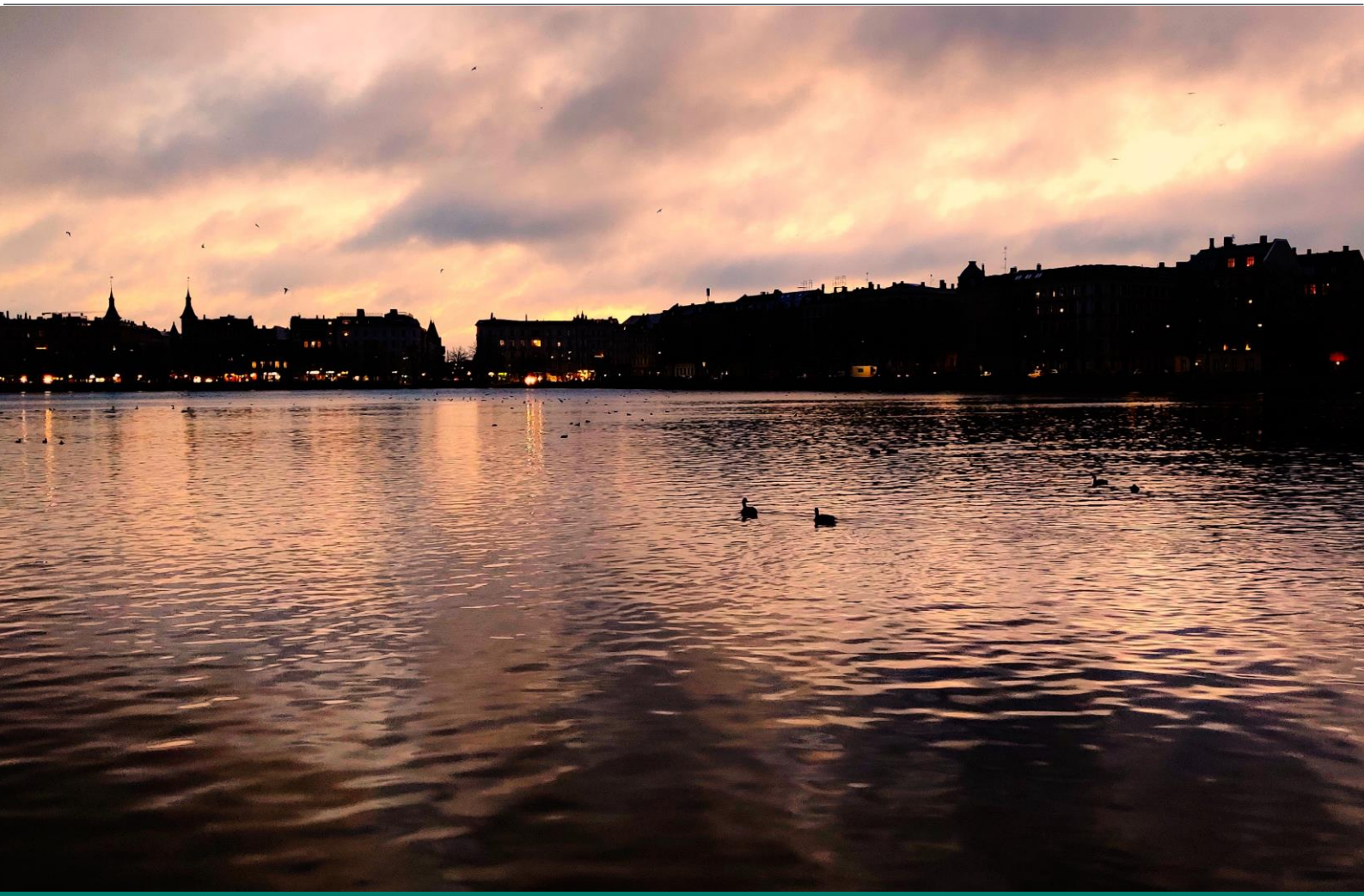
Circular economy country profile – Greece



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European Topic Centre on
Circular economy and resource use
https://www.eionet.europa.eu/etcs/etc-ce

Contents

Introduction

The European Commission requested the EEA to produce EU country profiles that offer an updated view of the following elements:

- circular economy policies being implemented at a national level with a particular focus on elements that go beyond EU mandatory elements; and
- best practice with a focus on policy innovation.

While implementing the EU Circular Economy Action Plan (CEAP 2020), Member States are encouraged to advance circularity at a national level by adopting policies and initiatives that go beyond EU regulations, while preserving the Single Market.

This circular economy country profile is based on information reported by the Eionet network and, in particular, the Eionet Group on Circular Economy and Resource Use in the second quarter of 2022. The information was reviewed and edited by the European Topic Centre on Circular economy and resource use (ETC CE). A selection of Eurostat data was made to further complement this country profile.

The information is current as of 19 September 2022 (final review), when members of Eionet verified the content of this profile.

