffic studies and reorganization of public transport (use of environment friendly vehicles, etc.).
- Incorporation of RES projects in regional development plans. Introduction of RES systems in public buildings and/or installations running by local authorities. Use of photovoltaic lights for municipal lighting.
- Close co-operation with NGOs as WWF, Greenpeace, etc. in order to raise public awareness.
- Replacement of conventional lamps with energy efficient ones in public buildings.
- Use of eco-friendly paints and solvents.
- Implementation of infrastructure projects and interventions in order to improve energy efficiency in desalination plants and other installations running by local authorities (e.g. reduce consumption of reactive power, energy recovery by turbines installation etc.).
- Use of tertiary treatment in waste water treatment plants and re-use of effluent for irrigation of croplands instead of using water from desalination plants.
- Wastewater treatment by applying non energy intensive systems as photocatalytic methods and aquatic plants.
- Implementation of composting programs for household organic wastes.
- Implementation of production and distribution programmes of drinking water at regions where water is in scarcity (mainly islands), in order to reduce the consumption of bottled water.
- Implementation of rainwater collection programmes at areas where tap water is produced by desalination plants.

- Recycling of electric appliances, batteries, wires, waste oils and packaging materials.

2.3.2 Sectoral mitigation actions

2.3.2.1 Overview

This chapter presents quantitative estimates of the expected effects of implemented and adopted policies and measures in Greece under the Convention (UNFCCC), aiming at reducing GHG emissions in order to meet the NECP targets and climate neutrality in 2050, in line with Paris Agreement. These policies and measures were adopted in the context of the National Action Plans including NECP. Moreover, it presents the implemented and adopted policies and measures that were reflected in the “with measures” projections scenario.

Tables 2.2a and b present estimates of the expected effects of these policies and measures in the time horizon of the years up to 2050. An ex-post estimation of the effect of policies for year 2020 is also included.

The total realistic quantifiable GHG emissions reduction potential from the implemented and adopted policies and measures is estimated to be 54.8Mt CO₂eq for 2030.

The possible interferences between these implemented/adopted measures, which may restrict the estimated GHG emissions reduction potential, were taken into account. Thus, it is obvious that the application of the already implemented and adopted measures for the mitigation of GHG emissions contributes considerably in the restriction of the augmentative trend of emissions, leading to the achievement of the NECP objectives and the 2030 targets pursuant to European Union obligations, exclusively with domestic measures and actions (see projections chapter).

The mitigation effect of each policy is estimated by comparing the ‘with measures’ scenario with a hypothetical baseline scenario that does not include the mitigation effect of the examined policy or measure. The same approach as that used in BR4 has been followed for the estimation of the mitigation effect of the policies. Any change of the mitigation effect of the policies compared to previous submission is attributed to a change of the WM scenario.

Tables 2.3a and b present estimates of the expected effects of planned policies, which are the additional policies in order to comply with the targets set in the National Energy and Climate Plan of Greece. These policies are associated with LULUCF sector.

The total realistic quantifiable GHG emissions reduction potential from the planned policies and measures is estimated to be 1.Mt CO₂eq in 2030.

Table 2.2a Effects of implemented / adopted policies and measures (included in the “with measures” scenario)

| PaM No | Name of mitigation action | Sectors affected | GHGs affected | Objective and/or activity affected | Type of instrument | Status | Start year | Implementing entity or entities | Ex-post mitigation effect (ktCO ₂ eq) Year 2020 | Mitigation impact (ktCO ₂ eq) Year 2025 | Mitigation impact (ktCO ₂ eq) Year 2030 | Mitigation impact (ktCO ₂ eq) Year 2035 | Mitigation impact (ktCO ₂ eq) Year 2040 | Mitigation impact (ktCO ₂ eq) Year 2045 | Mitigation impact (ktCO ₂ eq) Year 2050 |
|--------|--|--|-----------------|--|---|-------------|------------|--|--|--|--|--|--|--|--|
| 1 | Improvements in the conventional power generation system – Phasing out lignite | Energy | CO ₂ | Efficiency improvement in the energy and transformation sector (Energy supply); Switch to less carbon-intensive fuels (Energy supply) | Economic, Regulatory | Implemented | 1996 | Public Power Corporation S.A. (Companies); Ministry of Environment and Energy (Government) | 15,916 | 11,865 | 9,493 | 4,179 | 3,705 | 2,599 | 3,393 |
| 2 | Renewable Energy Sources | Energy | CO ₂ | Increase in renewable energy supply | Economic, Fiscal, Regulatory | Implemented | 1994 | Ministry of Environment and Energy (Government) | 11,719 | 21,190 | 19,190 | 28,117 | 34,427 | 41,294 | 46,242 |
| 3 | Alternative and Climate-Neutral Gases and Liquid Fuels | Energy Transport | CO ₂ | Low carbon fuels/electric cars (Transport) | Fiscal, Regulatory | Adopted | 2025 | Ministry of Environment and Energy (Government) | IE | IE | IE | IE | IE | IE | IE |
| 4 | Measures in industrial sector (EU-ETS, energy efficiency, CCS) | Energy, Industry/ industrial processes | CO ₂ | Efficiency improvement in industrial end-use sectors (Energy consumption) | Economic, Fiscal, Regulatory, Information | Implemented | 2008 | Ministry of Environment and Energy (Government) | 1,092 | 1,124 | 4,941 | 5,316 | 6,536 | 6,089 | 8,992 |
| 5 | Energy efficiency measures in Residential and Tertiary Sector | Energy | CO ₂ | Efficiency improvements of buildings (Energy consumption); Efficiency improvement in services/ tertiary sector (Energy consumption); Efficiency improvement of appliances (Energy consumption) | Economic, Fiscal, Regulatory, Information | Implemented | 2008 | Ministry of Environment and Energy (Government) | 2,789 | 4,409 | 6,347 | 7,203 | 8,132 | 8,436 | 8,466 |

| PaM No | Name of mitigation action | Sectors affected | GHGs affected | Objective and/or activity affected | Type of instrument | Status | Start year | Implementing entity or entities | Ex-post mitigation effect (ktCO ₂ eq) Year 2020 | Mitigation impact (ktCO ₂ eq) Year 2025 | Mitigation impact (ktCO ₂ eq) Year 2030 | Mitigation impact (ktCO ₂ eq) Year 2035 | Mitigation impact (ktCO ₂ eq) Year 2040 | Mitigation impact (ktCO ₂ eq) Year 2045 | Mitigation impact (ktCO ₂ eq) Year 2050 |
|--------|--|-------------------------------|--|--|--|-------------|------------|--|---|---|---|---|---|---|---|
| | | | | consumption) | | | | | | | | | | | |
| 6 | Transport measures | Transport | CO ₂ , CH ₄ , N ₂ O | Efficiency improvements of vehicles (Transport); Modal shift to public transport or non-motorized transport (Transport); Improved transport infrastructure (Transport); Low carbon fuels/electric cars (Transport) | Economic, Fiscal, Regulatory | Implemented | 2008 | Ministry of Environment and Energy (Government); Ministry of Infrastructure and Transport (Government) | 755 | 1,059 | 1,550 | 3,262 | 5,207 | 7,066 | 9,718 |
| 7 | Reduction of emissions of fluorinated gases | Industry/industrial processes | HFCs, PFCs | Reduction of emissions of fluorinated gases (Industrial processes); Replacement of fluorinated gases by other substances (Industrial processes) | Regulatory, Information | Implemented | 2004 | Ministry of Environment and Energy (Government) | 760 | 1,026 | 2,279 | 2,737 | 3,137 | 3,998 | 4,654 |
| 8 | Recovery of organic waste | Waste management /waste | CH ₄ | Reduced landfilling (Waste); Enhanced recycling (Waste); Improved landfill management (Waste) | Regulatory, Other (Other (Planning)) | Implemented | 2002 | Ministry of Environment and Energy (Government) | 1,000 | 1,100 | 1,900 | 2,500 | 2,900 | 3,500 | 4,000 |
| 9 | Recovery of biogas | Waste management/ waste | CH ₄ | Enhanced collection and use (Waste) | Regulatory, Other (Other (Planning)) | Implemented | 2002 | Ministry of Environment and Energy (Government) | 1,000 | 1,100 | 1,100 | 1,000 | 1,000 | 950 | 900 |
| 10 | Establishing common rules for direct support schemes under the common agricultural | Agriculture | CH ₄ , N ₂ O | Other activities improving cropland management (Agriculture); Improved livestock management (Agriculture); Improved animal | Other (Other (Planning)), Regulatory, Economic | Implemented | 2007 | Ministry of Rural Development and Food (Government) | 330 | 650 | 800 | 900 | 1,200 | 1,300 | 1,500 |

| PaM No | Name of mitigation action | Sectors affected | GHGs affected | Objective and/or activity affected | Type of instrument | Status | Start year | Implementing entity or entities | Ex-post mitigation effect (ktCO ₂ eq) Year 2020 | Mitigation impact (ktCO ₂ eq) Year 2025 | Mitigation impact (ktCO ₂ eq) Year 2030 | Mitigation impact (ktCO ₂ eq) Year 2035 | Mitigation impact (ktCO ₂ eq) Year 2040 | Mitigation impact (ktCO ₂ eq) Year 2045 | Mitigation impact (ktCO ₂ eq) Year 2050 |
|--------|---|------------------|------------------|---|---|-------------|------------|--|---|---|---|---|---|---|---|
| | policy: Reduction of the rate of intensity of agricultural land use and improvement of management of animal waste | | | waste management systems (Agriculture); Sustainable development of agricultural activities and rural areas, with a focus on climate change mitigation and adaptation objectives. (Other agriculture) | | | | | | | | | | | |
| 11 | Rural Development Programme (RDP): Increase of organic farming. | Agriculture | N ₂ O | Improved management of organic soils (Agriculture); Reduction of fertilizer/manure use on cropland (Agriculture) | Other (Other (Planning), Economic | Implemented | 2007 | Ministry of Rural Development and Food (Government) | 200 | 350 | 400 | 450 | 550 | 600 | 700 |
| 12 | Common Agricultural Policy (CAP) – Reduction in fertilizers use. | Agriculture | N ₂ O | Reduction of fertilizer/manure use on cropland (Agriculture) | Other (Other (Planning), Regulatory, Economic | Implemented | 2007 | Ministry of Rural Development and Food (Government) | 120 | 200 | 220 | 250 | 300 | 350 | 400 |
| 13 | Measures in the LULUCF sector | Forestry/ LULUCF | CO ₂ | Afforestation and reforestation (Land use, land use change and forestry); Enhancing production in existing forests (Land use, land use change and forestry); Enhanced forest management (Land use, land use change and forestry); Restoration of degraded lands (Land | Regulatory; Planning; Information ; Education; Economic | Implemented | 2000 | Ministry of Environment and Energy | NE | 5,332 | 6,540 | 6,736 | 6,980 | 6,995 | 7,155 |

[illegible]

Table 2.2b Brief description of implemented / adopted policies and measures (included in the “with measures” scenario)

| P&M No | Name of mitigation action | Brief description |
|--------|--|---|
| 1 | Improvements in the conventional power generation system – Phasing out lignite | <p>The main implemented / adopted measures for the improvement of the conventional power generation system are:</p> <ul style="list-style-type: none"> - The gradual decommissioning of old inefficient and more pollutant thermal power units. - The commissioning of new power units that follows BAT and the new IED. - The increase of NG share in electricity production. - The interconnection of certain islands with the mainland grid. <p>The Greek government prioritizes phasing out lignite, a highly polluting fuel, driven by environmental and economic imperatives such as rising emissions allowance costs. The de-lignitization process aims for a complete withdrawal of lignite-fired power plants by 2028, supported by Greece's significant renewable energy potential. A fair transition for impacted regions like Western Macedonia and Megalopolis is central, with alternative heating solutions such as high-efficiency natural gas co-generation and heat pumps. Natural gas serves as a transitional energy source, with infrastructure expansion ongoing to support this shift.</p> |
| 2 | Renewable Energy Sources | <p>Greece has set an ambitious target for renewable energy sources (RES) to account for 43% of gross final energy consumption by 2030, with specific goals for each sector. Key priorities include achieving a 75.7% RES share in electricity by transforming power generation and a 13.4% RES target in transportation through electrification, biofuels, and renewable gases. Heating and cooling aim for a 52.6% RES share, driven by heat pumps and solar thermal systems. Measures focus on integrating RES into buildings, expanding energy networks, and promoting technologies like offshore wind farms and green hydrogen. These initiatives, backed by regulatory reforms and investment incentives, ensure Greece's transition to a sustainable, low-carbon energy system.</p> |
| 3 | Alternative and Climate-Neutral Gases and Liquid Fuels | <p>The EU-ETS is the primary policy instrument for reducing GHG emissions in Greece's industry. Increased RES penetration in electricity, combined with the transition from natural gas to electricity in heating and industrial processes, aims to lower gaseous fuel consumption and carbon intensity. Biomethane production is being promoted through regulatory reforms, financial incentives, and supply chain optimization, with plans to integrate biomethane into gas networks. Green hydrogen development focuses on pilot projects, scaling up by 2030 for hard-to-abate sectors like transport and industry, supported by financial incentives and EU funding. Renewable liquid fuels, including synthetic fuels, will emerge post-2030 for aviation and maritime sectors, aligned with EU frameworks like ReFuelEU Aviation. These initiatives aim to decarbonize energy and fuel systems while fostering economic growth.</p> |
| 4 | Measures in industrial sector (EU-ETS, energy efficiency, CCS) | <p>Decarbonization of Greece's industrial sector focuses on electrification, Carbon Capture and Storage (CCS), and energy efficiency to tackle greenhouse gas emissions, especially in hard-to-abate industries like cement, refining, and chemicals. The EU Emissions Trading System (ETS) plays a pivotal role, driving electrification through rising carbon costs while addressing "carbon leakage" risks via indirect emissions cost compensation and bilateral renewable energy contracts. CCS projects, including a storage site at Prinos with a capacity of over 3 million tons of CO₂ annually, are underway, supported by EU and national funding. Energy efficiency is bolstered by mandatory audits, financial incentives, and tailored programs to optimize industrial processes and promote renewable heating solutions.</p> |
| 5 | Energy efficiency measures in Residential and Tertiary Sector | <p>Improving energy efficiency is a cornerstone of Greece's energy transition strategy, targeting a reduction of final energy consumption to 15.2 Mtoe by 2030, an 8% decrease compared to previous plans. In the building sector, policies aim to decarbonize by 2050 through renovations, renewable energy integration, and electrification of heating. Public and private buildings benefit from financial incentives, simplified procedures, and energy management systems, ensuring inclusivity and compliance with EU directives. Urban bioclimatic redevelopment focuses on smart city initiatives, green infrastructure, and sustainable mobility to enhance energy efficiency and livability. These measures align with EU goals, reducing emissions</p> |

| P&M No | Name of mitigation action | Brief description |
|--------|--|--|
| | | and fostering sustainable growth. |
| 6 | Transport measures | The goal of climate neutrality in Greece's transport sector focuses on electrification and the integration of green hydrogen and renewable fuels. Key measures include the electrification of road transport, supported by incentives for electric vehicle adoption and disincentives for older combustion-engine vehicles, alongside efforts to decarbonize logistics with green supply chain initiatives. Urban and public transport measures aim to modernize fleets with low-emission and hydrogen-powered vehicles, while rail transport expands electrification to replace diesel locomotives. Maritime and air transport prioritize renewable fuels, infrastructure upgrades, and green technologies. Nationwide charging infrastructure and sustainable urban mobility plans further promote greener, safer, and more efficient transport systems. |
| 7 | Reduction of emissions of fluorinated gases | F-gases, including hydrofluorocarbons (HFCs), are managed through EU legislation such as the F-gas Regulation (No. 517/2014) and the MAC Directive. These policies aim to prevent leaks, phase down HFCs, and impose strict usage controls. The new Regulation (EU) 2024/573 accelerates the phase-out of HFCs in heat pumps, air conditioning, and refrigeration systems starting in 2025, targeting a full phase-out by 2050. Greece implements these measures through a ministerial decision and supports oversight with an electronic database for F-gases and refrigerants. Estimated GHG emission reductions from these policies are 1.55 Mt CO ₂ eq by 2030, contributing to EU climate neutrality goals. |
| 8 | Recovery of organic waste | Reduction of the quantities of biodegradable wastes landfilled through the installation of solid waste treatment facilities. Acc. to Directive (EU) 2018/850 for the amendment of Directive 1999/31 / EC on the landfill of waste, it is targeted only the 10% of generated municipal solid waste to be landfilled by 2030. Promotion of measures for separate collection of biowaste, recycling, energy recovery and use of sludge in agriculture as fertilizer/compost. |
| 9 | Recovery of biogas | Collection and flaring / energy use systems of landfill gas are being installed in all managed sites for urban centres with population more than 100,000. Already, the managed disposal sites serving the population of the largest cities of Greece are equipped with systems for the collection or for the flaring of biogas. In the Psytalia wastewater treatment plant that serves approximately 4 millions of Attica population, a part the sludge produced is treated under anaerobic conditions resulting in the production of biogas. The biogas produced covers the energy needs of the wastewater treatment facilities. |
| 10 | Common Agricultural Policy (CAP) – Green Direct Payments: reduction of the rate of intensity of agricultural land use and improvement of management of animal waste. | The reduction of the rate of intensity of agricultural land use and the adoption of rules for the obligatory observance of cross compliance system relating to manure management contribute to the reduction of GHGs. Moreover, the disengagement of subsidies from the agricultural production has already enhanced indirectly the reduction of agricultural production and livestock population. In fact, the disengagement of subsidies from the agricultural production along with the enhanced citified way of life consist the main reasons for the reduction of agricultural production. |
| 11 | Rural Development Programme (RDP): Increase of organic farming. | Measures and incentives in order to increase the organic farming. Organic production results in a substantial decrease of N ₂ O emissions. According to national statistics, the total land with organic farming in Greece (fully converted and under conversion to organic farming) is 342,584 ha in 2016. The actions of Rural Development Program (2014-2020) for the transition to practices and methods of organic farming will cover 478,317.70 ha of land, while the aid to preserve existing organic farming practices and methods will cover 241,804 ha. |
| 12 | Common Agricultural Policy (CAP) – Green Direct | Decrease of the use of synthetic nitrogen fertilizer and protection of the groundwater, resulting in a substantial decrease of N ₂ O emissions. |

| P&M No | Name of mitigation action | Brief description |
|--------|--|--|
| | Payments: Reduction in fertilizers use | |
| 13 | Measures in the LULUCF sector | <p>Implementation of preventive forestry actions (e.g. forestry works for the reduction of fuel biomass), forestry work interventions (logging, etc.) in coniferous forests to remove combustible biomass for forest fire protection</p> <p>Rehabilitation of degraded coppice broadleaved forests to high forests, improvement of forest structure and stability, favouring regeneration, forest cultivation and wood harvesting, conservation and maintenance of forests</p> <p>Pilot management studies for the update of the forest management guidelines at national level</p> <p>Maintaining the health and vitality of forest ecosystems - Effective application of the Community plant health regime and Restoration of areas affected by natural disturbances</p> <p>Management of public forest nurseries, seeds gathering and management of seed- production stands and seed-production gardens to produce high-quality planting material</p> <p>Monitoring and assessment of the conservation status of protected species and habitats in Greece and establishment of regulatory framework for activities within protected areas</p> <p>Investing in the development of forest areas and the improvement of forest sustainability. Support for afforestation/creation of forested areas, aid for agroforestry systems</p> <p>Completion of the delineation of forest land in the country and establishment of National inventory and monitoring system for forests and forest areas</p> <p>Enhancement of the Monitoring, Reporting and Verification (MRV) System for GHG accounting, by incorporating geographically explicit data and research results</p> |

Table 2.3a Effects of planned policies and measures (included in the “with additional measures” scenario)

| PaM No | Name of mitigation action | Sectors affected | GHGs affected | Objective and/or activity affected | Type of instrument | Status | Implementing entity or entities | Mitigation impact (ktCO ₂ eq) Year 2030 | Mitigation impact (ktCO ₂ eq) Year 2035 | Mitigation impact (ktCO ₂ eq) Year 2040 | Mitigation impact (ktCO ₂ eq) Year 2045 | Mitigation impact (ktCO ₂ eq) Year 2050 |
|--------|--|------------------|-----------------|--|--|---------|------------------------------------|---|---|---|---|---|
| 14 | Additional measures in the LULUCF sector | LULUCF | CO ₂ | Promotion of biomass production for energy purposes (Land use, land use change and forestry); Increase of managed forest land over unmanaged forest land | Regulatory; Planning; Information; Education; Economic | Planned | Ministry of Environment and Energy | 1,038 | 1,055 | 1,070 | 1,540 | 1,850 |

Table 2.3b *Brief description of planned policies and measures (included in the “with additional measures” scenario)*

| P&M No | Name of mitigation action | Brief description |
|--------|--|---|
| 14 | Additional measures in the LULUCF sector | <p>Systematic forest management - Restoration of degraded forest ecosystems (coppice forests - scrub in high forests) - Integration of the climate dimension in management studies, monitoring the carbon balance, implementing measures to increase removals in forests and enhance their resilience gradually over the entire country</p> <p>Increase production of long-life wood products. In recent years there has been a continuously decreasing trend in the quantity of wood products produced based on the official statistics of FAO for Greece.</p> <p>Promotion of biomass production for energy purposes</p> <p>Afforestation/ Rehabilitation of disturbed areas (such as lignite mines, quarries, etc.) after the cessation of human activities.</p> <p>Integration of additional carbon pools in the LULUCF sector GHG inventory, which until today are not included in Greece's greenhouse gas emission inventory (i.e. woody biomass and SOC in mineral soils of Grasslands). Carbon removals from Posidonia seagrass meadows is also being investigated.</p> |

2.3.2.2 Sectoral policies and measures: Energy

Improvements in the conventional power generation system – Phasing out lignite

The Greek government's primary priority is to transition the economy away from lignite, a highly polluting fuel. The urgent need for de-lignitization arises both from environmental concerns, such as addressing climate change, and economic factors, particularly the rising costs associated with emissions allowances.

This shift away from lignite is achievable, supported by Greece's abundant renewable energy potential, which will become the cornerstone of the country's future energy mix. The planned withdrawal of all lignite-fired power plants by 2028 will be carried out systematically and responsibly. A central government objective is ensuring a fair transition for the regions of Western Macedonia and Megalopolis, which are heavily impacted by this change.