Greece – facts and figures

GDP: EUR 165.3.3 billion (1.2 % of EU27 total in 2020)

GDP per person: EUR 15 440 (purchasing power standard) (62.3 % of EU27 average per person figure in 2020)

Use of materials (domestic material consumption (DMC))
99.6 million tonnes DMC (1.7 % of EU27 total in 2020)
9.3 tonnes DMC per person (69.2 % of EU27 average per person in 2020)

Structure of the economy:
Agriculture: 4.8 %
Industry: 17.1 %
Services: 78.1 %

Employment in circular sectors:
68 879 people are employed in circular economy (CE) sectors (1.9 % of EU total in 2018)
People employed expressed as a percentage of total employment: 1.5 % (EU average 1.7 %)

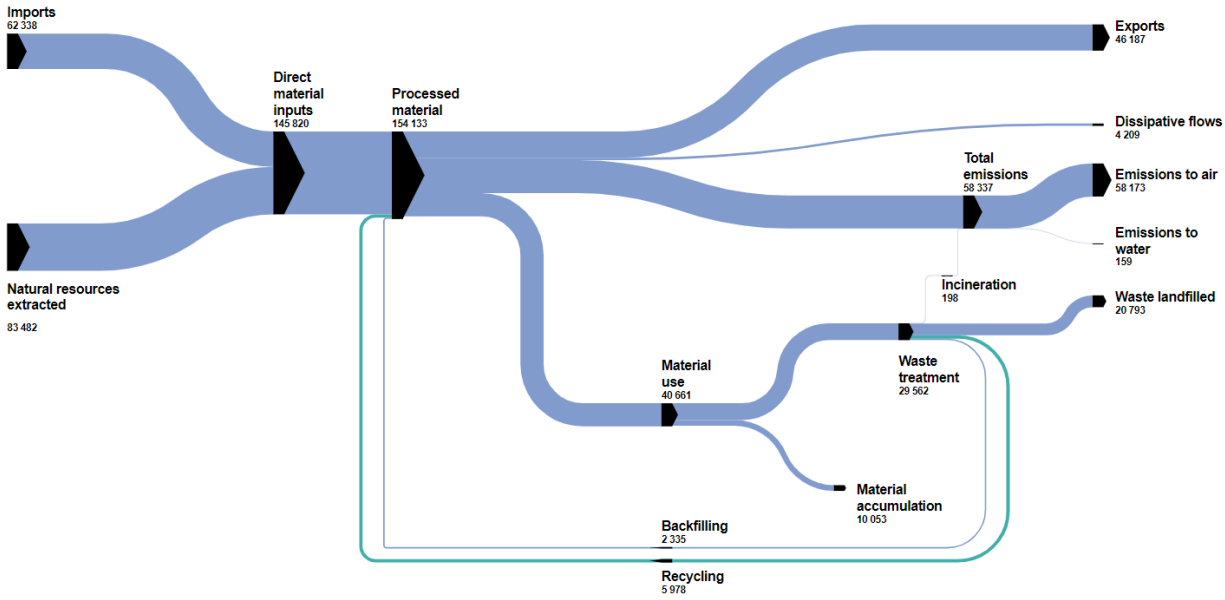
Surface area: 132 049 square kilometres (3.0 % of EU27 total)

Population: 10 718 565 (2.4 % of EU27 total in 2020)

Note: all definitions and metadata used in this profile are taken, as shown, from Eurostat

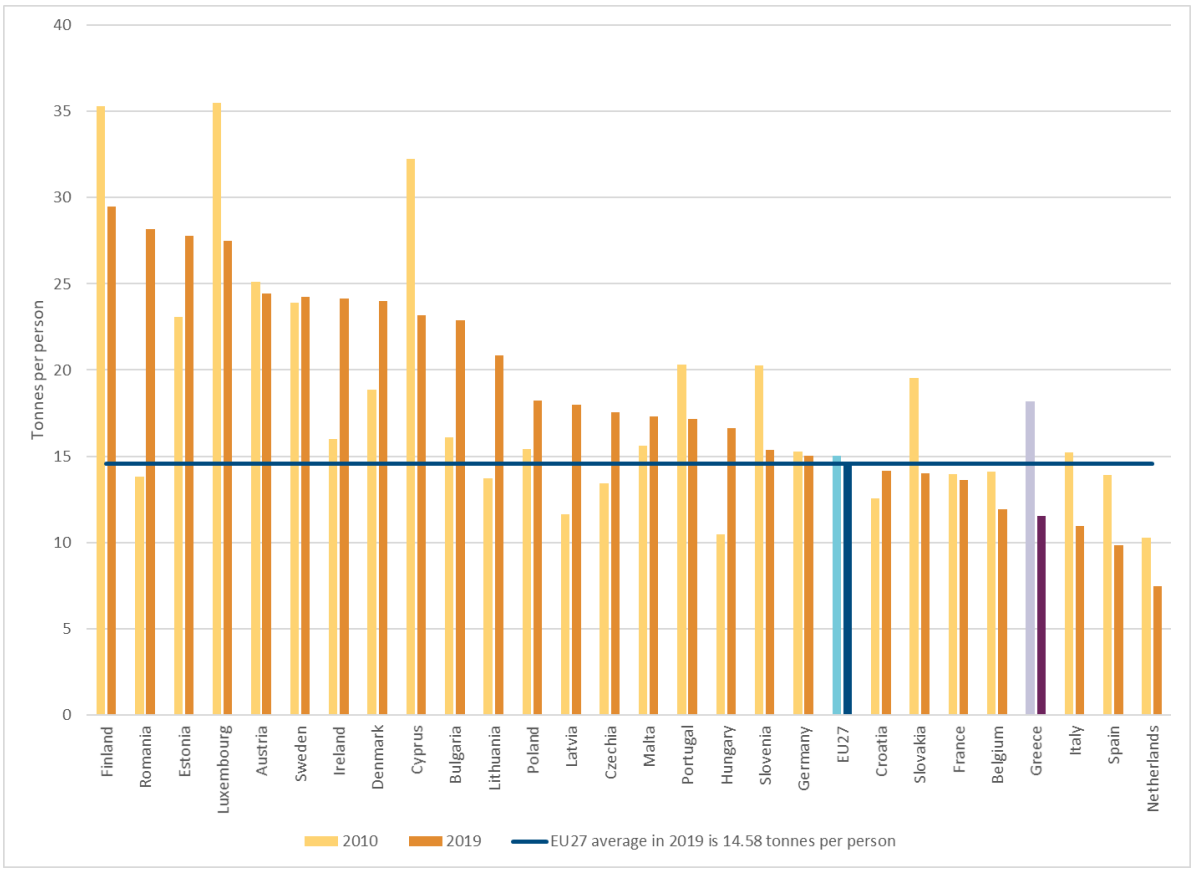
Source: Eurostat datasets, EU27 2020 (accessed 20 June 2022)