Special provisions will be made to secure heating for these de-lignitization regions through alternative means, such as district heating systems powered by high-efficiency natural gas co-generation or climate-appropriate heat pumps.

Natural gas is serving as a lower-carbon transitional energy source, bridging the gap toward the achievement of the 2050 net-zero target.

The introduction of natural gas in the national energy system was one of the largest investments ever carried out in Greece. An important part of the infrastructure, mainly the high pressure transmission system and the medium pressure network, which is necessary for the transport of natural gas to the main regions of consumption, has been completed, while the networks' development in the cities is ongoing. Expansion projects of Greek natural gas system are under way in order to link more cities and industries to the system (*Figure 2.1*).

The main implemented / adopted measures for the improvement of the conventional power generation system till the full phase-out of lignite in 2028 were:

- ✓ The gradual decommissioning of old inefficient and more pollutant thermal power units.
- ✓ The commissioning of new power units that follows BAT and the new IED.
- ✓ The increase of NG share in electricity production.
- ✓ The interconnection of certain islands with the mainland grid.

It should be mentioned that the PaM "Improvements in the conventional power generation system Phasing out lignite" is related to the Energy (Power sector). The affected GHG from this policy is mainly CO₂ (more than 99%).

Mitigation effect

The mitigation effect of this policy is assessed by comparing the "with measures" scenario to a hypothetical baseline scenario that excludes the impact of the policy or measure being evaluated. Specifically, the mitigation effect of this PaM is calculated by analyzing the emissions from fossil fuel power plants against a hypothetical scenario in which the same energy output is assumed to have been produced using the fuels and power plants available in 1990.



Figure 2.1 Greek National Natural Gas System

Renewable Energy Sources

The target for renewable energy sources (RES) as a share of gross final energy consumption in Greece by 2030 is set at 43%. This target is further broken down into sector-specific binding goals. Achieving the RES share in electricity consumption is a primary policy priority, requiring the timely and effective implementation of planned measures. The goal is to reach a 75.7% RES share in gross electricity consumption by 2030, emphasizing the energy transformation of the power generation sector.

Table 2.4 Key Characteristics of the Power Generation System up to the Year 2050

| Electricity production | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|-------------|-------------|-------------|-------------|--------------|--------------|--------------|
| Total Installed Capacity [GW] | 22.5 | 27.5 | 35.5 | 42.0 | 53.0 | 62.5 | 70.7 |
| Lignite | 1.6 | 1.3 | - | - | - | - | - |
| Natural gas | 6.3 | 7.0 | 7.9 | 6.3 | 5.9 | 5.9 | 5.9 |
| Oil products | 0.8 | 0.8 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Biomass and Biogas | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 |
| PV solar | 5.4 | 8.5 | 13.5 | 18.5 | 26.0 | 30.6 | 35.1 |
| Wind onshore | 4.7 | 7.0 | 8.9 | 9.5 | 11.0 | 13.0 | 13.0 |
| Wind offshore | 0.0 | 0.0 | 1.9 | 3.9 | 5.8 | 8.2 | 11.8 |
| Hydro | 3.4 | 2.8 | 3.1 | 3.6 | 3.8 | 4.2 | 4.5 |
| Total Net Electricity Generation [TWh] | 52.0 | 53.9 | 60.4 | 78.8 | 101.5 | 122.9 | 145.5 |
| Lignite | 5.8 | 4.5 | - | - | - | - | - |
| Natural gas | 19.1 | 12.2 | 10.9 | 4.7 | 4.1 | 2.9 | 3.8 |
| Oil products | 5.1 | 1.8 | 0.3 | 0.3 | 0.2 | 0.0 | 0.0 |
| Biomass and Biogas | 0.1 | 0.6 | 0.4 | 0.0 | 0.0 | 0.1 | 0.0 |
| PV solar | 7.1 | 13.1 | 20.9 | 28.7 | 40.1 | 47.1 | 54.0 |
| Wind onshore | 10.9 | 16.3 | 21.1 | 22.9 | 27.0 | 32.0 | 32.5 |
| Wind offshore | 0.0 | 0.0 | 0.6 | 15.4 | 22.8 | 32.4 | 46.5 |
| Hydro | 3.9 | 5.5 | 6.1 | 7.0 | 7.3 | 8.3 | 8.7 |

In transportation, the binding RES target is set at 13.4% for 2030, reflecting realistic expectations given current electrification rates. Key contributors to this goal include electrification, biofuels, and renewable non-biological fuels, with the latter projected to cover 0.9% of total transport fuels, supported by the production capacity of refineries. Additionally, advanced biofuels derived from lignocellulosic biomass are expected to account for 4.6% of transport fuels by 2030.

For heating and cooling, the RES share is set at 52.6% by 2030, driven mainly by heat pumps and solar thermal systems. Biomass use for combustion in urban buildings will not expand to avoid increasing air pollution, with current levels maintained to ensure efficient utilization. In the bio-economy sector, efforts will focus on integrating renewable gases into the natural gas mix to lower carbon intensity. Long-term, climate-neutral gases are expected to fully replace fossil gas.

Efforts to utilize livestock, agricultural, and forestry residues for biogas and biomethane production aim to inject approximately 2.1 TWh of biomethane into the gas grid by 2030. In industry, the RES share for both energy and non-energy purposes is targeted at 34% by 2030, though no penetration of renewable non-biological fuels is anticipated for industrial applications within this timeframe. In the building sector, the RES share is projected to reach 72.2% of final energy consumption by 2030.

The achievement of the 43.0% target for renewable energy sources (RES) as a share of gross final energy consumption by 2030 requires the development of regulatory and techno-economic policies and measures with a clear implementation timeline.

These measures and policies focus on expanding the use of RES into new applications and sectors, fostering sectoral energy coupling, and ultimately promoting the electrification of final energy consumption. The strong investment interest in new RES projects for the 2025-2030 period, combined with the rapid growth of projects observed in recent years, not only ensures the attainment of the ambitious new targets but also highlights critical needs for the support, expansion, and upgrade of the electricity transmission and distribution networks.

These enhancements are essential to integrate the necessary projects into the system with reliability and security. To this end, additional policies and measures are being implemented to optimize the management of green energy production:

1. Reform of the licensing framework and update of the special spatial planning framework for RES – Acceleration, digitization, and effectiveness of licensing.
2. Ensuring implementation of RES and energy storage investments – Promotion of bilateral contracts and hybrid island systems.
3. Promotion of distributed RES systems and strengthening the participatory role of local communities and consumers.
4. Ensuring the sustainability and liquidity of the mechanism for granting operational support to electricity generation units from RES and storage facilities.
5. Development and enhancement of energy networks and optimal integration and operation of RES units and energy storage.
6. Ensuring the contribution of RES to meeting energy needs in the building sector – adjustments to building regulations and promotion of energy sharing.
7. Promotion of RES systems for meeting thermal and cooling needs.
8. Promotion of new technologies and energy sector coupling with an emphasis on electrification to maximize the utilization of domestic RES potential.

Reform of the licensing framework and update of the special spatial planning framework for RES – Acceleration, digitization, and effectiveness of licensing

The Greek government aims to reform and modernize the licensing and spatial planning frameworks for Renewable Energy Sources (RES) to enhance efficiency, accelerate investments, and align with EU directives. Key measures include:

1. Streamlined Licensing: Simplifying and digitizing licensing processes with clear deadlines and the establishment of a One-Stop Service for investor support.
2. Updated Spatial Frameworks: Defining areas for RES installations based on environmental, energy, and land use assessments, including priority zones ("Go-to areas") with expedited licensing.
3. Dual Land Use: Enabling coexistence of agricultural and photovoltaic activities through specialized regulations and support for agrivoltaics.
4. Offshore and Hybrid Projects: Creating regulatory frameworks for offshore wind farms, floating photovoltaic parks, and combined RES technologies on the same land.
5. Sustainability Measures: Implementing policies for decommissioning and recycling RES projects, ensuring environmental compliance and site restoration.

These initiatives aim to reduce administrative delays, attract more investments, and support Greece's energy and environmental goals.

Ensuring implementation of RES and energy storage investments – Promotion of bilateral contracts and hybrid island systems

To boost renewable energy integration and achieve ambitious energy goals, Greece focuses on expanding energy storage and hybrid systems, particularly in non-interconnected islands. Key measures include:

1. Energy Storage Integration:
 - Encouraging storage integration in renewable projects to optimize grid capacity, either "behind the meter" or via cooperative setups with standalone energy storage.
 - Supporting standalone and hybrid storage through regulatory incentives, expedited licensing, and guaranteed energy pricing.

- Competitive bidding for storage projects with approved frameworks for financial support, aiming to install 4.3 GW of storage capacity by 2030.
- 2. Promotion of Hybrid Systems on Islands:
 - Developing hybrid energy systems combining RES and storage on non-interconnected islands under the “GR-eco Islands” initiative.
 - Targeting 80% RES penetration in standalone island systems, with projects on Crete and smaller islands like Astypalea, Rhodes, and Tilos.
- 3. Bilateral Contracts for RES Projects:
 - Facilitating direct power purchase agreements (PPAs) between RES producers and energy consumers or suppliers.
 - Establishing a digital platform for streamlined transactions, offering investment security and price stability.
- 4. Innovation in Pumped Hydro Storage:
 - Advancing large-scale storage technologies, such as the approved 680 MW Amfilochia pumped hydro project, with potential expansions under EU-approved frameworks.

These measures aim to enhance energy autonomy, attract investment, and decarbonize the energy system, particularly in remote regions.

Promotion of distributed RES systems and strengthening the participatory role of local communities and consumers

Greece is advancing policies to expand distributed renewable energy systems (RES) and strengthen local community and consumer participation. Key initiatives include:

1. Support for Self-Consumption:
 - Implementation of the new legal framework (Law 5037/2023) to facilitate self-consumption with simplified licensing, financial support, and reserved grid capacity.
 - Promotion of programs like "Photovoltaics on Rooftops" and "Photovoltaics on Fields" to subsidize installations, focusing on vulnerable households and energy-intensive consumers.
2. Encouraging Energy Autonomy:
 - Expansion of net metering and virtual net metering systems to enable energy self-sufficiency for households, farmers, businesses, and municipalities.
 - Introduction of a compensation mechanism where excess energy revenues offset energy bills without tax obligations.
3. Community Energy Engagement:
 - Strengthening Renewable Energy Communities (RECs) and Citizen Energy Communities (CECs) to enable collective self-consumption and reduce energy costs.
 - Establishment of advisory and technical support mechanisms to facilitate community participation and address barriers.
4. Incentivizing Local Governments and Vulnerable Consumers:
 - Launch of the "APOLLON" program, aimed at installing RES and storage systems for municipalities, irrigation organizations, and utilities.
 - Focus on reducing energy costs for vulnerable groups and local governments while encouraging energy-saving measures.
5. Digital and Regulatory Enhancements:
 - Deployment of an energy consumer registry and the introduction of "energy coaching" to optimize consumption habits.

- Continuous updates to regulatory frameworks to simplify the development of distributed energy systems.

These measures aim to decentralize energy production, empower local communities, and ensure equitable access to renewable energy benefits.

Ensuring the sustainability and liquidity of the mechanism for granting operational support to electricity generation units from RES and storage facilities

Since 2016, Greece has adopted a competitive framework to support renewable energy (RES) power generation and energy storage through operational subsidies. Key measures to ensure the sustainability and liquidity of this mechanism include:

1. Funding Sources:
 - Revenues are sourced from CO2 emissions rights auctions and energy market participation. Surpluses arise as competitive auctions for RES subsidies result in prices significantly below the average Day-Ahead Market prices. These surpluses will also support storage projects.
2. Dynamic Adjustment of Subsidies:
 - Reference prices for different RES technologies and storage units are adjusted based on financing and operational cost trends, ensuring fair and competitive support.
3. Introduction of Environmental Markets:
 - Guarantees of Origin (GO) for RES electricity have been introduced, with auctions starting in June 2024 to provide additional revenue streams.
4. Regulatory Oversight:
 - Continuous legislative and regulatory adjustments will safeguard the liquidity and long-term viability of the Special RES and CHP Account, ensuring uninterrupted support for RES and storage projects.

This framework balances market efficiency with financial sustainability to support Greece's transition to a greener energy system.

Development and enhancement of energy networks and optimal integration and operation of RES units and energy storage.

To enhance the penetration of Renewable Energy Sources (RES) and energy storage systems, Greece is focusing on modernizing and expanding energy transmission and distribution networks. Key measures include:

1. Network Expansion and Modernization:
 - Upgrading and expanding high-voltage transmission and distribution networks to support increased RES integration and reduce energy curtailments.
 - Developing infrastructure to accommodate local RES production and new energy demands, including electric vehicle charging and heating.
2. Integration of RES and Storage Systems:
 - Promoting combined RES and storage installations to manage grid congestion, stabilize the network, and enable RES producers to participate in additional energy markets.
 - Enhancing system flexibility and reliability with advanced storage technologies for balancing intermittent RES generation.
3. Regulatory and Technical Frameworks:
 - Accelerating the licensing of network projects through legislative interventions.

- Introducing cost-sharing models for network upgrades to facilitate connections for small producers and modernizing existing substations for increased capacity.
- 4. Improved Grid Management:
 - Developing a digital map of network capacity for new RES and demand loads.
 - Establishing regional control centers with advanced monitoring and control capabilities for distributed RES units.
 - Implementing mandatory installation of grid control equipment for larger RES installations.
- 5. Support for Islands:
 - Optimizing RES integration in non-interconnected island systems, including hybrid energy projects and future grid connections to the mainland.
- 6. Green Hydrogen and Energy Coupling:
 - Exploring synergies between electricity and natural gas networks to support green hydrogen production, storage, and usage for energy transition.

These initiatives aim to maximize RES integration, minimize energy curtailments, and ensure a reliable and flexible energy system capable of meeting future demands.

Ensuring the contribution of RES to meeting energy needs in the building sector – adjustments to building regulations and promotion of energy sharing.

To leverage the potential for renewable energy (RES) in buildings, Greece is implementing policies to enhance RES integration and promote energy sharing. Key measures include:

1. Mandatory RES Contribution:
 - Establishing regulatory requirements for a minimum share of RES in meeting energy needs in buildings, aligning with "nearly zero-energy building" standards.
2. Streamlined Installation Processes:
 - Simplifying and expediting the installation of RES systems on buildings, as mandated by the revised EU Directive (2018/2001).
3. Energy Sharing and Collective Self-Consumption:
 - Promoting energy-sharing models in multi-unit residential complexes, where 60% of the population resides, through targeted regulatory frameworks.
4. Revised Building Energy Code:
 - Updating the Energy Performance of Buildings Regulation to integrate RES requirements, focusing on public buildings as examples of energy efficiency and sustainability.
5. Removal of Installation Barriers:
 - Adapting building codes to eliminate obstacles for installing RES and energy storage systems.
6. Synergies with Energy Efficiency Policies:
 - Aligning RES policies with self-consumption and energy efficiency initiatives for both public and private buildings.

These policies aim to increase RES adoption in the building sector, reduce energy costs, and advance national energy efficiency goals.

Promotion of RES systems for meeting thermal and cooling needs.

To advance the use of renewable energy sources (RES) for heating and cooling, Greece is implementing targeted measures and policies. Key initiatives include:

1. Efficient Heating and Cooling Systems:
 - Supporting solar thermal systems, district heating using RES (geothermal, biomass, renewable gases), and hybrid RES systems like solar thermal with heat pumps or biomass.
 - Enforcing regulations, including the prohibition of oil heating burners, to reduce emissions in buildings.
2. Integration of RES with Heat Pumps:
 - Encouraging the installation of photovoltaic systems with storage for energy self-production, powering heat pumps to reduce energy costs.
3. Promotion of Bioenergy:
 - Leveraging Greece's bioenergy potential through efficient boilers and systems that comply with environmental laws.
 - Conducting studies to assess the technical and economic potential of bioenergy and promoting supply chains for biomass and biodegradable materials.
4. District Heating Networks:
 - Developing localized heating networks in industrial zones, utilizing waste heat from industrial processes to meet nearby thermal needs.
5. Incentives and Workforce Development:
 - Introducing incentives for the sustainable collection and use of forest biomass.
 - Strengthening professional skills for the installation and operation of RES technologies through training programs.
6. Alignment with National Goals:
 - Ensuring synergy with policies for building energy efficiency and RES integration, maximizing the impact on greenhouse gas emissions reduction and energy independence.

These measures aim to optimize heating and cooling energy use, reduce reliance on conventional energy sources, and foster sustainable development in Greece.

Promotion of new technologies and energy sector coupling with an emphasis on electrification to maximize the utilization of domestic RES potential.

Greece is prioritizing the deployment of advanced renewable energy technologies and the coupling of energy sectors to maximize the use of its renewable energy potential. Key measures include:

Offshore Wind Farms (OWFs):

- Establishing a comprehensive framework (Law 4964/2022) for the development of OWFs, balancing environmental protection, consumer interests, and investor security.
- Implementing a National Offshore Wind Development Program with a goal of 1.9 GW by 2030, starting with selected Organized Development Areas for Offshore Wind Farms (POAUAP).
- Introducing competitive auctions for energy tariffs and operational support agreements (20-year CfD) with the first tenders by 2025.

Innovative Renewable Energy Technologies:

- Supporting pilot projects for wave energy, floating photovoltaic systems, and green hydrogen production.
- Promoting small-scale autonomous desalination units powered by RES in remote areas, combining wind, solar, and geothermal energy with storage systems to address water scarcity.

Geothermal Energy Development:

- Expanding exploration and utilization of high-temperature geothermal fields with dedicated incentives and streamlined permitting processes.
- Informing local communities to ensure public support for geothermal projects.

Sector Coupling and Electrification:

- Integrating energy sectors (electricity, heating-cooling, and transport) to utilize excess renewable energy production.
 - Power-to-Heat: Deploying heat pumps and energy storage for efficient heating and cooling.
 - Power-to-Gas: Producing renewable gases like green hydrogen for use in various sectors.
 - Electrification of Transport: Expanding e-mobility to reduce emissions and increase RES usage.
- Enhancing system flexibility by combining storage and smart energy management systems to optimize renewable energy absorption and reduce demand-supply imbalances.

These initiatives aim to advance Greece's energy transition, ensuring sustainability, flexibility, and maximum efficiency in renewable energy deployment.

More information for the above policies and measures can be found in the National Energy and Climate Plan of Greece.

Mitigation effect

The mitigation effect of RES in power production is assessed by comparing the "with measures" scenario to a hypothetical baseline scenario that excludes the impact of the policy or measure being evaluated. Specifically, the mitigation effect of this PaM is determined by estimating the emissions avoided by generating electricity from RES instead of using the energy mix and power plants operating in the year for which the mitigation impact is being calculated.

The mitigation impact of biofuel use in Industry, Transport, and Buildings is accounted for within the effects calculated under other PaMs (at the sectors that the fuels are consumed, such as Transport, Industry, Residential sectors etc). To prevent double counting, it is not separately considered in this context.

It should be mentioned that the PaM "Renewable Energy Sources" is related to Energy sector. The affected GHG from this policy is mainly to CO₂ (more than 99%).

Alternative and Climate-Neutral Gases and Liquid Fuels

The main policy instrument for the reduction of GHG emissions in industry is the EU-ETS. The increased penetration of Renewable Energy Sources (RES) in electricity generation, along with the substitution of natural gas with electricity in building heating and industrial processes, leads to a gradual reduction in overall gaseous fuel consumption. Simultaneously, the natural gas transported through the system will progressively transition into a mixture incorporating renewable gases. A core strategic priority of the National Energy and Climate Plan (NECP) is the gradual reduction of both the consumption and carbon footprint of gaseous fuels.

Development of Biomethane Production in Greece

The promotion of biomethane as a renewable gas requires a comprehensive policy framework focused on upgrading existing biogas plants, establishing new facilities in rural areas, and integrating biomethane into natural gas distribution and transport networks. Key measures include regulatory adjustments for licensing and operational standards, financial support

through investment and operational incentives, and the establishment of a dedicated Biomethane Fund.

Supply chain optimization is critical, including crop rotation to utilize intermediate crops, efficient collection of agricultural residues, and mandatory biowaste collection in high-potential sectors like food industries and hotels. Pilot programs for compressed and liquefied biomethane are planned for areas without access to national gas networks.

Complementary initiatives include renewable gas certification systems and awareness campaigns to highlight the benefits of biomethane, emphasizing its role in circular economy practices and the use of digestate as a soil enhancer. These actions aim to scale biomethane production efficiently while maximizing its environmental and economic benefits.

Developing the Green Hydrogen Market in Greece

Greece aims to establish expertise in green hydrogen production and foster a domestic market through initial small- and medium-scale pilot projects. These projects will pave the way for large-scale hydrogen initiatives to meet decarbonization targets by 2050, with potential for future exports. To ensure commercial viability, financial support will be provided for installation costs of electrolysis systems, complemented by incentives such as tax benefits and low-interest loans.

By 2030, green hydrogen is expected to be used for synthetic fuel production and pilot applications in hydrogen-powered buses, focusing on hard-to-abate sectors. Post-2030, significant investment will be needed to expand electrolysis capacity and align with EU funding mechanisms, including leveraging the European Hydrogen Bank's model.

Quota obligations for green hydrogen consumption and price subsidies for climate-neutral fuels are being considered to stimulate demand. However, these must balance economic impacts, particularly in tourism-reliant sectors like aviation and maritime transport. Investment prioritization criteria include energy sourcing, water availability, economic leverage, and supply chain integration, emphasizing local economic and employment benefits.

Supporting policies will focus on developing hydrogen equipment manufacturing, retrofitting facilities for hydrogen use, reducing taxes on hydrogen production, streamlining licensing, and implementing certification systems for renewable fuels. These measures aim to position Greece as a leader in green hydrogen production and utilization.

Promoting Renewable Liquid Fuels in Greece

The development of renewable liquid fuels of non-biological origin (synthetic fuels) is projected to commence around 2030, with significant growth expected after 2040 as related technologies mature. These fuels will primarily serve transport sectors where electrification is not feasible, such as aviation and maritime shipping.

Key measures include introducing legislation mandating renewable fuel usage by suppliers and stakeholders (e.g., airlines), establishing certification systems for renewable fuel production or imports, and implementing green certificates aligned with EU practices. Incentives will aim to mitigate increased transportation costs associated with renewable fuels, particularly for vulnerable populations and businesses.

Additional policies focus on reducing reliance on liquid and gaseous fuels in transport through public transit enhancements, electrification of road vehicles, and cold ironing for docked ships and parked aircraft. The EU's ReFuelEU Aviation framework is expected to drive the production of Sustainable Aviation Fuels (SAF), supported by funding from EU or national resources. These initiatives will evolve in alignment with EU best practices and funding mechanisms to foster the adoption of renewable fuels.

Mitigation effect

The mitigation impact of this PaM is accounted for within the effects calculated under other PaMs (at the sectors that the fuels are consumed, such as Transport, Industry sectors, etc). To prevent double counting, it is not separately considered in this context.

It should be mentioned that the PaM “Renewable Energy Sources” is related to the Energy sector. The affected GHG from this policy is mainly to CO₂ (more than 99%).

Energy efficiency measures

Improving energy efficiency is a key horizontal priority in the country's energy transition and serves as the fundamental pillar upon which all other energy policies should be designed to achieve ambitious energy and climate goals. Under the current NECP, the objective is set, in accordance with Article 4 of Directive (EU) 2023/1791 of the European Parliament and the Council of September 13, 2023, on energy efficiency and the amendment of Regulation (EU) 2023/955, to limit final energy consumption to no more than 15.2 Mtoe by 2030. This represents a reduction of approximately 8% compared to the target of the previous NECP for the same year (16.5 Mtoe).

Similarly, primary energy consumption is expected to reach 17.8 Mtoe by 2030, reflecting a 13% reduction compared to the corresponding target set under the previous NECP.

The following measures are implemented and adopted to achieve the energy efficiency targets.

Energy Efficiency and Decarbonization in the Building Sector

Greece's long-term strategy for energy efficiency in the building sector targets the full decarbonization of the national building stock by 2050, following the requirements of EU Directive 2024/1275 on energy efficiency in buildings. The plan encompasses technical and financial measures to increase renovation rates, improve energy efficiency, and integrate renewable energy systems in both public and private buildings.

The strategy emphasizes upgrading existing renovation programs to address inefficiencies and expand their reach, particularly for vulnerable and energy-poor households. Measures include streamlined procedures, enhanced involvement of financial institutions, and targeted support for cost-effective interventions, such as building envelope upgrades, electrification of heating, and on-site renewable energy installations like solar panels and heat pumps. Special attention is given to the development of combined renewable energy technologies and leveraging existing resources for maximum benefit.

For public buildings, initiatives like the improved "Electra" program aim to set an exemplary role for government facilities, focusing on comprehensive renovations and the integration of energy management systems. These measures are supported by detailed action plans at the municipal and regional levels, ensuring consistent progress through digitized tracking of implementation. Public building renovations will also integrate energy efficiency with accessibility improvements, ensuring inclusivity.

Private buildings will benefit from refined financial incentives, including low-interest loans, guarantees, and improved tax relief mechanisms. Policies will address barriers in multi-tenant buildings by establishing frameworks for equitable cost and benefit sharing among owners and tenants, facilitating decision-making for energy renovations.

Specific measures target renewable energy integration in buildings, increasing the use of solar thermal, biomass, and geothermal systems while promoting nearly zero-energy buildings (NZEBs) with on-site renewable energy production. Comprehensive policies will ensure all new public buildings meet zero-emission standards by 2028 and all other new buildings by 2030.

Business support focuses on enhancing energy and water efficiency, with a mix of grants, tax incentives, and energy performance contracts. These programs are designed to encourage

corporate adoption of energy-efficient technologies and eliminate barriers to accessing required funding.

The plan also includes extensive training and certification programs for energy professionals to ensure high-quality interventions, alongside awareness campaigns to encourage energy-conscious behaviors among consumers. The introduction of "one-stop-shop" services in each region will simplify the renovation process by offering support across all project phases, from planning to implementation.

Health and indoor environmental quality are integrated into the strategy, with plans to install air quality monitoring and regulation systems. The upgraded Energy Performance Certificates (EPCs) will serve as detailed roadmaps for individual building improvements, aligned with updated EU requirements to ensure transparency and effectiveness.

By combining these measures, Greece aims to achieve ambitious energy and climate goals, reducing emissions, lowering energy costs, and improving the overall sustainability and livability of its building stock while meeting EU directives. The strategy's focus on innovative financing, digital tools, and renewable energy integration will ensure long-term success and alignment with European best practices.

Measures and Policies for Urban Bioclimatic Redevelopment and Smart Cities

Urban areas play a crucial role in developing and implementing policies and measures to address climate change, serving as the intersection of local actions, national strategies, and international commitments for mitigation. Urban and industrial zones in Greece significantly contribute to national energy consumption and greenhouse gas emissions. Therefore, improving urban planning, traffic management, and energy use at the local level can dramatically reduce urban energy consumption and carbon footprints.

The concept of "smart and sustainable cities," incorporating clean energy technologies and advanced ICT systems, is central to restructuring the energy sector. Smart cities adopt effective practices to lower their energy footprints, focusing on alternative transportation, efficient resource management, and participatory governance, all while enhancing sustainable economic growth and residents' quality of life. Intelligent urban systems attract investments, improve living conditions, and increase property values by promoting rational energy use and effective information management.

Bioclimatic urban redevelopment involves optimizing energy use through cool and photocatalytic materials, efficient water management, renewable energy integration, waste management, and green infrastructure like roofs and walls. Initiatives include creating pedestrian-friendly neighborhoods, reducing urban noise, expanding open public spaces, and implementing policies for sustainable mobility, such as bike lanes and wider sidewalks. These measures improve urban resilience, reduce heat effects, and lower carbon footprints.

Further, adopting urban cooling technologies, optimizing water use, and increasing urban greenery through green corridors and urban canyons enhance environmental quality. Smart cities leverage advanced governance systems for better resource management and foster citizen participation to implement effective local policies.

The integration of measures to improve energy efficiency in buildings and industry, including cogeneration units and district heating/cooling systems, contributes to reducing greenhouse gas emissions. Utilizing waste heat for energy production further decreases reliance on fossil fuels, aligning urban planning with climate goals and sustainable development.

Advancing Energy Efficiency in the Industrial Sector

The industrial sector's energy efficiency strategy prioritizes targeted programs to reduce energy consumption and emissions, particularly in production processes. Initiatives include financial incentives and regulatory measures to implement energy-saving recommendations identified through mandatory energy audits, as outlined in EU Directive 2023/1791. Special

focus is placed on supporting both large and small-to-medium enterprises (SMEs) to adopt energy management systems, promote electrification, and enhance competitiveness while safeguarding against future energy crises.

Tailored agreements with industries will provide financial incentives for achieving specific energy savings and emission reduction targets. Dedicated programs will promote efficient heating and cooling systems, including renewable energy technologies and the recovery of waste heat. Biomass and bioenergy will also be leveraged to meet thermal energy needs in industrial and manufacturing operations.

Energy efficiency initiatives will expand through contracts such as Energy Performance Agreements, supported by subsidized loan costs and improved access to finance for energy service companies (ESCOs). The strategy integrates mandatory reporting and systematic monitoring of energy consumption and savings through an upgraded electronic energy audit registry, which will streamline compliance and track progress across sectors, including industry, services, and transportation.

A 30% reduction in emissions by 2030 (compared to 2019 levels) is mandated for specific activities outside the EU Emissions Trading System, in accordance with national climate law. The integration of best practices and recommendations from energy audits into a publicly accessible database will further enhance efficiency and transparency.

These measures align with updated EU directives and support Greece's broader goals for decarbonization, energy security, and industrial competitiveness.

Market Mechanisms for Enhancing Energy Efficiency

The promotion of energy efficiency improvements will be significantly supported by activating market mechanisms, with the Energy Efficiency Obligation Scheme playing a central role alongside alternative policy measures. Obligations will be tailored to the technical and economic energy-saving potential of obligated parties and complemented by designed policy alternatives.

The framework for on-bill financing, enabling repayment of energy-saving investments through energy bills, will be explored to support obligated parties and leverage synergies with other policy measures. Additionally, expanding the current scheme to include mechanisms resembling white certificates with virtual energy equivalents (energy tokens) will be considered. Innovative digital modeling for the lifecycle of buildings, from design to operation, will also be incentivized to enhance adaptability to evolving needs.

Competitive bidding processes for achieving energy savings will target sectors such as industry and services, ensuring cost-efficient interventions and minimizing risks for third-party implementations. Aggregating smaller projects under these mechanisms will streamline implementation and drive impactful energy-saving measures across the economy.

Mitigation effect

The mitigation effect of Energy efficiency in the Building Sector is assessed by comparing the "with measures" scenario to a hypothetical baseline scenario that excludes the impact of the policy or measure being evaluated. Specifically, the mitigation impact is determined by comparing the specific CO₂ emissions intensity of the baseline year 2008—when the first energy efficiency action plan was implemented—with the corresponding intensity in the year for which the mitigation effect is being estimated.

The mitigation impact of the energy efficiency measures in Industry is accounted for within the effects calculated under other PaMs (Industry sector). To prevent double counting, it is not separately considered in this context.

It should be mentioned that the above-mentioned PaMs are related to the Energy sector. The affected GHG from this policy is mainly to CO₂ (more than 99%).

Measures in the industrial sector

Decarbonization of industry is a critical objective, given the sector's significant share in greenhouse gas (GHG) emissions. Certain industrial activities, such as cement production, oil refining, and chemical manufacturing, are classified as "hard-to-abate," meaning their emissions are inherently tied to the industrial processes themselves. In Greece, key industries, including cement production and oil refining, are well-developed, with additional activities in related sectors such as fertilizers and plastics. There is also potential for the expansion of existing industries or the emergence of new ones in the near future. Decarbonizing industry involves two main approaches: electrification of sub-sectors that can transition to electric energy and managing emissions from hard-to-abate sectors.

For sectors where mature technologies exist to replace fuel combustion with electricity, the transition will be gradually incentivized and supported. Electrification will also be driven by the rising cost of carbon emission allowances under the EU Emissions Trading System (ETS), making fossil fuel-based production increasingly uncompetitive. The shift will occur when the capital cost of converting a facility to electricity is outweighed by the long-term cost of carbon emissions.

While the ETS is a sufficient driver for electrification, complementary regulatory measures will also be required. Ensuring industrial competitiveness during this transition is vital, as the high capital (CAPEX) and operating costs (OPEX) of electrification pose economic risks, particularly in the face of international competition from countries with less ambitious climate policies. Bilateral agreements with renewable energy producers will be encouraged to stabilize energy costs.

The risk of "carbon leakage," where emissions-intensive industries relocate to regions with less stringent climate policies, has been recognized at both EU and national levels. Mechanisms to address this, including indirect emissions cost compensation, require further strengthening to protect European industries while supporting global climate efforts.

For industries unable to electrify, technologies such as Carbon Capture and Storage (CCS) are critical. Greece is developing its first geological storage site in depleted offshore oil fields near Prinos, Kavala, funded by the Recovery and Resilience Facility (RRF), with an estimated storage capacity of over 3 million tons of CO₂ annually. Additional projects, including CO₂ transport infrastructure, are also underway. Financial mechanisms like Contracts for Difference (CfD) may be explored to support CCS projects.

Major Greek industries in hard-to-abate sectors, including refineries and cement plants, are already planning significant CCS investments, with three out of four securing funding from the EU Innovation Fund. These efforts aim to capture and permanently store over 3 million tons of CO₂ annually by 2030.

As CCS technologies advance, the need for additional storage sites grows. While Northern Europe is rapidly expanding its carbon storage capacity, Mediterranean initiatives remain limited. Greece is actively exploring new geological formations for storage and advocating for EU policy changes to allow storage in non-EU countries, ensuring environmental safety and regulatory compliance.

This comprehensive approach, combining electrification, CCS, regulatory innovation, and international cooperation, positions Greece to achieve significant industrial decarbonization while safeguarding its economic viability.

Mitigation effect

The mitigation impact of Policies and Measures (PaMs) other than Carbon Capture and Storage (CCS), such as energy efficiency initiatives, in the Industrial Sector is evaluated by comparing the "with measures" scenario against a hypothetical baseline scenario that excludes the influence of the policy or measure under assessment. Specifically, the mitigation effect is quantified by analyzing the change in specific CO₂ emissions intensity between the

baseline year 2008—when the initial energy efficiency action plan was launched—and the corresponding intensity in the target year for which the mitigation is estimated.

For CCS measures, the mitigation impact in the Industrial Sector is directly calculated based on the projected volumes of CO₂ expected to be sequestered, reflecting the anticipated reduction in emissions due to CCS implementation. The CO₂ utilized for e-SAF production is excluded from the calculated mitigation effect to avoid double counting. Its mitigation impact is accounted for within the sector where the fuel is ultimately consumed (transport sector).

It should be mentioned that the above-mentioned PaMs are related to the Energy sector. The affected GHG from this policy is mainly to CO₂ (more than 99%).

Table 2.5 CO₂ Capture, Usage and Storage in kt

| | 2030 | 2035 | 2040 | 2045 | 2050 |
|----------------------------------|-------|-------|-------|-------|-------|
| CO ₂ Captured | | | | | |
| Industry (cement) | 2,800 | 2,800 | 3,129 | 3,114 | 2,999 |
| Refineries | 524 | 595 | 1,096 | 1,026 | 912 |
| DAC | | | | 17 | 4,500 |
| CO ₂ Storage | 3,121 | 2,977 | 3,455 | 2,929 | 5,744 |
| Use of CO ₂ for e-SAF | 203 | 418 | 771 | 1,228 | 2,667 |

2.3.2.3 Sectoral policies and measures: Transport

Information about measures targeting transport system, public transport, inspection of vehicles and fiscal measures can be found in the NC8.

The Goal of Climate Neutrality in the Transport Sector

The transport sector's climate neutrality goal is primarily supported by electrification, while the use of green hydrogen and other renewable liquid fuels of biological or non-biological origin is expected to contribute to varying degrees depending on the specific transport sector under consideration.

Road Transport

Light Road Transport

The policy initiated in 2019, mainly for light vehicles, has gradually been enriched and evolved, enabling the creation of an electromobility market and the introduction of electric vehicles in the country. Achieving the revised CO₂ emission reduction targets for light vehicles requires the continuation of existing policies as well as the adoption of new ones, focusing on maintaining, improving, and where necessary, expanding the appropriate framework for the electrification of this sector.

Special emphasis should be placed on the electrification of light commercial vehicles (vans) within the context of "greening" the supply chain. Specific measures and both direct and indirect incentives for the acquisition and use of such vehicles are expected to be implemented.

Indicative policy measures for 2030 include:

- Economic incentives: Direct and indirect financial incentives for vehicle acquisition (e.g., tax relief and subsidies for individuals and businesses).

- Vehicle withdrawal measures: Incentives for scrapping old, polluting vehicles, combined with strict technical inspections for older vehicles (e.g., via technical control centers and on-road inspections).
- Usage cost reduction incentives: Enhanced incentives to lower operating costs for these vehicles.

Additionally, disincentives for the use of older internal combustion engine (ICE) vehicles, particularly in urban centers, are deemed important. Various forms of disincentives will be explored, taking into account the maturity of the electromobility market and the pace of fleet renewal in the country.

Green Supply Chain

Reducing greenhouse gas emissions in the supply chain is a key priority for achieving climate neutrality. This includes tracking environmental performance, such as road transport emissions and energy consumption within storage and distribution centers, to decarbonize logistics. Significant measures include implementing Article 5 of Law 4302/2014 for green logistics and electrifying light trucks used for goods distribution.

Specific incentives for last-mile delivery will also be considered, such as promoting the replacement of motorcycles with e-cargo bikes.

Heavy Road Transport

Specialized measures for heavy vehicles (e.g., urban buses, supply vehicles) aim to accelerate their carbon footprint reduction while addressing other urban transport objectives.

Urban Mobility – Public Transport

Road Passenger Transport

Decarbonization actions for road passenger transport in Athens include:

- Development of a Strategic Transport Plan.
- Renewal of the fleet with low-emission vehicles.
- Conversion of existing buses to hydrogen use, integrating predictive consumption systems.
- Improved pedestrian accessibility to bus stops.

For passenger transport outside Athens, measures such as pilot projects for electromobility, green hydrogen use, and low-carbon gas fuels will be explored.

Rail Transport

Rail electrification will continue to expand, with key projects involving electrification and signaling upgrades on multiple lines, aiming to minimize the use of diesel locomotives.

Maritime Transport

Policies will focus on technology neutrality and infrastructure compatibility, emphasizing:

- Incentives for retrofitting ships to reduce emissions and for fleet renewal, especially for coastal shipping.
- Development of shore-side electricity (cold-ironing) infrastructure.
- Research into renewable energy technologies and alternative fuels.
- Carbon capture technology development for ships.

Maritime transition pillars include:

1. Green transformation of ships.
2. Green transformation of ports.
3. Green transformation of island connectivity.

Air Transport

Targets for reducing CO₂ emissions in air transport include gradually adopting renewable liquid fuels, such as biofuels and synthetic fuels. Infrastructure for electrifying aircraft during airport stays will also be developed. Policies will focus on supporting domestic biofuel production and public-private partnerships to ensure economic and technical feasibility.

Charging Infrastructure for Electric Vehicles

Nationwide development of charging infrastructure is essential for further electrification of road transport. Measures will include:

- Incentives for publicly accessible charging points, with an emphasis on high-power charging stations.
- Regulatory actions to simplify licensing and connection procedures.
- Promotion of renewable energy sources for powering charging infrastructure.

Additionally, smart charging systems will be developed to enable interoperability across networks, optimize grid use, and support renewable energy integration (e.g., vehicle-to-grid systems).

Sustainable Urban and Active Mobility

Plans for promoting sustainable urban mobility include:

- Municipal sustainable urban mobility plans (SUMP).
- Lower speed limits in urban areas.
- Active mobility initiatives such as promoting cycling, walking, and micromobility with incentives (e.g., tax benefits for bicycles and e-bikes).

These actions aim to create a greener, safer, and more efficient transport network, aligning with national and European climate goals.

Mitigation effect

The mitigation effect of the Transport sector, disaggregated per mode of transport in the next table, is assessed by comparing the "with measures" scenario to a hypothetical baseline scenario that excludes the impact of the policy or measure being evaluated. Specifically, the mitigation impact is determined by comparing the specific CO₂ emissions intensity of the baseline year 2008—when the first energy efficiency action plan was implemented—with the corresponding intensity in the year for which the mitigation effect is being estimated.

It should be mentioned that the above-mentioned PaMs are related to the Energy sector. The affected GHG from this policy is mainly to CO₂ (more than 99%).

Table 2.6 Mitigation effect of PaMs targeted Transport sector in kt CO₂eq

| | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---------------------|------|-------|-------|-------|-------|-------|
| Domestic aviation | | | 18 | 182 | 234 | 297 |
| Road transportation | 733 | 1,027 | 1,342 | 2,766 | 4,380 | 5,805 |
| Railways | 21 | 32 | 54 | 58 | 63 | 67 |
| Domestic navigation | | | 136 | 256 | 529 | 897 |
| Total transport | 755 | 1,059 | 1,550 | 3,262 | 5,207 | 7,066 |

2.3.2.4 Sectoral policies and measures: Industrial processes

Most of the industrial processes emissions (with the exception mainly of the emission from the use and consumption of fluorinated gases) are regulated by the EU-ETS market-based mechanism (e.g. CO₂ emissions from plants producing cement, lime, ceramics, glass, iron

and steel, ferroalloys, aluminium (PFCs), nitric acid (N₂O)). The cap and trade principle of EU ETS is described in previous sections.

To control emissions from fluorinated greenhouse gases (F-gases), including hydrofluorocarbons (HFCs), the European Union has adopted two legislative acts: the 'MAC Directive' (2006/40/EC) on air conditioning systems used in small motor vehicles, and the 'F-gas Regulation' (No 517/2014) which covers all other key applications in which F-gases are used. The two strategies described in the abovementioned regulation to reduce emissions is to prevent leakage and emissions {Emission prevention and leak checks, Control of by-production, End of life treatment of products and equipment, Training and qualification, Information for users (labelling, product info)} and control of use of F-gases (Ban on new applications, Ban on uses, Phase-down of HFC supply). Several control mechanisms and penalties are implemented in Greece. Checks for compliance with these regulations of the European Union are carried out by the relevant bodies and agencies of the competent authorities, as appropriate, in the context of their remit. In cases of infringement of the provisions of the relevant EU Regulations by legal or natural entities of the public and private sector, sanctions are imposed by the relevant bodies and agencies of competent authorities.

It is considered that the action taken by the EU and its Member States under the F-gas Regulation will enable the EU to comply with the Kigali amendment to the Montreal Protocol on a global phase-down of hydrofluorocarbons (HFCs).

In line with the Green Deal and the European Climate Law, emissions of fluorinated greenhouse gases must be further reduced to contribute to achieving a 55% reduction in emissions by 2030 and climate neutrality by 2050. In this context, the new Regulation (EU) 2024/573 has been adopted, aiming to further limit fluorinated gas emissions. It includes provisions to phase out the use of hydrofluorocarbons (HFCs) in heat pumps, air conditioning (AC), and refrigeration systems starting as early as 2025.

Specifically, the new Regulation introduces stricter provisions for the quota system, mandating a further reduction in the quantities of HFCs placed on the market, with a gradual phase-out by 2050. Moreover, HFCs used in inhaler devices are now included in the quota system. The Regulation also imposes stricter rules to prevent emissions of fluorinated gases and incorporates additional categories of equipment containing these gases.

For the Regulation's implementation in Greece, a joint ministerial decision (YTIEN/ΔΔΕΔ/85858/2124/16.9.2021, Official Gazette B' 6777) has been issued, designating the competent authorities and outlining the necessary measures and procedures to apply European legislation. The responsible authorities (primarily regional services and customs authorities) monitor the movement of fluorinated gases and impose penalties as per Article 15 of the decision. Additionally, a Technical Interministerial Committee has been established to support the coordination efforts led by the Ministry of Environment and Energy.

Inspections are conducted by the designated authorities, primarily regional services and customs authorities. In cases of non-compliance, penalties are applied based on the provisions of the aforementioned joint ministerial decision. A revision of this decision is expected to ensure the proper implementation of the new Regulation.

To enhance the oversight of Regulation (EU) 517/2014, the Climate Change and Air Quality Directorate of the Ministry of Environment and Energy established and has maintained since 2019 an electronic database named "F-GASES & ODS DATABASE." The database serves two purposes: a) Recording equipment installed within the Greek system that operates with fluorinated gases. b) Tracking the movement of refrigerants in the domestic market (excluding very small quantities).

This facilitates the implementation of the required inspections and ensures that activities involving fluorinated gases are carried out by certified personnel.

The database acts as a supervisory tool for domestic inspections and complements the monitoring tools utilized by the EU.

It is estimated that the mitigated GHG emissions from the implemented and adopted policies and measures that are related to the reduction of emissions of fluorinated gases are estimated at 760 kt CO₂eq for 2020 and 1.55 Mt CO₂eq for 2030.

The mitigation effect is assessed by comparing the "with measures" scenario to a hypothetical baseline scenario that excludes the impact of the policies and measures targeted F-gases.

It should be mentioned that the above-mentioned PaMs are related to the Energy sector. The affected GHG from this policy is mainly to CO₂ (more than 99%).

2.3.2.5 Sectoral policies and measures: Agriculture

Agricultural activities can result in methane emissions from livestock digestion processes and storage of animal manure and the use of organic and mineral nitrogen fertilizers can lead to nitrous oxide emissions.

National Strategic Plan of the Common Agricultural Policy (CAP) of Greece for the period 2023-2027

The Common Agricultural Policy (CAP) determines a common way for all Member States of the European Union. The strategic objectives of the Greek plans for rural development in the EU have been set in line with the European Strategy.

Recently, in November 2022, the National Strategic Plan of the Common Agricultural Policy (CAP) of Greece for the period 2023-2027 was approved. It is the main strategic planning tool for the implementation of the CAP 2023-2027 and the development of the primary sector and the rural areas of the country.

The main objective of the Strategic Plan is to support the sustainable development of the Agriculture and Food sectors, by:

- i. Ensuring sustainable rural incomes
- ii. Enhancement of competitiveness
- iii. Enhancement of the rural areas' socio-economic environment
- iv. Contribution to the achievement of environmental and climate objectives, at national and European level.

Through the actions of the said plan, the creation of a new productive model for the agricultural and food sectors in Greece is adopted, aiming among others at the reduction of the climate footprint and the adaptation to climate change. The reduction of the climate footprint concerns the reduction of greenhouse gas emissions and the enhancement of CO₂ sequestration, as well as the promotion of sustainable energy.

The main tools of the new "Green Architecture" of the CAP could be summarized in:

- i. The enhanced conditionality,
- ii. The ecological schemes of Pillar 1 (interventions of Article 31 of Regulation (EU) 2021/2115) and
- iii. The interventions related to climate and environment of Pillar 2 (Article 70 of Regulation (EU) 2021/2115, agri-environment and climate commitments).

Enhanced conditionality regulates the receiving CAP payments of farmers, consisting of statutory management requirements (SMRs) and standards for maintaining land in good agricultural and environmental condition (GAEC). Through the Strategic Plan, Greece will implement a system of enhanced conditionality by improving the already existing Good Agricultural and Environmental Condition (GAEC) practices, while integrating some existing "Greening" requirements of the previous programming period into the enhanced conditionality.

New voluntary, annual agri-environmental programmes, known as "Ecological Schemes", will enhance the environmental and climate results achieved by CAP Pillar 1 payments. Greece will allocate 25% of the CAP direct payments budget (Pillar 1) to "Ecological

Schemes", providing farmers with a choice of simple, practical measures that they can implement on their farms each year, with the aim of maximising farmers' participation in achieving climate and environmental improvements across all cultivated areas. The ecological schemes that will be implemented in the three agronomic regions (arable, arboreal, pasture) of the Country are:

- i. Use of resistant and adapted species and varieties to climate change
- ii. Expansion of the implementation of ecological focus areas
- iii. Implementation of improved vegetation cover practices while enhancing biodiversity.
- iv. Circular economy applications in agriculture
- v. Improvement of agroforestry ecosystems rich in landscape elements
- vi. Support for producers to implement precision agriculture methods using the input management tool/application and monitoring of environmental parameters.
- vii. Environmental management of livestock systems
- viii. Maintenance and improvement of terraced crops
- ix. Maintenance of organic farming and livestock farming methods
- x. Protection and maintenance of landscapes and agricultural systems of High Environmental Value.

The actions of Pillar 2 could be summarized into the following categories:

1. Aid provision to the producers to compensate for the additional costs and loss of income, created by the increased commitments/agricultural environmentally friendly practices they apply. This category includes interventions for:
 - i. The protection of wildlife within protected areas (birds, wild mammals),
 - ii. The protection of the rural landscape,
 - iii. The reduction of the use of plant protection products through the implementation of alternative plant protection methods,
 - iv. The protection of genetic resources in agriculture and livestock farming,
 - v. The transition to organic farming and breeding practices,
 - vi. The afforestation of agricultural land,
 - vii. The enhancement of biodiversity and the adaptation of forests to climate change.
2. The provision of aid to producers in mountainous and less favored areas (ANCs), as well as disadvantaged areas. The aim is on the one hand maintaining agricultural income in these areas, and on the other hand, continuing to practice agricultural activity that contributes to the protection against soil erosion, the protection of biodiversity and the preservation of the rural landscape and the protection of biodiversity and the adaptation of forests to climate change in the Special Protection Areas (SPAs) of the NATURA 2000 network areas.
3. Public and private investments aimed at the environment and climate: This section includes:
 - i. Investments in agricultural holdings for:
 - a. Water saving
 - b. Energy saving
 - c. Energy production from RES
 - d. The acquisition of equipment for protection against natural disasters and extreme weather events.
 - ii. Public investments for water management (construction of reservoirs to retain water, modernization of irrigation networks to reduce losses) as well as investments for the prevention and restoration of damage to forests against biotic and abiotic causes, including wild fires.

- iii. Investments for the protection of wild mammals, the habitats of the triangle and soil protection.

Aid to producers for undertaking agri-environmental commitments under Pillar 2 and ecological schemes under Pillar 1 absorb 19% of the Community assistance of the Strategic Plan. In addition to serving the environmental and climate objectives of the Strategic Plan, it aims to maintain the practice of agricultural activity in mountainous and disadvantaged areas, which works beneficially for the protection of biodiversity and the treatment of soil erosion. 26.6% of the resources of the Strategic Plan are allocated to serving the environmental and climate objectives of the Strategic Plan, if the budget of the two specific interventions is taken into account.

Common Agricultural Policy for the period 2014 – 2020

For the period 2014 – 2020, three strategic objectives for rural development in the EU had been set in line with the Europe 2020 Strategy: Improving the competitiveness of agriculture, the sustainable management of natural resources and climate action, and a balanced territorial development of rural areas. The legislative framework concerning the rules for agriculture production in Greece was fully harmonized with the European Common Agricultural Policy (CAP).

Regulation (EU) No 1305/2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) foresees that Member States draw up and co-finance multiannual rural development programmes (RDPs), at national or regional level. These programmes have to meet the three strategic objectives for 2014 – 2020, including sustainability and climate action.

The “Horizontal Regulation” (EU) No 1306/2013 provides the financial management rules for the two CAP funds, the European Agricultural Guarantee Fund (EAGF) which finances market measures and direct payments, and the EAFRD which finances support to rural development. It brings together the rules on cross compliance, farm advisory systems and monitoring and evaluation of the CAP. The Regulation on Transitional Provisions (EU) No 1310/2013 is designed to bridge the gap between the two rural development programming periods – before and after the 2013 reform. Under certain circumstances already existing national programmes are also eligible for support in the new programming period.

In 2013, the EU has agreed that at least 20 % of the Union’s budget for 2014 – 2020 should be spent on climate related action. This also affects the CAP and its specific funding programs, which consequently take climate mitigation and adaptation as an additional criterion for support.

Implementation of the new Common Agricultural Policy (CAP) regulations started only in 2015 (with 2014 being a transitional year). In its most recent revision, CAP introduced specific measures for “**Green Direct Payments**” linked to the provision of environmental public goods, linking viable food production, sustainable management of farmland and environmentally-friendly practices. In order to receive payments, farmers shall respect a set of basic rules. Farmers not respecting EU law on environmental, public and animal health, animal welfare or land management will see the EU support they receive reduced. These reductions are proportional to the extent, permanence, severity and repetition of the infringement specified. Cross-compliance covers two elements:

- Statutory Management Requirements (SMRs): These requirements refer to 13 legislative standards in the field of the environment, food safety, animal and plant health and animal welfare.
- Good agricultural and environmental conditions (GAECs): The obligation of keeping land in good agricultural and environmental condition refers to a range of standards related to soil protection, maintenance of soil organic matter and structure, avoiding the deterioration of habitats, and water management.

Cross-compliance includes directives and regulations – "statutory management requirements" – that are applied under the sectorial legislation and apply therefore also to farmers not receiving the CAP support covered by cross-compliance:

- ✓ Public, animal and plant health: General Food Law, Hormones ban Directive, Regulations on identification and registration of pigs, bovine, ovine and caprine animals, Regulation on prevention, control and eradication of TSE, Regulation on plant protection products;
- ✓ animal welfare: Directives on the protection of calves, pigs and animals kept for farming purposes;
- ✓ environmental protection: Nitrates Directive, NATURA 2000 Directives (wild birds and habitats).

To this has been added – specifically for farmers receiving CAP payments – a set of standards on good agricultural and environmental condition of land, designed to:

- ✓ prevent soil erosion: minimum soil cover, minimum land management;
- ✓ maintain soil organic matter and soil structure: maintenance of soil organic matter level;
- ✓ biodiversity and ensure a minimum level of maintenance: retention of landscape features including ban on cutting hedges and trees during the bird breeding and rearing season;
- ✓ protect and manage water: establishment of buffer strips along water courses, authorisation on water for irrigation and protection of ground water against pollution.

Rural Development Programme (RDP)

The Rural Development Programme (RDP) for Greece was formally adopted by the European Commission on 11 December 2015 and modified on 28 June 2017, outlining Greece's priorities for using the € 5.6 billion of public money that is available for the period 2014-2022 (€ 4.7 billion from the EU budget and € 0.9 billion of national co-funding).

The Greek RDP focuses mainly on enhancing farm viability and competitiveness, preserving and enhancing ecosystems and promoting local development in rural areas. Farmers will receive support to put 10.3% of the Greek farmland under contracts to preserve biodiversity, 12.1% to improve water management and 10.7% to improve soil management and/or prevent soil erosion. Investment support for restructuring and modernisation will be provided to 6300 agricultural holdings and 23900 young farmers will receive start up aid. In addition, over 5600 agricultural holdings will receive support to develop short supply chains, local markets and to carry out promotional activities and about 600 agri-food businesses will receive support for investments in processing and marketing of agricultural products. Support for knowledge and innovation activities makes up over 5% of the planned public expenditure and the programme will create around 76 618 training places for farmers and other rural businesses. The RDP will also support local development via LEADER Local Action Groups covering nearly half of the country's rural population and improve access to basic services for approximately 10% of the rural population, including IT infrastructures (e.g. broadband internet).

The Greek RDP will fund actions under all six Rural Development priorities – with a particular emphasis on the competitiveness of the agricultural sector and sustainable forestry, and on restoring, preserving and enhancing ecosystems related to agriculture and forestry. In budgetary terms, two of the biggest RDP measures are linked to climate change mitigation and adaptation:

- ✓ € 741 million allocated to Organic farming
- ✓ € 452 million allocated to Agri-environment and climate measures

The RDP 2014-2020 is required to spend a minimum of 30 % of the total contribution from the EAFRD on climate change mitigation and adaptation as well as environmental issues.

Rural Development Policy's actions that contribute directly to the decrease of greenhouse gas emissions are the following:

- ✓ Organic farming.
- ✓ Decrease of the use of synthetic nitrogen fertilizers.
- ✓ Disengagement of subsidies from the agricultural production (reduction of the rate of intensity of agricultural land use).
- ✓ Use of environment-friendly livestock farming methods and improvement of the management of animal waste.
- ✓ Improvement of energy efficiency, renewable energy generation and use, including biomass.
- ✓ Improve management of soil (maintenance of agricultural activities in mountainous areas, green cover, and permanent grassland) and increase carbon sequestration.

Organic production and decrease of the use of synthetic nitrogen fertilizers result in a substantial decrease of N₂O emissions. According to national statistics, the total land with organic farming in Greece (fully converted and under conversion to organic farming) is 342,584 ha in 2016. The actions of Rural Development Program (2014-2020) for the transition to practices and methods of organic farming will cover 478,317.70 ha of land, while the aid to preserve existing organic farming practices and methods will cover 241,804 ha.

The reduction of the rate of intensity of agricultural land use and adoption of rules for the obligatory observance of cross compliance system relating to manure management and rational use of fertilizers contribute to the reduction of GHGs, too.

Furthermore, the disengagement of subsidies from the agricultural production has already enhanced indirectly the reduction of agricultural production and livestock population. In fact, the disengagement of subsidies from the agricultural production along with the enhanced citified way of life consist the main reasons for the reduction of agricultural production.

2.3.2.6 Sectoral policies and measures: Waste

Policies and measures relating to solid waste disposal, biological treatment of waste, waste incineration and open burning of waste, as well as wastewater treatment and discharge, are climate relevant. Important GHGs in this sector are CH₄, which mainly arises from the treatment and disposal of solid waste, and N₂O originating from waste water. In addition, a substitution of primary raw materials by secondary raw materials coming from recycling allow for significant GHG savings due to lower demand for energy needed to extract raw materials and turn them into products.

From waste management to a circular economy

The EU's Circular Economy Action Package was adopted in December 2015. The circular economy package goes beyond waste management alone, by addressing the whole life cycle of resources and products, in order to close the loop. This means dealing with production processes, material and product design, consumer and buyer information, distribution and retail to stimulate waste prevention by increased re-using, repairing, refurbishing and also by recycling existing materials and products to minimize the residual waste, ideally leading to a zero waste society. The strategy set out a number of priority issues, including plastics, food waste, critical raw materials, construction and demolition, biomass and bio-based products, innovation and investment and monitoring progress.

The Ministry of Environment and Energy of Greece made a number of institutional interventions, which are in line with the principles of circular economy:

(a) The revised National Waste Management Plan (which has been approved and published on 15-12-2015 with the Act no. 49 of Ministerial Council "Amendment and approval of the National Waste Management Plan and the National Strategic Plan for Waste Prevention,

ratified according to the 51373/4684/25–11–2015 Joint Ministerial Decision”) foresees that 50% of the waste (recyclable and biowaste) will be recovered by recycling and reuse at local level;

- (b) the development of regional waste management plans (all thirteen have been approved);
- (c) the financing of projects involving the remaining 50%, with provision for the recovery of resources, energy and secondary materials;
- (d) the recent law about the alternative management of packaging waste and other products (Law 4496/2017);
- (e) the application of the principle “pay as you throw”.

The "New Action Plan - Circular Economy Roadmap" was approved by Act No. 12/29.4.2022 of the Council of Ministers (A' 84). This plan, which is a revision of the previous National Operation Plan 2018-2019, has a time horizon of 2022-2025 and is aligned with the objectives of the corresponding Commission action plan and compatible with national legislative actions.

The general actions contained therein have been divided into four groups:

- i. Sustainable production and industrial policy
- ii. Sustainable consumption
- iii. Less waste with more value and
- iv. Horizontal actions

while it also includes specific actions for key products that need to be addressed as a priority.

The actions concerning the sustainable production and industrial policy can be summarized to:

- i. Provision of tax incentives (joint ministerial decision under reference 139818 EX/29.09.2022, B' 5083).
- ii. Connection of the sustainable production with the producers' contributions (paragraph 3b of article 9 and article 78 of law 4819/2021, A' 129),
- iii. Requirements specification for recycled plastic content in plastic containers and cups (article 6 of law 4736/2020, A' 200).

From the actions concerning the sustainable consumption, the implementation of the following will continue:

- i. Development of Creative Materials Reuse Centers (KDEY) (article 18 of law 4819/2021).
- ii. Imposition of the obligation to inform consumers about repairable and upgradeable products (article 17 of law 4819/2021).
- iii. Carrying out information and training actions.

Regarding actions for less waste with more value, the following will be strengthened:

- i. Development and implementation of "Pay-as-you-throw" (PAYT) systems (article 37 of law 4819/2021).
- ii. Creation of new extended producer responsibility systems for streams, such as textiles, vehicle spare parts, etc.
- iii. Promotion of the use of secondary (waste-based) fuels in energy-intensive industries.
- iv. Intensification of controls at all stages of waste management, including the installation of an electronic location system (GPS).

The New Action Plan for the Circular Economy also includes a series of horizontal actions, concerning:

- i. The single-use plastics in implementation of Law 4736/2020 (A' 200).
- ii. The definition of a policy framework for a) education, training, lifelong learning and social innovation in sectors of the circular economy and b) the promotion of circular innovation in research, innovation, digital technologies.

- iii. The common public aid action "Research-Create-Innovate". This is the "Research-Innovate" action for the period 2021-2027, which focuses on targeted interventions for the circular economy.

For excavation, construction and demolition waste (ECDW), the following actions are foreseen:

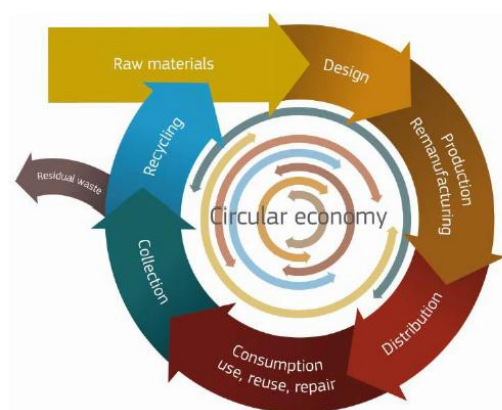
- i. The enhancement of the efficiency of alternative ECDW management.
- ii. The development of markets for secondary materials resulting from the processing of ECDW.

For water, funding is provided for projects concerning:

- i. Interventions to reduce water waste at the distribution and consumption stage.
- ii. Efficient water use in economic activities with a significant footprint.
- iii. Wastewater treatment projects for priority C and D settlements and
- iv. Reuse of water and sludge from wastewater treatment plants.

In particular, support will be provided for,

- i. Wastewater treatment projects and access to high-quality drinking water.
- ii. Water resources management interventions.
- iii. Actions to reduce losses in irrigation networks, modernize networks, and promote investments in water saving and reuse.



Source: European Commission.

Figure 2.2 Main phases of a circular economy model

Waste to landfill - Management of biodegradable waste

The National Waste Management Plan was revised in 2020 and 2023, including actions for:

- i. The separate collection and aerobic or anaerobic treatment of biodegradable waste (of urban and agricultural origin, including fats and oils), which constitute a priority stream, for the production of compost and/or energy recovery
- ii. The separate collection of waste materials (plastic, paper, glass and metals) for preparation for reuse, recycling/recovery of materials
- iii. The production of alternative secondary fuels and the recovery of energy from energy-intensive industry and from energy recovery units (waste to energy), contributing to the replacement of fossil fuels by biomass/biofuel and waste-based fuel.

In addition, measures for generation rate reduction and proper management of biodegradable waste are provided in the law on waste (Law 4819/2021, A' 129) and in the National Waste

Prevention Program, and food waste reduction targets have been established, contributing to the UN Sustainable Development Goal of reducing per capita food waste by 50% by 2030. Specifically, it is aimed by 2030 to:

- i. Reduce food losses along the production and supply chain
- ii. Reduce per capita food waste by comparing to 2022 at the retail and consumer levels.
- iii. Take measures to encourage the donation and redistribution of food for human consumption.

Moreover, the improvement of the waste management for all infrastructures across Greece is planned:

- i. Upgrading of the Recyclable Materials Sorting Centers (KDAY)
- ii. Upgrading of the Waste Processing Units (MEA) to Recycling Recovery Units (MAA), where separately collected recyclable materials and biowaste will be processed
- iii. Reduction of the amounts of the residual waste
- iv. Minimization of the number of the unmanaged waste disposal sites.

The main objective of the national plan is the reuse and the recycling of MSW generated at least by 60% in 2030, upon completion of the projects, and the reduction of landfill share to 10%.

To be noted that energy generation from secondary fuels RDF (Refused Derived Fuel) or SRF (Solid Recovered Fuel), which are recovered from Mechanical-Biological Treatment units of residual mixed municipal waste (MWW and MSW) and possibly also from MSWW, is compatible with:

- i. The management and utilization of waste with modern circular economy technologies
- ii. The requirements of the Circular Economy, given that the energy utilization of secondary fuel is in a higher position in the hierarchy of waste than its final disposal in a landfill.
- iii. The European Commission Directives on the diversion of waste disposed of in landfills by 90% by the year 2035.

At the same time, CO₂ emissions from its use are lower than those from fossil fuels, because RDF/SRF contains a significant percentage of biomass.

Special management and specific measures will be taken to address seasonality in the waste sector, with the aim of fully covering island areas during the tourist season.

To be noted that National Waste Management Plan was adopted in 2015 which with the decision 50910/2727/2003 and the Law 4042/2012, the measures, the terms and the processes for the rational management of waste in national and regional level had been specified.

According to the National Waste Management Plan (2015), the national policy for waste, taking into consideration, among others, waste hierarchy as set in the Directive 2008/98/EC, was formulated in order to achieve the following goals for the year 2020: (i) waste generation per capita should be reduced drastically, (ii) the preparing for reuse and recycling including separate collection of recyclables – biowaste should reach 50 % of total produced municipal waste, (iii) energy recovery should be chosen as a supplemental / final solution when the application of the remaining recovery operations is not possible and (iv) landfill shall be the last choice of waste management whereas landfilled waste should be reduced at 30% of the total municipal waste generation.

Landfills shall comply with the requirements of Directive 1999/31/EC on the landfill of waste, which has transposed to Greek legislation by JMD 29407/3508/2002. The objective of the Landfill Directive 1999/31/EC is to prevent or reduce as far as possible negative effects on the environment resulting from the landfilling of waste –including emissions of GHG – by introducing stringent technical requirements for waste and landfills.

Biodegradable waste is of interest in terms of GHG emissions, as this is the waste fraction delivering most CH₄ emissions during anaerobic decomposition. The necessity to reduce the

quantities of biodegradable waste going to landfills is acknowledged by Joint Ministerial Decision 29407/3508 in agreement with Directive 1999/31/EC. Within the framework of the national strategy for the reduction of biodegradable waste, as reviewed according to the National Waste Management Plan (2015), Greece had the target to limit the biodegradable waste going to landfills in 2020 to 35% of the biodegradable waste produced in 1997. The reduction of biodegradable waste landfill is enhanced by the directive for Packaging and Packaging Waste (94/62/EC) Paper/Cardboard recycling.

The Landfill Directive required, also, the collection of landfill gas from all landfills receiving biodegradable municipal waste. The flaring of landfill gas in all managed sites for urban centres with population more than 100,000 is partially an integrated measure. Already, the managed disposal sites serving the population of the largest cities of Greece are equipped with systems for the collection or for the flaring of biogas.

Urban Waste Water Treatment

As regards wastewater, a collection network with its corresponding wastewater treatment plants has already been developed during the last five-years, covering the needs of 70% of the population in 2001 and the 91% in 2015, in compliance with the Directive 91/271/EEC concerning the collection, treatment and discharge of the urban wastewater. In the Psytalia wastewater treatment plant that serves approximately 4 millions of Attica population, a part the sludge produced is treated under anaerobic conditions resulting in the production of biogas. The biogas produced covers the energy needs of the wastewater treatment facilities, while the surplus is flared.

Finally, the implementation of Directive 86/278/EEC for the use of sludge in agriculture is in force, however until 2012 only a minor amount of sludge is used in agriculture (about 0.04% of produced sewage sludge) on the frame of research projects and pilot studies. Nevertheless an increase in the quantity of sludge in agriculture is observed for the period 2013 - 2015 (about 20% of the dry produced sewage sludge).

Policies targeting waste streams

In this section policies are grouped together which target different waste streams; the GHG reduction potential may become apparent only in the overall life-cycle where emissions are avoided during production or due to smaller amounts of waste.

The Directive 94/62/EC established the general principles of the European Union on packaging and packaging waste. This directive was incorporated into national law by Law 2939/2001 which lays down recycling targets per waste stream and introduces the obligatory participation of the parties responsible (packaging producers) in alternative waste management systems. In Greece, the most known packaging waste recycling system is the system of placed nationwide blue bins, but there are other systems as well with small recycling kiosks. The materials recycled are plastic, glass, aluminum, paper and cardboard, tinplate and wood. The Alternative Waste Management System Packaging SSER-RECYCLING started its operation in 2003 by placing blue recycling bins. The packaging recycling systems have since grown and noted a steady increase in the geographical range, the number of contracted producers and the amount of packaging recycled.

The particular problem of plastic waste is addressed by a Green Paper (COM(2013) 123 final) and a Proposal for an amendment to the Directive 94/62/EC to reduce the consumption of lightweight plastic carrier bags (COM(2013) 761 final). On 28 April 2015, the European Parliament approved of such an amendment that will require EU Member States to either reduce annual average consumption of lightweight plastic bags per citizen, or to ban the handing-over of free bags (Directive (EU) 2015/720). In Greece, as of 1 January 2018, consumers are required to pay an environmental fee per piece of lightweight plastic carrier

bag (Law 4496/2017 and JMD 180036/952/10.8.2017 (OJG 2812 B)). The charge is set as from 1 January 2018 at three (3) cents of euro and from 1 January 2019 to seven (7) cents.

The Directive on Waste of Electrical and Electronic Equipment (WEEE) 2012/19/EC requires Member States to take measures to encourage producers to design and produce electrical and electronic equipment which take into account and facilitate dismantling and recovery. Moreover, it sets ambitious collection targets in order to minimize the disposal of WEEE in the form of unsorted municipal waste. It also sets targets for re-use and recycling as well as targets for recovery of WEEE to ensure the correct treatment of all collected WEEE. In Greece, the annual waste electrical and electronic equipment is estimated at 120,000 to 140,000 tons. Waste electrical and electronic equipment has been identified by the Greek legislation as a priority waste stream, due to the dangerous nature of growth in the volume and the significant impact caused by the production of electrical and electronic equipment in the environment. According to the revised National Waste Management Plan, from 2019, the minimum collection rate is set at 65% of the average annual weight of the Electrical and Electronic Equipment placed on the market in the previous three years or alternatively in 85% of the Waste Electrical and Electronic Equipment produced by weight.

The End-of-Life Vehicles Directive (ELVD) 2000/53/EC aims to reduce the amount of waste produced from vehicles when they are scrapped and to increase re-use, recycling and other forms of recovery of end-of-life vehicles and their components. The Motor Vehicles Directive 2005/64/EC sets very high targets for re-use, recycling and other forms of recovery of end-of-life vehicles and their components so as to reduce the disposal of waste as well as to improve the environmental performance of all economic operators involved in the life cycle of vehicles. Further, it sets provisions on the type-approval of motor-vehicles with regards to their reusability, recyclability and recoverability. In Greece, after the launch of the system of Alternative Vehicle Management Association (EDOE) in December 2004, the rate of recycling of ELVs has shown an upward trend. Apart from private owners of old cars, local government agencies have been active and have fully contributed to the removal of abandoned old cars from the streets of the cities. The recycling system of EDOE collaborates with other collective recycling systems, where materials are delivered as oil, tires, batteries and other hazardous waste delivered to hazardous waste management companies. A percentage, almost 75% of ELVs consists of useful metals that are recycled in their respective industries. Finally some parts are sold as used parts (reuse). The national institutional framework for ELVD is governed by PD 116/2004, JMD 186921/1876/30-10-2016 and JMD 15540/548/E103. Under the Presidential Decree 116/2004, quantitative targets for recycling vehicles have been set to 85% for vehicles produced after 1/1/1980 and to 75% for vehicles produced before 1/1/1980. Production date is considered the issue date of the first license. These objectives were increased to 95% reuse and recovery irrespective of the year of production.

The Battery Directive 2006/66/EC provides, *inter alia*, targets for collection and recycling and establishes rules for treatment and disposal of batteries and accumulators. In Greece, in 2013 around 1,700 tons of portable batteries are placed into the market, and around 590 tons of waste portable batteries are collected corresponding to 34% collection rate. The national institutional framework for used batteries is governed by JMD 41624.2057.E103/2010 and JMD 39200/2015.

There are three additional waste streams already covered by the national institutional framework for alternative management:

- ✓ Waste Lubrication Oils - WLO (PD 82/2004). In Greece it is estimated that 60% of oils available in the market becomes waste.
- ✓ Used vehicle tires (PD 109/2004). In Greece, a collective tire recycling system operates since 2004, nationwide since 2006. Currently, the collection of used tires exceeds 95% of used tires in the country (36,307 t in 2016), of which 60% was recycled and 40% were utilized for energy recovery.
- ✓ Construction Demolition and Excavation Wastes - (JMD 36259/1757/E103/2010).

2.3.2.7 Sectoral policies and measures: LULUCF sector

The potential of the LULUCF sector in Greece is still roughly estimated due to lack of data. Efforts towards developing tools to efficiently monitor land use changes and carbon emissions and removals from this sector are underway to meet the increased monitoring, reporting and verification requirements set by EU Regulations 2018/841, 2018/1999 and 2023/839 after 2025.

The National Energy and Climate Plan (NCEP) acts as a roadmap towards achieving specific energy and climate goals until 2030. The priorities for the LULUCF sector until 2030, outlined in the NCEP, include sustainable forest management, protection of forest resources and restoration of areas affected by natural disturbances.

Pursuant to Article 24 of the Greek Constitution, forest conversion to other land uses is strictly regulated and is only allowed in exceptional cases. Deforestation is thus limited to specific cases of public interest and benefit (e.g. construction of roads, railways, high tension lines). Any other temporary loss of forest cover due to disturbances is not considered deforestation and is declared instantly reforested following specific administrative procedures under the provisions of Greek laws (art. 61 Legislative Decree No 86/1969, art. 37, 38, 46, 47 Law 998/1979) in order to gradually return to its former state.

Forest protection and sustainable management is further promoted by the National Forest Strategy (NFS) for the period 2018-2038, adopted in 2018 (M.D.170195/758/28-11-2018). The NFS stipulates the principles and guidelines of forest related policies with the following indicative priorities:

- Reconstruction of Central & Regional Forest Services, aiming at Sustainable Forest Management optimization
- Development of national, regional & local road maps for the enhancement of preventive pre-fire planning & forest fires tackling
- Systematic forest management of all ecosystems for the reduction of forest fires, taking into consideration sustainability & multiple forest ecosystem services
- Establishment of a permanent & flexible mechanism for national forest inventory & monitoring
- Recognition of forest value and enhancement of forest contribution to bio-economy & circular economy
- Forest management aiming to adapt/ mitigate climate change
- Conservation, restoration & enhancement of provided forest ecosystem services
- Enhanced networking and synergies between institutional and non-governmental players for better governance
- Coherence of national forest policy with forest international & European policies, targets and commitments

The current policies and targeted measures, already implemented¹ in the framework of National or Strategic Plans or other national, European or international commitments of our country, will continue to be implemented with the aim of **increasing net removals** and offsetting greenhouse gas emissions of the LULUCF sector through the following actions:

1. Sustainable management of forests and woodlands
2. Production of long-life cycle wood products
3. Strengthening the protection of forests against natural disasters

¹ Sources: LIFE-IP AdaptInGR, Ministry of Environment and Energy, Ministry of Rural Development and Food

4. Afforestation of agricultural land and restoration of degraded areas

Institutional measures, such as the codification of forest legislation, the updating of technical specifications of forest management plans and studies for sustainable forest management (ongoing) and then the preparation of management studies for the whole country (by recording the data on a digital platform), in combination with the staffing of the Forest Service, will improve the existing forest management framework, in order to:

1. improving the productive potential of forests by restoring degraded and dual forest ecosystems and increasing the carbon stock;
2. the production of long-life wood products and the fight against illegal logging and related trade (see FLEGT Timber Regulations Nos 2173/2005 and 995/2010);
3. improving forest structure to increase their resilience and adapt to climate change;
4. the protection and promotion of forest vegetation regeneration,
5. the provision of multiple ecosystem services (e.g. improving water quality, protecting biodiversity).

The prevention and restoration of damage to forests against biotic and abiotic threats (forest fires, pathogens, floods and other natural disasters and catastrophic events) is also an important part of the measures and policies that will continue to be implemented. Prevention measures, which will continue, include vegetation clearing (e.g. under the ANTINERO programme, which is financed by the Recovery and Resilience Fund, etc.), but also the preparation of Fire Protection Plans for the whole country. Also, in order to maintain the health and vitality of forest ecosystems, appropriate specialized measures are taken to combat diseases, insects and fungi, as well as any pathogenic cause in forest trees (e.g. systematic monitoring by sampling), in application of the relevant obligations arising from Community legislation on plant health controls.

With regard to the restoration of forest potential damaged by fires, natural disasters and other catastrophic events or degraded by other causes such as soil erosion, actions will continue to be implemented such as:

1. Reforestation under the National Reforestation Plan (aims at restoring degraded forest ecosystems using mainly native species) and the institution "Restoration and Reforestation Contractor" (concerning forests damaged by catastrophic fires and restoration works in mountain streambeds).
2. Mountain anti-erosion and flood protection works, as a priority in cases of extensive disasters in Evia (2021) and Dadia in the Evros region (2022 - 2023).

In the past years, Greece has also made significant progress towards land use monitoring. The Forest Maps' project has delineated the forests and forest areas in more than 95% of the country, to prevent arbitrary land use change, improve spatial planning and safeguard private and public property. The remaining 5% concerns areas that were either:

- a. excluded from posting as areas of city plans and demarcated and non-demarcated settlements of the country, as indicated by the competent Authorities, or
- b. under dispute as to their thematic content and, at this stage, are being reviewed by the relevant Objection Examination Committees

Forest maps delineate forest, settlements and other land uses. The "forest" category includes woodlands, reforestation areas, as well as shrublands and grasslands. Therefore, the information forest maps provide is not sufficient to determine land uses in Greece and additional data from Forest Management Plans, Grazing Plans and other sources are required for a complete inventory. The delineation of managed forest land however needs to coincide with forest boundaries depicted on the forest maps. This means that, to accurately map

current land uses, the forest cadaster will be used as the basemap on which additional geographical datasets will be overlaid.

Building on the existing Forest Maps, the Ministry of Environment and Energy is establishing an inventory and monitoring system (IMS) for forests and forest areas in the entire country which is expected to be completed in 2025. The IMS will provide the current baseline for forests and forest areas in Greece through the national forest inventory completed in 2024. It will also establish a permanent network of sampling plots which will gradually produce additional information to estimate and monitor carbon fluxes in aboveground and belowground biomass, litter and deadwood. More information is provided below.

Greece is also planning a new voluntary carbon market scheme, which is expected to be operational in the year 2025. The voluntary carbon market is expected to contribute to sustainable land management in the forestry and agricultural sectors. Carbon credits allow companies and other organizations to offset greenhouse gas emissions by financing projects that remove CO₂ from the atmosphere. These include temporary carbon storage projects from afforestation, carbon farming practices but also from forest restoration.

A necessary future improvement in the national GHG reporting is the inclusion of emissions and removals from "unmanaged" forests, i.e. forests for which there are currently no management studies. In this direction, 19 pilot management studies are already being implemented in four Regions of the country covering an area of 1395 ha, while legislation is planned for the future to extend management to all public forests, as well as the operation of a digital platform for recording study data. The inclusion of these areas in the category "managed forests" of the greenhouse gas inventory is estimated to be implemented in the year 2028 (with reference year 2026, after the completion of the IMS project). Also, Law 5106/2024 (A' 63) foresees the establishment of hybrid cooperative schemes for the management and exploitation of public forests in accordance with the approved management and other plans for the protection of forest ecosystems. The above steps are part of the reform for the management of public forests implemented by the Ministry of Environment and Energy.

In addition, the mitigation of emissions and the increase of removals by the LULUCF sector is expected to be enhanced through the implementation of policies and measures included in the Strategic Plan of the Common Agricultural Policy of Greece (CAP SA) 2023 - 2027, and mainly concern the conservation and sustainable use of soil and natural resources in general, as well as agricultural land management practices.

Research and innovation are also prioritized in order to implement advanced techniques in agriculture and forestry. In addition, the National long term-strategy developed aiming towards climate neutrality by 2050 addresses the LULUCF sector only in terms of energy crops for the production of biofuels. It is expected that lignocellulosic biomass, or agricultural/ forestry residues, will be applicable at industrial scale for the production of advanced biofuels (2nd generation) after 2030.

The measures for the LULUCF sector arise from rural development actions and other financial mechanisms. For the period 2020-2040, the measures implemented and adopted aim primarily at protecting forest land, its sustainable management, preserving and strengthening its multifunctional role, contributing also to the mitigation of climate change impacts and the development of the forestry sector. Additional policies and measures relevant to the LULUCF sector are included in the CAP Strategic Plan for 2023 – 2027, aiming at the increase of carbon removals and biodiversity conservation.

Those policies and measures are briefly presented below:

(A) Forest protection & sustainable management

According to that legislative framework, forest management is applied following specific rules and guidelines for practices driven by the fundamental principle and predominant goal of preserving and promoting the "sustainability" of forests in terms of their provision of products, growing stock and services. More information on the forest legislation and the historical background of forest management are available in the National Inventory Report (2024).

Table 2.7 Key policies and measures for forest protection & sustainable management (adopted/implemented)

| Measure | Description | Funding |
|--|---|--|
| Management of Public Forests | Rehabilitation of degraded coppice broadleaved forests to high forests, improvement of forest structure and stability, favouring regeneration, forest cultivation and wood harvesting, conservation and maintenance of forests Pilot management studies for the update of the forest management guidelines at national level | Public Investment Program/ Green Fund ² |
| Maintaining the health and vitality of forest ecosystems - Effective application of the Community plant health regime | The aim is to promote appropriate actions to take adequate measures to combat insects and fungi, and all pathogen-causes under the obligations arising from the Community legislation for plant health inspections, and from the Commission's implementing decisions on taking urgent measures with regard to the spread of pests | Public Investment Program/ Green Fund |
| Fire protection of public forests and forested areas | Implementation of preventive forestry actions (e.g. forestry works for the reduction of fuel biomass), forestry work interventions (logging, etc.) in coniferous forests to remove combustible biomass for forest fire protection | Public Investment Program/ Green Fund |
| Management of public forest nurseries, seeds gathering and management of seed- production stands and seed-production gardens | Production of high-quality planting material that will substantially contribute to successful reforestation works | Public Investment Program/ Green Fund |
| Special Environmental studies and Management plans for the | Zoning within protected areas, determination of activities that are allowed or prohibited in each | PA 2014-2020 |

² Annually the General Directorate of Development and Protection of Forests and Forest Environment develops a special «Forestry Financing Program under the Green Fund» which finances many measures implemented in the LULUCF sector

| Measure | Description | Funding |
|---|---|---|
| NATURA 2000 sites | <p>zone, taking into account existing infrastructure and human impact. Conservation targets and management measures to be implemented in order to reconcile environmental protection and sustainable development.</p> <p>The study results will be used by all competent authorities responsible for the protected areas (Management Bodies, Ministry of Energy and the Environment, Administrative Regions, Decentralized Administrations etc., as an important basis for spatial planning, programming and environmental permits of future investments.</p> | |
| Monitoring and assessment of the conservation status of protected species and habitats in Greece | Includes all land uses within protected areas, focusing on the conservation of habitats and species of national and community interest, including forest land, grasslands, agricultural land | PA 2014-2020 |
| <p>Investing in the development of forest areas and the improvement of forest sustainability</p> <p>Restoration of areas affected by natural disturbances</p> | Support for afforestation/creation of forested areas, aid for agroforestry systems, support for the prevention and/ or restoration of damages to forests from forest fires, natural disasters and catastrophic events, support for investment in forestry technologies and in processing, distribution and marketing of forest products | Rural Development Regulation ³ |

(B) Afforestation/ reforestation projects

- The **National Reforestation Plan** for the period 2020-2030, which involves approximately 57,000 ha of burned and degraded land. The reforestation activities are expected to be completed in 2026. The overall budget is 2.75 million Euros (Status: Adopted).
- The afforestation of agricultural land pursuant to EEC Regulations 2080/92 and 1257/99, in effect since 1994, under the EEC Regulations. (Status: Implemented).

(C) Adaptation to climate change

³ 5th Programming Period 2014-2020 and Strategic Plan for Common Agricultural Policy 2023-2027

- The **National inventory and monitoring system for forests and forest areas** to support the strategy development for their adaptation to climate change, in response also to the implementation of Regulation 841/2018 (Reporting period 2026-2030). The action involves the creation of a permanent monitoring plots network of biotic and abiotic parameters for assessing the impact of climate change on forests. Estimated budget 6.5 Million Euro, foreseen implementation period 2021 – 2025 (Status: Adopted).
- **LIFE-IP AdaptInGR** - Boosting the implementation of adaptation policy across Greece. The project aims to catalyse the implementation of the Greek National Adaptation Strategy and of the 13 Regional Adaptation Action Plans at the current 1st adaptation policy cycle (2016-2025) and to prepare the passage to the 2nd adaptation policy cycle (2026+), through appropriate action at national, regional and local levels
- **RESALLIANCE**. Landscape resilience knowledge alliance for agriculture and forestry in the Mediterranean basin. The project aims at increasing knowledge flow, skills, and innovation in landscape resilience. With a specific focus on Mediterranean countries, the project will engage with farmers, foresters, and other stakeholders to support the application of innovative landscape resilience approaches to fight climate change and mitigate its effects.
- **CARBONICA**. Carbon Initiative for Climate-resilient Agriculture. The project aims to introduce Carbon Farming techniques in the widening countries of Greece, North Macedonia and Cyprus. To achieve this overarching goal, the Carbonica Excellence Hub will be established, aiming to connect and strengthen the innovation ecosystems of the three Countries by streamlining the R&I between them to bolster the adoption of CFA, by coming up with new business models for the agrifood industry that would take into account carbon sequestration, by bringing together policy makers and civil society, all the while fostering the reduction of their carbon footprint.

(D) Grassland management

- Regulations of grazing land (Law 4351/2015 amended by art.32 of Law 4599/2019), which refer to grassland, phrygana and shrublands include the establishment of a National Geographic Database and the elaboration of management plans for grazing lands are ongoing, funded by through the Agriculture and Veterinary Fund (Status: Partially implemented).

(E) Enhanced Monitoring, Reporting and Verification (MRV) System for GHG accounting

Greece has prioritized the enhancement of its MRV system for the LULUCF sector, in compliance with Regulations 2018/841/EU and 2018/1999/EU, aiming to better protect and manage its natural resources. The establishment of the Inventory and Monitoring System for forests and forest areas is a major step towards this direction. This necessary improvement as the benefits of LULUCF-related interventions usually take several years to pay off. To increase the accuracy and completeness of calculations,

At the same time, research is carried out to improve scientific knowledge on parameters in the field of LULUCF through national and European programs (HORIZON etc.), while the implementation of new research programs is planned. Indicatively, the project "Creation of a monitoring network for model sustainable and multifunctional Mediterranean forest ecosystems for the development of a strategy for mitigation and adaptation of the effects of possible climate changes", which will be proposed by the Ministry of Environment and Energy (General Directorate of Forests and Forest Environment) for inclusion in a funding program of the Green Fund. In addition, an integrated plan for the enhancement of the MRV system has been elaborated and is expected to be adopted in 2025, to apply higher

tier methodologies and account for additional carbon pools. All of the above are expected to contribute to the methodological upgrading of emission and absorption estimates in the sector.

It is noted that improvements have already been made to Greece's greenhouse gas inventories, in accordance with the relevant European Regulations, such as the inclusion of changes in organic carbon stocks in agricultural land and the mapping of land use changes using geospatial data.

2.4 Policies and measures no longer in place

All policies and measures listed in previous national communications are still in place. However, they are being updated to reflect current circumstances, changing priorities, and new developments at both national and international levels. These updates help ensure the policies stay effective and relevant, addressing new challenges and opportunities. Additionally, plans and strategies are being improved to support their implementation, involve stakeholders, and enhance their overall impact.

2.5 Effect of policies and measures on the modification of long-term trends

The primary document outlining Greece's mitigation policies and measures is the National Energy and Climate Plan (NECP). The plan's overarching goal is to achieve climate neutrality.

The main objective of the NECP is to design, plan, and implement socially, environmentally, and economically efficient policies that will contribute to meeting Greece's medium- and long-term energy and climate goals. These policies aim to drive economic growth while addressing key challenges such as reducing energy costs and protecting end-users from high energy prices.

Greece's energy and climate targets for 2030 are shaped by specific quantitative commitments as a Member State of the European Union. These targets consider the unique characteristics and particularities of the national energy system, the country's capacity to develop relevant technologies and applications, its ability to adapt, and its socio-economic conditions. Through this process, Greece's national targets are aligned with broader EU goals, including those for sectors covered by the Emissions Trading System, renewable energy sources (RES), and energy efficiency, which are all integrated into the NECP.

Additionally, the NECP outlines quantitative policy targets for the period up to 2030, which also serve as intermediate steps toward achieving greenhouse gas (GHG) emission reductions by 2050. The Greek Government's ultimate goal is to contribute to the EU-wide commitment to a climate-neutral economy by 2050.

The green energy transition focuses on establishing a climate-neutral energy system. This entails achieving near-zero CO₂ emissions from fossil fuel combustion and ensuring climate-neutral processes in non-energy sectors. The aim is to balance positive and negative GHG emissions, incorporating enhanced CO₂ absorption from soil, forests, and marine ecosystems, to achieve net-zero emissions by 2050. This balance will be sustained indefinitely to ensure long-term climate neutrality.

2.6 Assessment of the economic and social consequences of response measures

The formulation of climate policy in Greece is closely aligned with EU policies, which are designed to comprehensively assess the potential economic and social impacts of climate action. To ensure a balanced approach, the European Union has established structured processes to evaluate these impacts before implementing new policy measures.

EU Impact Assessment Framework

The European Commission employs a robust impact assessment system for the development of new legislative proposals. This system ensures that every proposed initiative undergoes a thorough examination of its potential benefits and costs. It incorporates an integrated analysis of economic, social, and environmental impacts. For more detailed information, reference can be made to the EU BTR.

Beyond internal EU evaluations, mechanisms are in place to assess the effects of EU climate policies on countries outside the Union. Although there is no formalized dialogue exclusively focused on response measures, these impacts are often discussed within the framework of bilateral and regional cooperation agreements. Such agreements ensure that the consequences of EU policies on non-EU countries are considered and addressed.

Trade Agreements and External Impact Considerations

EU Free Trade Agreements (FTAs) serve as concrete examples of this inclusive approach. For instance, the Deep and Comprehensive Free Trade Area (DCFTA) between the EU and Ukraine, signed on June 27, 2014, and effective as of September 1, 2017, provides mechanisms for stakeholders to engage with the EU on policy impacts. The agreement allows concerned parties to comment on proposed regulations and includes provisions for enquiry points to address questions related to the agreement's implementation. Similar agreements are under negotiation with countries like Morocco, Tunisia, and Jordan, reflecting the EU's commitment to transparency and cooperation in trade and climate policies.

European Neighbourhood Policy (ENP)

Under the European Neighbourhood Policy, the EU engages in bilateral Association Agreements with neighboring countries. These agreements outline political priorities and areas of cooperation, followed by action plans tailored to specific country needs. These plans, typically spanning three to five years, enable partner countries to address their concerns and highlight priority areas for collaboration. Technical discussions within sub-committees (e.g., on energy, transport, and the environment) facilitate detailed exchanges on policy directions and allow countries to seek clarifications from EU experts on planned legislative initiatives.

Supporting Global Climate Objectives

The EU actively supports third countries in implementing the Paris Agreement in ways that foster socio-economic opportunities while achieving climate objectives. Capacity-building programs play a pivotal role in this effort. For example, the Africa LEDS (Low Emissions Development Strategies) project supports nine African countries by aligning low-emission strategies with their broader development goals. This initiative includes technical capacity building, such as analytical modeling, to strengthen long-term policy decision-making frameworks.

Through its comprehensive assessment systems, trade agreements, bilateral partnerships, and capacity-building initiatives, the EU ensures that the formulation and implementation of its climate policies are inclusive and considerate of their broader impacts. Greece, as part of the EU, adheres to these processes, benefitting from their structure and insights to develop its own climate strategies.

3. Projections of greenhouse gas emissions and removals

3.1 Projections

This chapter outlines the "with measures" (WM) or "with existing measures" (WEM) scenario regarding national projections of greenhouse gas (GHG) emissions by sources and removals by sinks for the years 2025, 2030, 2035, 2040, 2045, and 2050. The WM scenario assumes that no additional emission reduction policies or measures are implemented beyond those currently in place or adopted. It reflects all the measures outlined in the latest update of the National Energy and Climate Plan (NECP), with the exception of the additional measures planned for the Land Use, Land-Use Change, and Forestry (LULUCF) sector.

Additionally, a "with additional measures" (WAM) scenario is included. This scenario accounts for the impact of all implemented and adopted measures specified in the NECP, as well as the additional measures planned for the LULUCF sector.

The NECP serves as a strategic plan for the Greek government on climate and energy issues, providing a comprehensive roadmap to achieve specific energy and climate goals by 2030 and attain climate neutrality by 2050. It highlights Greece's energy and climate priorities, development opportunities, and aims to function as the central tool for shaping and integrating national energy and climate policy over the next decade. Further details on the NECP are provided in section 2.3.1.2.

The GHG emission projections presented in this chapter are based on the latest official energy projection scenarios developed by the Ministry of Environment and Energy.

In **Figure 3.1**, the evolution of GHG emissions (national total, EU-ETS and non ETS) and their projections till year 2050, along with the ESD (2013-2020) and ESR (2021-2030) targets of Greece are presented. The projections of GHG emissions of the WM and WAM scenarios disaggregated by sector and by gas are presented in CTF Table 4.1 and 4.2 (**Tables 3.1-3.2**). In **Table 3.3** a split of the projections of the GHG emissions is presented between the sectors covered and not covered by the EU ETS.

It should be mentioned that actual inventory data till the year 2022 have been used in the preparation of the emission projections (obtained from the 2024 GHG Inventory Submission of Greece).

Under the WM scenario, GHG emissions, including LULUCF, are projected to decrease by 59.3% by 2030, 80.5% by 2040, and 95.5% by 2050, relative to 1990 levels. The WAM scenario, incorporating the additional LULUCF measures, projects slightly higher reductions of 60.3% by 2030, 81.5% by 2040, and more than 97% by 2050. These projections underscore Greece's commitment to implementing robust policies for achieving its climate neutrality objectives.

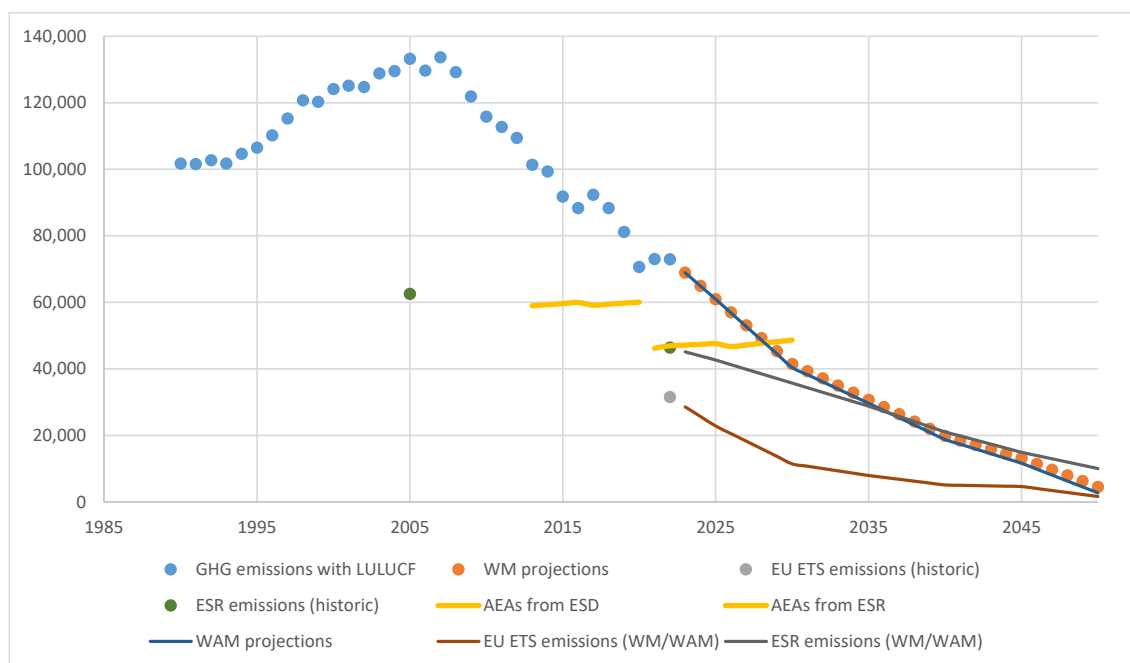


Figure 3.1 Projections of total national GHG emissions (excluding LULUCF), EU ETS and ESD sectors (in ktCO₂eq)

Table 3.1 CTF Table 7 Information on projections of greenhouse gas emissions and removals under a ‘with measures’ scenario

| | <div>Most recent year in the Party's national inventory report</div> <div>Projections of GHG emissions and removals</div> | | | | | | |
|---|---|-----------|-----------|-----------|-----------|-----------|-----------|
| | (kt CO ₂ eq) ^c | | | | | | |
| | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| Sector^d | | | | | | | |
| Energy | 36,544.61 | 25,843.85 | 11,977.58 | 7,461.36 | 3,343.39 | 2,363.66 | -816.50 |
| Transport | 17,908.59 | 18,222.08 | 16,324.28 | 12,112.58 | 7,829.53 | 4,124.33 | 675.62 |
| Industrial processes and product use | 9,639.95 | 8,556.68 | 7,284.27 | 6,501.53 | 5,829.64 | 4,940.14 | 4,458.98 |
| Agriculture | 7,980.46 | 7,544.03 | 7,139.48 | 6,841.53 | 6,194.27 | 5,832.26 | 5,273.01 |
| Forestry/LULUCF | -5,390.88 | -5,332.56 | -6,540.50 | -6,736.56 | -6,979.95 | -6,995.44 | -7,155.04 |
| Waste management/waste | 6,240.42 | 6,090.82 | 5,261.62 | 4,528.61 | 3,628.85 | 2,902.08 | 2,132.44 |
| Gas | | | | | | | |
| CO ₂ emissions including net CO ₂ from LULUCF | 52,652.16 | 42,293.02 | 25,291.07 | 15,905.20 | 7,033.38 | 2,267.59 | -4,453.59 |
| CO ₂ emissions excluding net CO ₂ from LULUCF | 58,122.29 | 47,700.41 | 31,918.84 | 22,736.66 | 14,110.76 | 9,363.57 | 2,806.76 |
| CH ₄ emissions including CH ₄ from LULUCF | 11,869.43 | 11,169.98 | 10,003.33 | 9,066.20 | 7,611.95 | 6,580.62 | 5,314.36 |
| CH ₄ emissions excluding CH ₄ from LULUCF | 11,807.33 | 11,115.08 | 9,940.49 | 8,997.99 | 7,541.46 | 6,507.04 | 5,237.69 |
| N ₂ O emissions including N ₂ O from LULUCF | 3,752.14 | 3,632.72 | 3,397.16 | 3,253.36 | 3,105.57 | 2,960.55 | 2,768.55 |
| N ₂ O emissions excluding N ₂ O from LULUCF | 3,734.98 | 3,612.80 | 3,372.73 | 3,226.68 | 3,078.62 | 2,933.58 | 2,739.90 |
| HFCs | 4,557.02 | 3,734.00 | 2,665.00 | 2,399.11 | 2,014.68 | 1,293.10 | 884.03 |
| PFCs | 87.37 | 90.00 | 85.00 | 80.00 | 75.00 | 60.00 | 50.00 |
| SF ₆ | 5.03 | 5.17 | 5.17 | 5.17 | 5.17 | 5.17 | 5.17 |
| NF ₃ | NO | NO | NO | NO | NO | NO | NO |
| Total with LULUCF | 72,923.15 | 60,924.90 | 41,446.73 | 30,709.04 | 19,845.74 | 13,167.03 | 4,568.52 |
| Total without LULUCF | 78,314.03 | 66,257.46 | 47,987.23 | 37,445.60 | 26,825.69 | 20,162.47 | 11,723.55 |

Table 3.2 CTF Table 8 Information on projections of greenhouse gas emissions and removals under a ‘with additional measures’ scenario

| | Most recent year in the Party's national inventory report (kt CO ₂ eq) ^c | Projections of GHG emissions and removals (kt CO ₂ eq) ^c | | | | | |
|---|--|---|-----------|-----------|-----------|-----------|-----------|
| | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| | | | | | | | |
| Sector^d | | | | | | | |
| Energy | 36,544.61 | 25,843.85 | 11,977.58 | 7,461.36 | 3,343.39 | 2,363.66 | -816.50 |
| Transport | 17,908.59 | 18,222.08 | 16,324.28 | 12,112.58 | 7,829.53 | 4,124.33 | 675.62 |
| Industrial processes and product use | 9,639.95 | 8,556.68 | 7,284.27 | 6,501.53 | 5,829.64 | 4,940.14 | 4,458.98 |
| Agriculture | 7,980.46 | 7,544.03 | 7,139.48 | 6,841.53 | 6,194.27 | 5,832.26 | 5,273.01 |
| Forestry/LULUCF | -5,390.88 | -5,332.60 | -7,578.85 | -7,791.24 | -8,049.71 | -8,535.84 | -9,004.08 |
| Waste management/waste | 6,240.42 | 6,090.82 | 5,261.62 | 4,528.61 | 3,628.85 | 2,902.08 | 2,132.44 |
| Gas | | | | | | | |
| CO ₂ emissions including net CO ₂ from LULUCF | 52,652.16 | 42,293.02 | 24,252.75 | 14,850.55 | 5,963.65 | 727.21 | -6,302.62 |
| CO ₂ emissions excluding net CO ₂ from LULUCF | 58,122.29 | 47,700.41 | 31,918.84 | 22,736.66 | 14,110.76 | 9,363.57 | 2,806.76 |
| CH ₄ emissions including CH ₄ from LULUCF | 11,869.43 | 11,169.98 | 10,003.33 | 9,066.20 | 7,611.95 | 6,580.62 | 5,314.36 |
| CH ₄ emissions excluding CH ₄ from LULUCF | 11,807.33 | 11,115.08 | 9,940.49 | 8,997.99 | 7,541.46 | 6,507.04 | 5,237.69 |
| N ₂ O emissions including N ₂ O from LULUCF | 3,752.14 | 3,632.68 | 3,397.13 | 3,253.33 | 3,105.54 | 2,960.53 | 2,768.53 |
| N ₂ O emissions excluding N ₂ O from LULUCF | 3,734.98 | 3,612.80 | 3,372.73 | 3,226.68 | 3,078.62 | 2,933.58 | 2,739.90 |
| HFCs | 4,557.02 | 3,734.00 | 2,665.00 | 2,399.11 | 2,014.68 | 1,293.10 | 884.03 |
| PFCs | 87.37 | 90.00 | 85.00 | 80.00 | 75.00 | 60.00 | 50.00 |
| SF ₆ | 5.03 | 5.17 | 5.17 | 5.17 | 5.17 | 5.17 | 5.17 |
| NF ₃ | NO | NO | NO | NO | NO | NO | NO |
| Total with LULUCF | 72,923.15 | 60,924.85 | 40,408.37 | 29,654.36 | 18,775.98 | 11,626.63 | 2,719.48 |
| Total without LULUCF | 78,314.03 | 66,257.46 | 47,987.23 | 37,445.60 | 26,825.69 | 20,162.47 | 11,723.55 |

Table 3.3 *Projections based on WM/WAM scenario of total national GHG emissions (excluding LULUCF), EU ETS and ESR sectors (in ktCO₂eq)*

| Year | National emissions excl LULUCF | EU ETS | ESR |
|------|--------------------------------|--------|--------|
| 2022 | 78,314 | 31,516 | 46,409 |
| 2025 | 66,257 | 22,853 | 42,690 |
| 2030 | 47,987 | 11,473 | 35,748 |
| 2035 | 37,446 | 7,983 | 28,789 |
| 2040 | 26,826 | 5,137 | 21,062 |
| 2045 | 20,162 | 4,669 | 14,921 |
| 2050 | 11,724 | 1,668 | 10,015 |

Concerning the 2020 non-ETS target (ESD target) of Greece pursuant to European legislation (Commission Decision 2013/162/EU as amended by 2017/147/EU and Commission Decision 2013/634/EU), Greece has met this target, on the basis of the domestic policies and measures.

Concerning the 2030 non-ETS target (ESR target) of Greece pursuant to European Regulation 2018/842, each Member State shall ensure that its greenhouse gas emissions in each year between 2021 and 2029 do not exceed the limit defined by a linear trajectory, starting on the average of its greenhouse gas emissions during 2016, 2017 and 2018 and ending in 2030 on the limit set for that Member State (-16% for Greece). The linear trajectory of a Member State shall start either at five-twelfths of the distance from 2019 to 2020 or in 2020, whichever results in a lower allocation for that Member State.

The Annual Emission Allocations of Greece for the period 2021-2030, which correspond to a reduction of emissions of 16% by 2030 compared to 2005 pursuant to Article 4(1) of Regulation (EU) 2018/842, are presented in **Table 3.4**. The AEAs for this period were set out by Commission Implementing Decision (EU) 2020/2126. In 2023, the Commission amended the Commission Implementing Decision (EU) 2020/2126 to update the number of AEAs assigned to Member States in the years 2023-2030. The annual emissions allocations for the years 2026-2030 will be determined in 2025, following a comprehensive review of the emission data.

By comparing the annual emissions allocation for the years 2021-2030 (Table 3.4) with the projected emissions from ESR sectors (Figure 3.1), it is projected that Greece will also meet the ESR target on the basis of the domestic policies and measures.

To be noted that Figure 3.1 and Tables 3.1-3.4 are based on GWP AR5.

Table 3.4 Annual Emission Allocations (AEAs) of Greece for the year 2021 to 2030 calculated applying global warming potential values from the fifth IPCC assessment report⁴

| Year | AEAs (t CO ₂ eq) |
|------|-----------------------------|
| 2021 | 46,227,407 |
| 2022 | 46,969,645 |
| 2023 | 47,184,382 |
| 2024 | 47,399,120 |
| 2025 | 47,613,857 |
| 2026 | 46,729,225 |
| 2027 | 47,218,805 |
| 2028 | 47,708,385 |
| 2029 | 48,197,965 |
| 2030 | 48,687,544 |

3.2 Assessment of aggregate effects of policies and measures

In this chapter the estimated and expected total effect of implemented / adopted and planned policies and measures is presented. The effects of individual policies and measures are reported in the policies and measures section (chapter 2).

The aggregate effect of currently implemented and adopted policies and measures (that is incorporated in the “with measures” projections scenario) is presented in **Tables 3.5** and **3.6** in terms of GHG emissions avoided on a CO₂ equivalent basis. The effect of policies, or with other words GHG emissions avoided, correspond mainly to CO₂, with the exception of policies in industrial processes, waste and agriculture sectors. In the case of waste sector, GHG emissions avoided correspond totally to CH₄, while in the agriculture sector about 70% to N₂O and 30% to CH₄. In the case of industrial processes sector, GHG emissions avoided correspond totally to HFCs and PFCs.

⁴ The annual emissions allocations for the years 2026-2030 will be determined in 2025, following a comprehensive review of the emission data. The reported 2026-2030 AEAs are proxy estimations.

Table 3.5 Aggregate effect of currently implemented and adopted policies and measures (kt CO₂ eq)

| Policies and Measures | Effect of implemented and adopted policies and measures | | | | | | |
|---|---|---------------|---------------|---------------|---------------|---------------|---------------|
| | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| Energy sector (CO ₂) | 31,516 | 38,588 | 39,971 | 44,815 | 52,800 | 58,418 | 67,093 |
| Transport sector (CO ₂) | 755 | 1,059 | 1,550 | 3,262 | 5,207 | 7,066 | 9,718 |
| Industrial processes (HFC, PFC) | 760 | 1,026 | 2,279 | 2,737 | 3,137 | 3,998 | 4,654 |
| Agriculture (CH ₄ 30%, N ₂ O 70%) | 650 | 1,200 | 1,420 | 1,600 | 2,050 | 2,250 | 2,600 |
| Waste Sector (only CH ₄) | 2,000 | 2,200 | 3,000 | 3,500 | 3,900 | 4,450 | 4,900 |
| LULUCF (CO ₂) | NE | 5,332 | 6,540 | 6,736 | 6,980 | 6,995 | 7,155 |
| Total Effect | 35,681 | 49,405 | 54,760 | 62,650 | 74,074 | 83,177 | 96,120 |

Table 3.6 Aggregate effect of currently planned policies and measures (kt CO₂ eq)

| Policies and Measures | Effect of planned policies and measures | | | | |
|--------------------------------|---|--------------|--------------|--------------|--------------|
| | 2030 | 2035 | 2040 | 2045 | 2050 |
| LULUCF (CO₂) | 1,038 | 1,055 | 1,070 | 1,540 | 1,850 |

3.3 Methodology used for the presented GHG emission projections

For scenario development and projections two main procedures have been used:

- ✓ The projections of energy sector are based on the official energy planning (NECP) provided by the MEEN (Directorate of Energy Policy and Energy Efficiency). These data were “translated” to GHG emissions based on the spreadsheet models used for the estimation of annual GHG inventory.
- ✓ Spreadsheet models for the non-energy sectors, in which future changes in activity data are mainly derived from statistical analysis, while emission factors are derived from expert assessments based on the 2006 IPCC guidelines and country specific information.
- ✓ Actual inventory data till year 2022 have been used in the preparation of the emission projections.

Emissions for all sectors were projected using the same models that were used for the BR5, updated to:

- ✓ include improvements in inventory reporting;
- ✓ include emissions for 2022, as reported in the 2024 NIR submission; and
- ✓ update of key assumptions, in order to reflect in the projections the current economic situation, and the most recent forecasts of macroeconomic parameters (e.g. GDP, fuel and carbon prices).

3.3.1 Energy Sector

3.3.1.1 Methodology

The energy planning is performed by the MEEN (Directorate of Energy Policy and Energy Efficiency). It is based on the execution of energy planning models, which was performed by the Center for Renewable Energy Sources / Energy Systems Analysis Lab. In order to simulate the Greek energy system and to project its future structure, the Integrated MARKAL-EFOM System (TIMES) in combination with PropSim were used.

The main input data for TIMES are: GDP and population forecasts, import prices of energy commodities, CO₂ prices, costs of energy technologies, and potential of indigenous energy sources (conventional and renewable). The main input data for PropSim are chronological curves of customer load and production of non-dispatchable power plants, expansion plan of

power system (energy technology capacities, investments on power plants), and electricity demand.

The use of these models leads to the conduction of analytical quantitative targets per technology, such as the demanded power for wind turbines, small - scale hydro or biomass or the quantification of energy savings in the industrial and residential sectors, etc.

The evaluation of policies has been performed using the TIMES energy model. TIMES constitutes a tool that simulates and optimizes the energy market. It is being continuously developed in the context of the Energy Technology Systems Analysis Programme (ETSAP) of the International Energy Agency (IEA), in which Greece participates as a Member State. The TIMES model is driven by the predicted useful energy demand. By determining the evolution of the useful energy demand (i.e. heating, ventilating and air conditioning, lighting), in the input of the model, and combining it with the course of techno-economical parameters of various energy technologies, the model optimizes the energy technology and fuel combination that satisfies the energy demand and the targets set by energy strategies (concerning emissions, energy conservation, etc.).

The basic components in TIMES model are specific types of energy or emission control technology. Each is represented quantitatively by a set of performance and cost characteristics. A menu of both existing and future technologies is input to the model. Both the supply and demand sides are integrated, so that one side responds automatically to changes in the other. The model selects the combination of technologies that minimizes total energy system cost.

Thus, unlike some "bottom-up" technical-economic models, TIMES does not require - or permit - an a priori ranking of greenhouse gas abatement measures as an input to the model. The model chooses the preferred technologies and provides the ranking as a result. Indeed, the choice of abatement measures often depends upon the degree of future abatement that is required.

In order to improve the simulation of the electricity system, the PropSim model has been used. Using PropSim enables the identification of the best possible electricity generation system that satisfies the given energy demand. The model simulates the operation of the generation system derived and calculates the peak load capacity required, the balancing units capacity required to cover the residual load hourly variations and the storage capacity required to restrict energy curtailment.

In addition, the following models have been used:

- WASP IV, which permits the user to find an optimal expansion plan for a power generating system over a long period through discrete investments); and
- HSIMUL (developed by CRES) for the hourly simulation of the electricity market, to estimate the production shares of each unit of the system

3.3.1.2 Scenario definition

The level of emissions estimated in WM and WAM scenarios depends on assumptions regarding main parameters, such as population, economic growth, energy prices etc. It also depends on the specific policies incorporated into the scenario. The implemented / adopted and the planned policies and measures, which were presented in **Chapter 2**, are incorporated in the “with measures” and “with additional measures” scenarios, respectively. The main assumptions made for the projection of GHG emissions in WM and WAM scenarios are presented in **section 3.3.1.3** and **CTF Table 7**. The projections of energy production and consumption data were converted to GHG emissions by following the 2006 IPCC Guidelines and by applying global warming potential values from the fifth IPCC assessment report, in line with the national GHG inventory submissions. Emission factors are derived from expert assessments based on the 2006 IPCC guidelines and country specific information.

The “with measures” scenario (WM) encompasses currently implemented and adopted policies and measures. The “with additional measures” scenario (WAM) reflects the mitigation effect of

planned policies and measures, in addition to currently implemented and adopted policies and measures. It reflects the additional measures planned for the Land Use, Land-Use Change, and Forestry (LULUCF) sector, reported in the NECP. Both scenarios assume an emission allowance cost and the international fuel prices reported in **section 3.3.1.3**. The evolution of demand for useful energy in the final consumption sectors (buildings, transport, etc.) is shaped by both the evolution of economic activity per sector and the evolution of population, housing, household size, production capacity of individual industrial sectors and other macroeconomic and demographic parameters.

The base year for energy projections is 2022, as it is the most recent year for which a GHG inventory is available.

The current revised National Energy and Climate Plan (NECP) emphasizes reducing emissions from electricity generation, as more than two-thirds of the greenhouse gas emissions reduction between 2020 and 2030 comes from the electricity production sector. This approach aligns with international experience, as in most countries, emissions reductions in electricity generation are faster compared to other sectors (buildings, industry, transportation, etc.). Electricity generation is also responsible for the majority of emissions in Greece, making it logical for the NECP to focus heavily on this sector.

By 2050, Greece aims for 97% of its electricity to come from RES, with lignite and most oil-fired plants phased out by 2028. Natural gas will play a transitional role, peaking in capacity by 2030 before declining. Installed RES capacity will grow significantly, especially in wind and solar, supported by reduced costs and market dynamics.

Key targets include:

- RES contributing 81% of electricity generation by 2030 and 97% by 2050.
- Installed RES capacity rising from 13.7 GW (2022) to 64.4 GW (2050).
- Phasing out lignite and reducing oil-based generation by over 80% by 2030.
- Developing grid interconnections for islands and modestly increasing hydropower.

The transition leverages market mechanisms, reduced RES costs, and strategic investments in infrastructure, ensuring a sustainable and economically efficient energy system.

Energy consumption in End use sectors in Greece is expected to decline from 2022 to 2050, despite economic growth, increased household income, and the rising value of economic sectors. This reduction is attributed to energy efficiency measures and a shift toward more sustainable technologies. The transport sector, historically the largest energy consumer, will see a steady decrease in consumption due to the replacement of inefficient vehicles, the promotion of electric mobility, and upgrades to public transport systems. Energy use in this sector is projected to drop from 6.9 Mtoe in 2030 to 4.6 Mtoe in 2050.

The household sector will also experience a decline in energy consumption, decreasing from 4.5 Mtoe in 2022 to 3.8 Mtoe in 2050. Efficiency improvements and energy-saving initiatives will drive this reduction, although the sector's share of total energy use will increase by 2% between 2030 and 2050. Conversely, the tertiary sector will see an increase in energy consumption, rising from 2.3 Mtoe in 2030 to 2.7 Mtoe in 2050, reflecting economic expansion and increased activity in services.

In the industrial sector, energy use is expected to decline from 2.3 Mtoe in 2030 to 2.0 Mtoe in 2050 due to enhanced efficiency and optimization in industrial processes. The agricultural sector, contributing the least to total energy consumption, will see a slight decrease from 350.1 ktoe in 2030 to 342.1 ktoe in 2050. Overall, these trends underscore the effectiveness of Greece's policies on decarbonization, energy efficiency, and technological advancements in reducing energy consumption across sectors.

The estimation of the GHG emissions is based on the formation of analytical energy balances for the years 2025-2050 and the computation of emissions per fuel and technology in every

sector. **Table 3.7** include the projections of emissions from the energy sector under WM /WAM (NECP) scenarios.

Table 3.7 GHG emissions from the energy sector (in ktCO₂eq) for WM/WAM scenario of projections

| Sector / Year | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--------------------------------|---------------|---------------|---------------|---------------|---------------|--------------|--------------|
| Energy Industries | 24,735 | 16,079 | 8,693 | 5,876 | 4,142 | 3,366 | 3,305 |
| Fugitives emissions | 479 | 268 | 125 | 119 | 114 | 102 | 102 |
| Man. Industry and Construction | 4,474 | 4,206 | 3,011 | 2,179 | 1,265 | 1,031 | 922 |
| Transport | 17,909 | 18,222 | 16,324 | 12,113 | 7,830 | 4,124 | 676 |
| Tertiary | 613 | 713 | 467 | 270 | 91 | 26 | 38 |
| Residential | 5,299 | 4,050 | 2,327 | 1,579 | 781 | 421 | 276 |
| Agriculture | 644 | 226 | 223 | 214 | 202 | 196 | 183 |
| Other | 301 | 302 | 252 | 202 | 202 | 151 | 101 |
| TOTAL | 54,453 | 44,066 | 31,423 | 22,551 | 14,627 | 9,417 | 5,603 |

The technology of Carbon Capture, Utilization, and Storage (CCUS) is expected to be implemented in Greece in the coming years, as depicted in **Table 3.8**. CO₂ capture from domestic industry is projected to reach 3.3 million tons of CO₂ by 2030, peaking at 4.2 million tons by 2040, and then decreasing to 3.9 million tons by 2050. When combined with CO₂ captured through Direct Air Capture (DAC) technology, which is anticipated to develop between 2045 and 2050, the total amount of captured CO₂ is estimated to rise to 8.4 million tons by 2050.

CO₂ storage is expected to play a significant role between 2030 and 2050, reaching 3.1 million tons of CO₂ by 2030 and 5.7 million tons by 2050. Finally, other technological solutions, such as DAC, currently expensive but projected to become more affordable over time, are also expected to be implemented by 2050.

Table 3.8 CO₂ Capture, Usage and Storage in kt

| | 2030 | 2035 | 2040 | 2045 | 2050 |
|----------------------------------|-------|-------|-------|-------|-------|
| CO ₂ Captured | | | | | |
| Industry (cement) | 2,800 | 2,800 | 3,129 | 3,114 | 2,999 |
| Refineries | 524 | 595 | 1,096 | 1,026 | 912 |
| DAC | | | | 17 | 4,500 |
| CO ₂ Storage | 3,121 | 2,977 | 3,455 | 2,929 | 5,744 |
| Use of CO ₂ for e-SAF | 203 | 418 | 771 | 1,228 | 2,667 |

3.3.1.3 Main assumptions

The level of emissions estimated in any scenario depends on assumptions regarding main parameters, such as population, economic growth, energy prices etc. It also depends on the specific policies incorporated into the scenario. Implemented and adopted policies and measures, which were presented in chapter 2, are incorporated in the “with measures” scenario, while planned policies and measures are incorporated in “with additional measures” scenario. The main assumptions made for the projection of GHG emissions, which are the same for both WM and WAM scenarios and were also reported in CTF Table 7, are analyzed as follows:

International fuel prices: they are presented in Table below (source: NECP).

Table 3.9 International fuel prices

| Fuel | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---------------------|--------|--------|--------|--------|--------|--------|--------|
| Crude oil [€/ bbl] | 103.00 | 103.00 | 103.00 | 103.00 | 109.00 | 117.00 | 131.00 |
| Natural Gas [€/MWh] | 120.00 | 38.00 | 38.00 | 38.00 | 38.00 | 38.00 | 38.00 |

Price of CO2 emission allowances (EUAs): the EUA's price during the period 2022-2050 is presented in **Table 3.10** (source: NECP).

Table 3.10 CO2 emission allowances price

| Year | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|----------------------------------|-------|-------|-------|--------|--------|--------|--------|
| CO2 emission allowances €/tCO2eq | 60.00 | 80.00 | 80.00 | 140.00 | 290.00 | 430.00 | 490.00 |

Demographic characteristics: the population during the period 2022-2050 is presented in **Table 3.11** (source: NECP).

Table 3.11 Population evolution

| Year | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|------------------|-------|-------|-------|------|------|------|------|
| Population [mil] | 10.50 | 10.30 | 10.10 | 9.90 | 9.70 | 9.50 | 9.30 |

Macroeconomic data: Energy demand development of the system depends to a great extent on the development of relevant economic activity sectors, the effect of current economic recession and the way that they are diffused in the population and the impacts in its living standards. In **Table 3.12** the projected macroeconomic data till 2050 are presented. The projections of main macroeconomic indexes were provided by the Ministry of Finance.

Table 3.12 Gross domestic product growth

| Year | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|-------------|--------|--------|--------|--------|--------|--------|--------|
| GDP (mil €) | 190.70 | 205.90 | 216.10 | 225.80 | 236.00 | 245.40 | 255.20 |

3.3.2 Non-energy sectors

3.3.2.1 Methodology

GHG emissions in the non-energy sectors are calculated using spreadsheet models that calculate emissions based on activity data, emission factors and sector specific assumptions, according to the following general equation:

$$E_{g,t} = \sum_{j=1}^J A_{0,j} \cdot (1 + r(x_i))^t \cdot C_{g,j}$$

where,

- j : An activity, which constitutes a source of GHG emissions (source)
- E_{g,t} : Projection of emissions of g-greenhouse gas in year-t
- A_{0,j} : Activity data of the j-source of emissions in base year
- r(x_i) : Growth rate of activity data for j-source based on the changes of the determinant parameter x

$C_{g,j}$: Emission factor of the g-greenhouse gas for the j-source consistent to the latest GHG inventory submission and 2006 IPCC Guidelines.

The growth factor accounts for changes (increases or decreases) in the emission-generating activity. In estimating the growth factor, time-series analysis and/or regression analysis using appropriate determinant parameters of the available activity data is used. Potential determinant parameters include population, value added, product output, etc.

The base year for projections is 2022, as it was the most recent year for which a GHG inventory was available by the time of compilation of this report.

3.3.2.2 Industrial processes and product use sector

Projected emissions from industrial processes and product use sector are based mainly on the analysis (a) of the activity data of the respective industrial branches and (b) the apparent consumption of refrigeration and air-conditioning appliances. The emission factors used are similar to those reported in the latest inventory, according to 2006 IPCC guidelines and country specific data.

The main assumptions that were adopted in the context of the present analysis in order to evaluate the future development of GHG emissions from the industrial processes sector are presented in **Table 3.13**. The economic recession of our times is taken into consideration. In order to ensure consistency with energy sector's projections, the emissions from the sectors: mineral products, metal production and chemical industry, were projected on the basis of the emission projections of the energy sector. Projected emissions under both scenarios (WM and WAM) are identical.

Table 3.13 Main assumptions for the “with measures” scenario in IPPU sector.

| Process | Projections |
|------------------------|--|
| Mineral products (Mt) | The energy projected to be consumed by Times model was used as a driver for the estimation of process emissions. |
| Metal production (Mt) | The energy projected to be consumed in metal production plants by Times model was used as a driver for the estimation of process emissions. Use of inert anodes technology in Aluminium production. |
| Chemical industry | One Nitric acid production unit will be in operation from 2007 and afterwards. The energy projected to be consumed in ammonia production plants by Times model was used as a driver for the estimation of emissions of ammonia production. Electrolysis-based ammonia production |
| Production of F-gases | HCFC-22 production has been stopped since 2006. |
| Consumption of F-gases | The mitigation effect of EU Regulation 517/2014 and Regulation (EU) 2024/573 was reflected in the projections. |

The projections of GHG from IPPU sector (**Table 3.14**) show a decrease compared with 1990 levels. Key highlights include:

- ✓ HFCs emissions from HCFC-22 manufacture does not occur since 2006, because the HCFC-22 production unit ceased operation.
- ✓ HFCs emissions due to the use of refrigeration and air-conditioning equipment present an annual rate of decrease almost 2.6% from 2020 to 2040, while the total decrement in 2030, 2040 and 2050 compared to 2020 levels is estimated to be 44%, 57% and 82%, respectively. This decrease is attributed to the implementation of the new EU Regulation of the European Parliament and of the Council of 16 April 2014 (No 517/2014) on fluorinated greenhouse gases and the new Regulation (EU) 2024/573. In specific, the reduction in the emissions is expected due to the prevention of leakages and emissions (emission prevention and leak checks, end of life treatment of products and equipment, training and qualification, information for users (labelling, product infos) and the control of use of F-gases (ban on new applications, ban on uses, phase-

down of HFC supply). Directive 2006/40 of the European Parliament and of the Council of 17 May 2006 relating to emissions from air-conditioning systems in motor vehicles amending Council 70/156/EEC is also anticipating reducing F-gases emissions from MACs.

Table 3.14 Projections of GHG emissions from the IPPU sector (in kt CO₂eq)

| Year | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Mineral products | 3,419 | 3,397 | 3,290 | 3,080 | 2,956 | 2,808 | 2,729 |
| Chemical industry | 761 | 212 | 205 | 1 | NO | NO | NO |
| Metal production | 599 | 891 | 802 | 704 | 541 | 531 | 538 |
| Non-energy products from fuels and solvent use | 64 | 70 | 70 | 70 | 70 | 70 | 70 |
| Other product manufacture and use | 215 | 228 | 228 | 228 | 228 | 228 | 228 |
| Product uses as substitutes for ODS | 4,581 | 3,759 | 2,690 | 2,419 | 2,035 | 1,303 | 894 |
| Total | 9,640 | 8,557 | 7,284 | 6,502 | 5,830 | 4,940 | 4,459 |

3.3.2.3 Waste sector

Solid waste disposal on land is the major source of GHG emissions from the waste sector. For the projection of emissions from solid waste, the generation rate of quantities of solid waste was considered as shown in **Table 3.15**, based on the data provided by “National waste management plan, 2020-2030”, which has been approved and published on 31-08-2020 with the Act no. 39 of Ministerial Council “Approval of the National Waste Management Plan.

In order to estimate the composition of MSW generated on an annual basis, the assumptions presented in the last National Inventory Report (2024) were used. It was assumed that the official composition of MSW provided by the Ministry of Environment and Energy (MEEN) for 2020 can be considered for all the period up to 2050:

- The share of biodegradable is 38.3%, while the share of metals is 3.7% and of glass 4.1%.
- The share of paper is 24.2% and of plastics 13.9%.
- The share of garden (yard) waste is 4.3%, of wood 3.6% and of textiles 2.0%.

The composition of the solid waste landfilled at disposal sites was estimated taking into account the composition of MSW generated and the amounts of waste recycling and compost, as per “National waste management plan, 2020-2030”, while for 2030-2050 assumptions were provided by MEEN. The Municipal solid waste generation, the Municipal solid waste going to landfills and the share of CH₄ recovery in total CH₄ generation from landfills are presented in **Table 3.15**.

Table 3.15 Main assumptions of projections scenarios for solid waste disposal on land

| | Historical | Projection | | | | | |
|--|------------|------------|---------|---------|---------|---------|---------|
| | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| Municipal solid waste (MSW) generation (t) | 5301499 | 5291081 | 5301499 | 5195731 | 5097817 | 4999903 | 4890469 |
| Municipal solid waste (MSW) going to landfills (t) | 1195696 | 1304470 | 1195696 | 1089928 | 992014 | 894100 | 784666 |
| Share of CH ₄ recovery in total CH ₄ generation from landfills (%) | 23.3 | 26.7 | 31.5 | 37.1 | 43.1 | 49.8 | 57.1 |

Policy issues that affect significantly the projection of GHG emissions from solid waste disposal on land and wastewater handling include (a) the revised National Waste Management Plan (b) the implementation of Council Directive 1999/31, regarding sanitary landfill (which is the main reason for the significant increase of waste recycled, especially from 2010 and onwards and the increase on the implementation of systems for flaring or recovery of biogas), (c) the Directive (EU) 2018/850 for the amendment of Directive 1999/31 / EC on the landfill of waste, (c) the Directive on Packaging and Packaging Waste (94/62/EC) concerning the Paper and Cardboard recycling, as amended by Directives (EU) 2018/851 and 2018/852 and (e) the Directive (EU) 2019/904 of the European Parliament and of the Council (5 June 2019) on the reduction of the impact of certain plastic products on the environment.

The estimation of methane emissions from solid waste disposal on land was performed with the FOD method while the default 2006 IPCC methodology was followed for the other source categories (domestic wastewater handling, human sewage and industrial wastewater handling). The total emissions from waste sector are presented in **Table 3.16**.

Table 3.16 GHG emissions from the waste sector (kt CO₂eq)

| | Historical | Projection | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| Solid Waste Disposal | 4514 | 4191 | 3486 | 2882 | 2103 | 1548 | 919 |
| Biological treatment of solid waste | 111 | 367 | 384 | 389 | 394 | 399 | 404 |
| Incineration and open burning of waste | 3.7 | 3.7 | 3.6 | 3.5 | 3.4 | 3.4 | 3.3 |
| Wastewater treatment and discharge | 1612 | 1529 | 1387 | 1254 | 1128 | 952 | 807 |
| Total | 6240 | 6091 | 5262 | 4529 | 3629 | 2902 | 2132 |

3.3.2.4 Agriculture

The main determinant parameters of GHG emissions from agriculture are the animal population, the quantities of synthetic nitrogen fertilizers applied on soils and the agricultural crops production.

Regarding the animal population, the rate of change of population of each animal category is estimated based on the analysis of the expected GDP and the Greek population evolution for the next decades and the impact of the adopted mitigation measures concerning the reduction of the rate of intensity of agricultural (**Table 3.17**).

The use of synthetic nitrogen fertilizers (**Table 3.18**) decreases continuously with a mean annual rate of 3% for the period 2000 – 2050. The decrease in the use of synthetic nitrogen fertilizers could probably be attributed to the mitigation measures, to the high price and the impact of initiatives to promote good practice in fertilizer use and to the civilized way of life. Data for the period 1990-2022 derive from the Pan-Hellenic Association of Professional Fertilizers Producers & Dealers (PHAPFPD), while the projections are based on the analysis of the trends observed in the whole period 1990-2022.

Table 3.17 Animal population (thousands) per species (3-year average)

| Animal population (thousands) | Historical | Projection | | | | | |
|-------------------------------|------------|------------|------|------|------|------|------|
| | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| Dairy cattle | 80 | 78 | 76 | 73 | 71 | 69 | 67 |
| Non dairy cattle | 494 | 465 | 451 | 437 | 424 | 412 | 399 |
| Buffalos | 6.8 | 5.1 | 4.9 | 4.8 | 4.8 | 4.7 | 4.6 |
| Sheep | 8944 | 8619 | 8436 | 8268 | 8112 | 7956 | 7782 |
| Goats | 3733 | 3812 | 3732 | 3657 | 3588 | 3519 | 3442 |
| Horses | 5.0 | 5.3 | 5.1 | 5.0 | 5.0 | 4.9 | 4.7 |

| | | | | | | | |
|---------------|-------|-------|-------|-------|-------|-------|-------|
| Asses & mules | 2.6 | 2.7 | 2.6 | 2.6 | 2.5 | 2.5 | 2.4 |
| Swine | 658 | 674 | 660 | 647 | 635 | 622 | 609 |
| Poultry | 37185 | 40009 | 39162 | 38381 | 37657 | 36934 | 36126 |

Table 3.18 *Projection of nitrogen inputs in soils (in kt) from synthetic fertilizers*

| | Historical | Projection | | | | | |
|------------------------------|------------|------------|------|------|------|------|------|
| | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| Synthetic fertilizers (kt N) | 167 | 133 | 105 | 93 | 82 | 70 | 58 |

Finally, for the projection of agricultural crops production, similarly with the animal population, an analysis based on the expected GDP and Greek Population evolution for the next decades and the impact of the adopted mitigation measures concerning the reduction of the rate of intensity of agricultural, was performed. In **Table 3.19**, the projections of agricultural crops production for the period examined are presented.

For the estimation of CH₄ emissions from enteric fermentation of cattle and sheep, which account for 80% of methane from this sub-source, Tier 2 methodologies were applied, while for the other animal default emission factors by 2006 IPCC Guidelines for Eastern Europe are used. The CH₄ emissions from manure management are estimated based on emissions factors suggested by 2006 PCC Guidelines for developed countries. The emission factors used for the estimation of N₂O from manure management are the ones suggested by IPCC Guidelines for Western Europe. The methodologies and emission factors suggested by the 2006 IPCC Guidelines were used for the estimation of GHG emissions from agricultural soils, rice cultivations and field burning of agricultural residues. Finally, other parameters like manure management systems and percentage of agricultural residues burned on site are kept constant at 2000 levels, while it is also assumed that climate parameters will not undergo significant changes.

Table 3.19 *Projection of agricultural crops production (kt)*

| Production (ktn) | Historical | Projection | | | | | |
|------------------|------------|------------|------|------|------|------|------|
| | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| Wheat | 1164 | 1077 | 1054 | 1033 | 1014 | 994 | 973 |
| Barley | 296 | 360 | 353 | 346 | 339 | 333 | 325 |
| Oats | 100 | 103 | 101 | 99 | 97 | 95 | 93 |
| Rye | 16 | 18 | 18 | 17 | 17 | 17 | 16 |
| Maize | 1089 | 1213 | 1188 | 1164 | 1142 | 1120 | 1096 |
| Rice | 242 | 216 | 211 | 207 | 203 | 199 | 195 |
| Beans | 14 | 15 | 14 | 14 | 14 | 14 | 13 |
| Peas | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Potatoes | 355 | 452 | 442 | 433 | 425 | 417 | 408 |
| Sugarbeet | 21 | 98 | 96 | 94 | 92 | 90 | 88 |

Total GHG emissions from agriculture are presented in **Table 3.20**.

Table 3.20 *GHG emissions from agriculture in the “with measures” scenario (kt CO₂eq)*

| | Historical | Projection |
|--|------------|------------|
|--|------------|------------|

| | 2022 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Enteric Fermentation | 4120 | 3918 | 3736 | 3565 | 3066 | 2880 | 2554 |
| Manure Management | 974 | 971 | 949 | 928 | 881 | 805 | 690 |
| Rice Cultivation | 158 | 147 | 143 | 141 | 138 | 135 | 132 |
| Agricultural Soils | 2677 | 2464 | 2272 | 2172 | 2076 | 1980 | 1868 |
| Field Burning of Agricultural Residues | 21.1 | 20.9 | 20.5 | 20.1 | 19.7 | 19.3 | 18.9 |
| Urea application | 30.7 | 23.5 | 18.1 | 15.8 | 13.6 | 11.4 | 9.3 |
| Total | 7980 | 7544 | 7139 | 6842 | 6194 | 5832 | 5273 |

In general, emissions from the agriculture sector decrease for the whole period 2020-2050. Except of the citified way of life which has been adopted and the abandonment of rural areas, this trend could be attributed to reduction of agricultural production and to the reduction in the use of synthetic nitrogen fertilizers, as a result of the adopted mitigation measures.

3.3.2.5 Land Use, Land Use Change and Forestry

Projected emissions from the LULUCF sector are based mainly on the analysis of the activity data during the period 1990 – 2022. The emission factors used are similar to those reported in the current inventory, according to 2006 IPCC guidelines and country specific data. CO₂ is the greenhouse gas most affected by the LULUCF sector, following carbon stocks changes in different carbon pools. Non-CO₂ greenhouse gases (CH₄ and N₂O) and indirect GHG are released in relatively small quantities, mainly when biomass is burnt.

An analysis of data and trends of the last decades was elaborated in order to estimate the evolution of GHG emissions and removals, and the following assumptions have been made:

- The annual biomass uptake in these lands, as well as the annual losses as a result of the loggings, follow the trend observed from 2000 onwards.
- The contribution of harvested wood products pool in total net emissions/removals follows the trend observed from 2000 onwards.
- Carbon stock changes in areas under conversion to forest land will remain constant and equal to the average estimated during the period 2010 – 2022.
- Areas affected by wildfires each year are considered equal to the average area burnt in the period 1990 – 2022 (this assumption results in reduced inter-annual variation in net emissions/ removals of greenhouse gases from this sector in relation to the variation observed during 1990 – 2022).
- N₂O emissions arising from N mineralization associated with loss of soil organic matter resulting from change of land use or management of mineral soils will remain constant and equal to the average during the period 1990 – 2022.

The projections of the LULUCF net removals up to the year 2050 were performed under two scenarios:

- a. the baseline scenario "With Measures" (WM) or "WithExisting Measures" (WEM), which is based on the existing policies and measures that are in place or have been adopted and are expected to be implemented in the near future.
- b. the 'With Additional Measures' (WAM) scenario, which is based on the implementation of additional measures that may further increase carbon removals.

The sink capacity of the LULUCF sector is projected to increase in the future, from -5.5 Mt CO₂ eq. in 2022 to -7.3 Mt CO₂ eq. in 2050 under the WEM scenario, and -9.1 Mt CO₂ eq. under the WAM scenario in 2050.

It should be noted that this increase is partially attributed to policies and measures and also to improvements in the national LULUCF GHG inventory. Values reported in the projections for years 2020 and 2022 derive from the 2024 NIR submission. The projections for 2025 are also based on the assumptions and carbon pools reported in the 2024 NIR. However, from 2026 onward Greece is expected to improve its MRV system by including the entire area of Forest Land as managed and also including additional carbon pools in the reporting as a result of moving to higher Tiers (i.e. soil in Forest Land and Grassland and living biomass in Grasslands - shrubs). These improvements are expected to be applied in the 2028 NIR submission (reference year 2026), therefore the projections after 2025 mainly reflect the impact of improved reporting and less the actual impact of additional policies and measures. More information is available below and in the revised NECP (2024).

WM scenario

The main assumptions that were adopted in the context of the present analysis in order to evaluate the future development of GHG emissions from the LULUCF sector under the WEM scenario are presented in **Table 3.21**.

Table 3.21 *Main assumptions for the “with measures” scenario in LULUCF sector*

| Land accounting categories ⁵ | Projections |
|---|--|
| Afforested land | The impact of the EEC Regulations 2080/92 and 1257/99 has been considered until 2035, when its implementation is expected to be completed. The restoration of lignite mining sites in Western Macedonia was included in the estimations from 2025 and on which will be included also in the 2025 NIR submission |
| Deforested land | Area under deforestation activities is expected to follow the trend during the period 2010 – 2022 |
| Managed forest land | 15% annual harvesting rate is estimated, annual increment is based on mean values from the database of Forest Management Plans. The area of managed forest land is expected to increase after 2025, when the forest cadaster and the national forest monitoring project are planned to be completed, incorporating also land currently classified as “unmanaged” (+167% by 2030, compared to 2022 base year). More accurate information are expected in 2025, after the completion of the IMS |
| Managed cropland | Reduction of arable land in 2050 by -1% compared to 2020 (halting the current trend of decline observed in recent decades). In the area that remains arable, an increase of 6% in perennial woody crops is foreseen and a corresponding decrease in other crops. The area being reduced is expected to move to the land use category “Settlements”. |
| Managed grassland | Reduction of grassland area in 2050 by -2% compared to 2020, due either to natural expansion of the forest and transition to the category “Forests” or to land use change and transition to the categories “Settlements” and “Other land”. |
| Managed wetland | Wetland area is expected to follow the trend during the period 2010 – 2022 |

The projections of GHG for the LULUCF sector in Greece show an increase compared to 2022 levels until 2050, under the WM scenario, which are presented in **Table 3.22** below, for the main land accounting categories.

Table 3.22 *Aggregate effect of currently implemented and adopted policies and measures (kt CO₂ eq.)*

⁵ EU Regulation 841/2018

| Policies and Measures | Effect of implemented and adopted policies and measures | | | | |
|----------------------------|---|------------------|------------------|------------------|------------------|
| | 2022 | 2025 | 2030 | 2040 | 2050 |
| Managed forest land | -2,088.31 | -2,357.77 | -3,286.75 | -3,552.68 | -3,670.83 |
| Afforested land | -40.91 | -93.18 | -201.58 | -124.81 | -47.90 |
| Managed Cropland | -1,373.96 | -1,209.38 | -1,318.91 | -1,496.28 | -1,672.85 |
| Managed Grassland | -1,962.75 | -1,715.31 | -1,684.38 | -1,643.49 | -1,582.07 |
| Managed wetland | NO | NO | NO | NO | NO |
| Total Effect | -5,465.93 | -5,375.64 | -6,491.62 | -6,817.25 | -6,973.65 |

The minus sign (-) indicates that these policies affect the enhancement of removals of CO₂.

WAM Scenario

The contribution of additional measures was also assessed, resulting in a second projection of net removals for the LULUCF sector until the year 2050. In the context of Greece's long-term planning, the additional measures considered in the WAM scenario estimates include:

1. Systematic forest management - Restoration of degraded forest ecosystems (coppice forests - scrub in high forests) - Integration of the climate dimension in management studies, monitoring the carbon balance, implementing measures to increase removals in forests and enhance their resilience.
2. Increase production of long-life wood products. In recent years there has been a continuously decreasing trend in the quantity of wood products produced based on the official statistics of FAO for Greece.
3. Rehabilitation of disturbed areas (such as lignite mines, quarries, etc.) after the cessation of human activities.
4. Integration of additional carbon pools, which until today are not included in Greece's greenhouse gas emission inventory, as follows:
 - A. Woody biomass and carbon storage in soils of the category 'Grassland remaining grassland'.
 - B. Removals from Posidonia seagrass meadows. The carbon absorption potential of these ecosystems is estimated at 68 kt CO₂eq. annually based on HCMR research results for the South Aegean region (Apostolaki et al., in press). It should be noted that the inclusion of marine Grassland in greenhouse gas inventories may be carried out on a voluntary basis and subject to sufficient data and a scientifically acceptable methodology. The possibility of including these ecosystems in the national greenhouse gas inventory is currently being investigated by our country, in the context of upgrading the MRV system for the Greek LULUCF sector.

The main assumptions that were adopted in the context of the present analysis in order to evaluate the future development of GHG emissions from the LULUCF sector under the WAM scenario are presented in **Table 3.23**, in addition to the assumptions already presented in **Table 3.21** which also apply to the WAM Scenario.

Table 3.23 Main assumptions for the “with additional measures” scenario in LULUCF sector

| Land accounting categories ⁶ | Projections |
|---|-------------|
|---|-------------|

⁶ EU Regulation 841/2018

| Land accounting categories ⁶ | Projections |
|---|--|
| Afforested land | The expected impact of afforestations in 5000 ha of quarries/ mines or other disturbed areas until 2050 was considered, adding up to -0.1 to -0.2 Mt CO ₂ eq additional removals Increase of domestic production of long-lived wood products (halting the ever-decreasing trend of wood products produced in recent years). Estimated increase of at least 0.1 – 0.2 Mt CO ₂ eq compared to the WEM scenario at country level per year. |
| Deforested land | No additional assumptions in relation to the WEM scenario |
| Managed forest land | Systematic management and restoration of degraded forests is expected to increase removals by -0.3 to -0.4 Mt CO ₂ eq, compared to the WEM scenario until 2050 |
| Managed cropland | No additional assumptions in relation to the WEM scenario |
| Managed grassland | The inclusion of the woody biomass and soil carbon pools from the category 'Grassland' is expected to increase carbon removals reported by -0.5 to -0.9 Mt CO ₂ eq compared to the WEM scenario at country level per year until 2050 |
| Managed wetland | Removals from the restoration of coastal ecosystems (seagrass meadows) are reported to reach 68 kt CO ₂ eq. per year, in the southern Aegean alone, based on research results of HCMR (Apostolaki et al., in press). Estimated additional carbon removals of -0.1 to -0.2 Mt CO ₂ eq compared to the WEM scenario |

The projections of GHG for the LULUCF sector in Greece show an increase compared to 2022 levels until 2050, under the WAM scenario, which are presented in **Table 3.24** below, for the main land accounting categories.

Table 3.24 Aggregate effect of additional policies and measures (kt CO₂ eq.)

| Policies and Measures | Effect of implemented and adopted policies and measures | | | | |
|----------------------------|---|------------------|------------------|------------------|------------------|
| | 2022 | 2025 | 2030 | 2040 | 2050 |
| Managed forest land | -2,088.31 | -2,357.77 | -3,595.06 | -3,873.97 | -4,238.50 |
| Afforested land | -40.91 | -93.18 | -201.58 | -124.81 | -144.90 |
| Managed Cropland | -1,373.96 | -1,209.38 | -1,318.91 | -1,496.28 | -1,672.85 |
| Managed Grassland | -1,974.41 | -1,715.31 | -2,314.42 | -2,270.53 | -2,411.21 |
| Managed wetland | NO | NO | -100.00 | -100.00 | -200.00 |
| Total Effect | -5,477.59 | -5,375.64 | -7,529.97 | -7,865.59 | -8,667.46 |

The minus sign (-) indicates that these policies affect the enhancement of removals of CO₂.

Managed Forest Land

During the period 1990–2022 managed forest land acts as a net carbon sink. In order for forest land to be considered as managed, a forest management plan should be in effect from 1990 or later. These forests cover approximately 36% of the total forest land of Greece, which is the area currently reported as “Managed”. This national definition is planned to be revised in 2026 (2028 NIR submission) to include the entire area of Forest Land. Emissions/removals from forest land are the result of the balance mainly in biomass increment from forest growth and biomass loss due to loggings and wildfires. Net removals from forest land show an upward

trend in the inventory period that is attributed mainly to the reduction in loggings and the afforestation programmes started in 1994.

Projections for managed forest land for 2025 are based on the forest reference level (FRL). FRLs applied by the Member States for the period 2021-2025 are included in the annex of the Commission Delegated Regulation amending Annex IV to Regulation (EU) 2018/841 of the European Parliament and of the Council. The Greek FRL for the period from 2021 to 2025 is -2,337.640 Mt CO₂ eq. per year. This value was based on the Corrigendum to the NFAP submitted by Greece in 2020⁷ (*Table 3.25*).

Table 3.25 Estimation of FRL for the period 2021 - 2025

| Kt CO ₂ eq. | 2021 | 2022 | 2023 | 2024 | 2025 | Average |
|-------------------------------------|-----------|-----------|-----------|-----------|-----------|------------------|
| CO ₂ (living biomass) | -2,107.11 | -2,188.77 | -2,201.58 | -2,169.48 | -2,159.11 | -2,165.21 |
| CO ₂ (HWP_FOD) | -161.01 | -187.11 | -165.99 | -183.84 | -170.02 | -173.59 |
| CH ₄ | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 |
| N ₂ O | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Total CO ₂ eq. (HWP_FOD) | -2,266.96 | -2,374.72 | -2,366.41 | -2,352.16 | -2,327.97 | -2,337.64 |
| Total CO ₂ eq. (HWP_IO) | -2,105.95 | -2,187.61 | -2,200.42 | -2,168.32 | -2,157.95 | -2,164.05 |

The policies implemented and adopted for the forestry sector are expected to gradually increase the area of managed forest land, after 2025 and incorporate the entire forest area by 2026.

Wildfires constitute a common disturbance in the Mediterranean basin, and particularly in Greece. They account for the emissions of managed forest land, with significant annual variation further intensified by climate change. Emissions from wildfires were taken into account for the projections, following the trend during the period 1990–2022.

Afforestation

This category includes cropland that has been afforested in the context of the EEC Regulations 2080/92 and 1257/99 with artificial planting and also grassland converted to forest through natural expansion of forest. This activity is projected to remain a sink under the WEM and WAM scenarios. Grassland conversion to forestland constitutes a natural process, not associated with emissions by sources and removals by sinks, since that kind of conversion is not directly human induced. Removals are therefore not estimated in the NIR for grassland conversion.

Deforestation

With regard to emissions resulting from the conversion of forest land (deforestation) those are expected to remain at low levels. Greek law allows the land-use change of forest land only in cases of national interest and thus there is only a very small area where such land-use conversions occur (e.g. construction of high-tension lines). The share of emissions from forest land conversions is projected to be at approximately 1% of the total emissions/removals of the sector.

⁷ <https://ekpaa.ypeka.gr/wp-content/uploads/2020/04/Corrigendum-to-the-NFAP.pdf>

Harvested Wood Products

Harvested Wood Products (HWP) pool is projected to represent a sink during the period 2020-2050, under the WEM and WAM scenarios. In the both scenarios, HWP removals are expected to increase in relation to the 2022 values. National policies about future harvested wood products (HWP) from domestic forests point towards the increase of the harvesting rate after 2030.

Managed cropland

During the period 1990-2022 removals from cropland, fluctuate between 0.1-1.5 Mt CO₂ eq. yr⁻¹. Following the trend observed during the inventory period, and especially the last decade, cropland is projected to represent a sink in the following period, due to existing and newly established perennial woody crops. The share of removals from cropland to the total removals is expected to be between 1.5 – 1.8 Mt during the period 2020-2050, under the WEM and WAM scenarios.

Managed grassland

Grassland category is projected to continue to act as a sink in the period 2020-2050, even though its area is expected to gradually decrease based on the trend of the past 10 years (-0.04%). Projections were based on this assumption, mainly owed to the conversion of cropland to grassland. Emissions from that category are primarily the result of land conversion to settlements or other land, and wildfires. The share of removals from managed grassland is expected to fluctuate between -2.0 Mt CO₂ eq. in 2022 and -1.7 Mt CO₂ eq. in 2050 under the WEM scenario, or -2.5 Mt CO₂ eq. in 2050 under the WAM scenario.

Managed wetland

Wetland category is projected to act as a source in the period 2020-2050 mainly due to conversion of forest and grassland to flooded land, under the WEM scenario. The trend of the last 10-year period was applied for the projections, divided in half due to the absence of policies and measures at this point to increase wetlands. Its share in the overall emissions from the LULUCF sector is expected to remain low (<2%). Under the WAM scenario, removals from Posidonia seagrass meadows are also considered. It should be noted that the inclusion of marine Grassland in greenhouse gas inventories may be carried out on a voluntary basis and subject to sufficient data and a scientifically acceptable methodology. The possibility of including these ecosystems in the national greenhouse gas inventory is currently being investigated by Greece, in the context of upgrading the MRV system for the LULUCF sector.

3.4 Results of the sensitivity analysis performed for the projections

During the preparation of projections, many alternative scenarios based on sensitivity analysis of their input variables and underlying assumptions were examined.

This chapter contains the results of the analysis of 3 scenarios. The scenarios are described in *Table 3.26*.

Table 3.26 Main assumptions of Sensitivity Analysis Scenarios

| Scenario No | Main assumptions |
|-------------|----------------------------------|
| SensSc1 | WAM scenario 2021 (First NECP) |
| SensSc2 | WM scenario 2024 (Updated NECP) |
| SensSc3 | WAM scenario 2024 (Updated NECP) |

In **Figure 3.2**, the evolution of GHG emission projections of the scenarios listed in **Table 3.26** is illustrated. As it can be observed from the figure, the current WM and WAM scenarios correspond to more ambitious emission reduction trajectories, aiming for climate neutrality by 2050. This increased ambition is attributed to the fact that the 2024 scenarios reflect new climate targets and policies that were adopted under the framework of the updated NECP pursuant to Regulation (EU) 2018/1999.

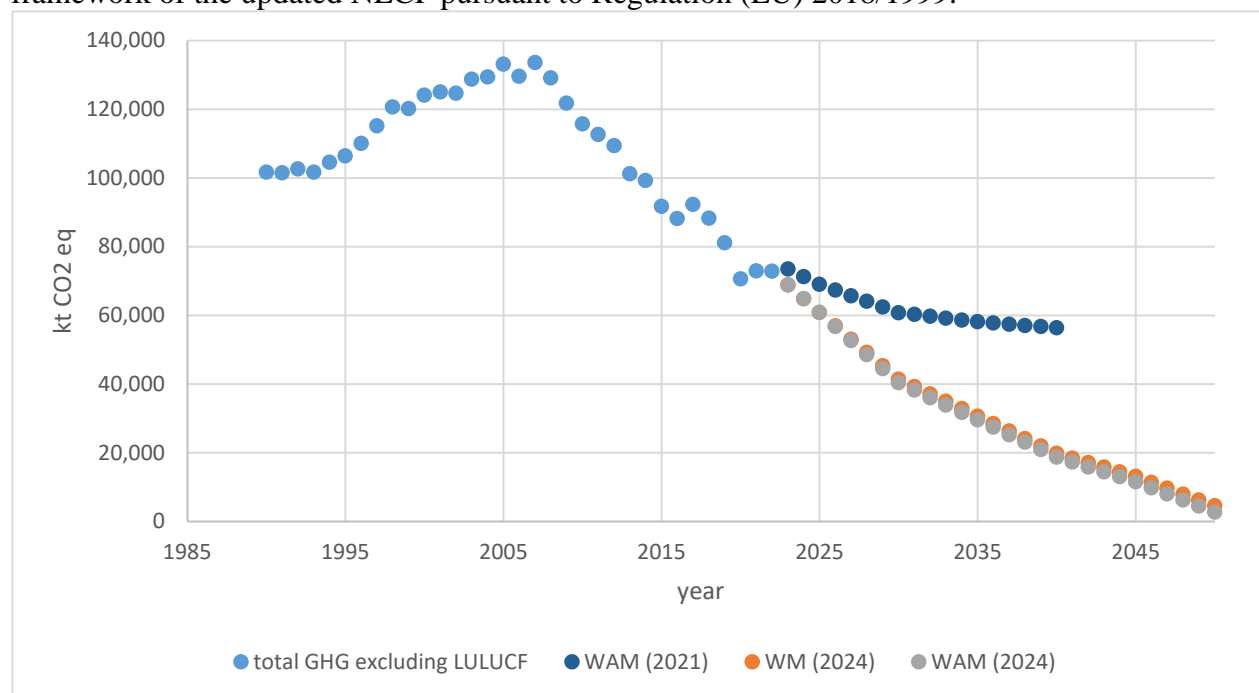


Figure 3.2 Evolution of GHG emission projections corresponding to the sensitivity analysis scenarios examined