Figure 1 Material flow diagram for Greece in 2020, '000 tonnes



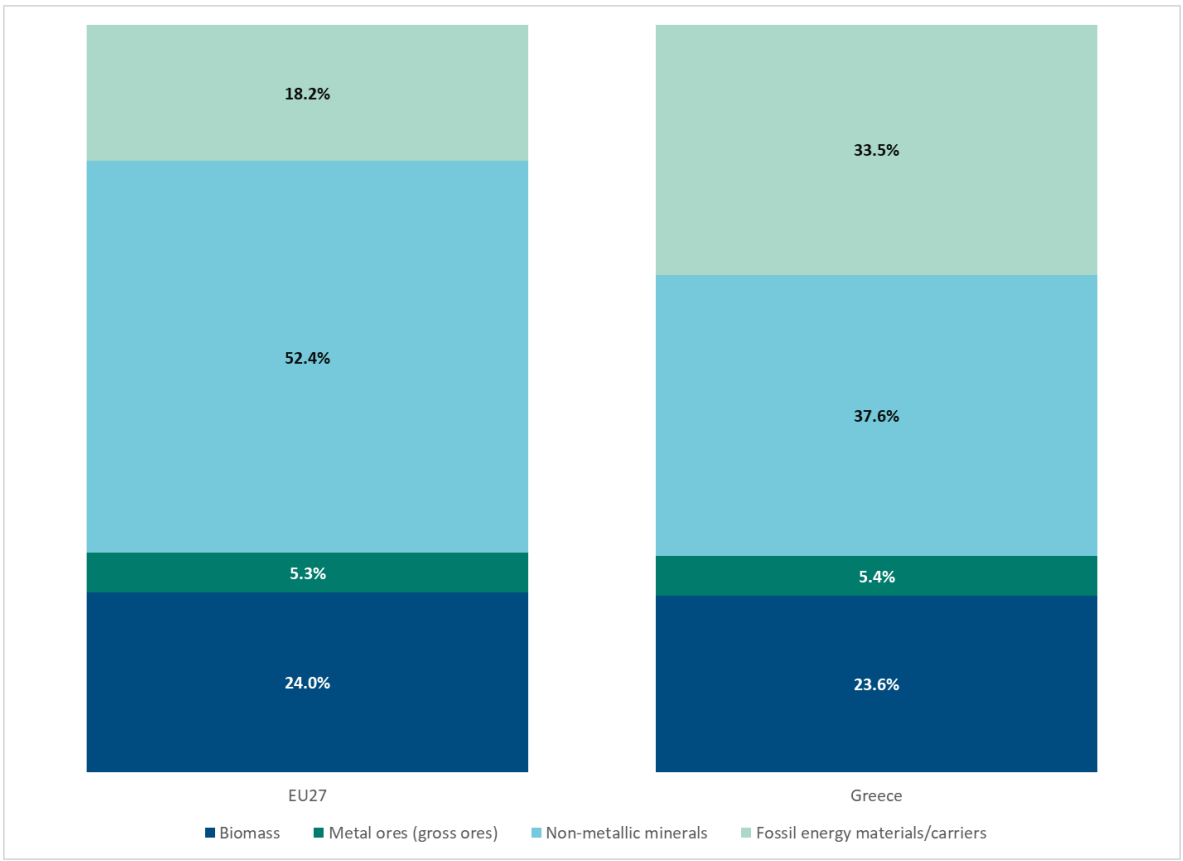
Source: Eurostat (2022) [env_ac_mfa], [en_ac_sd], [env_wassd] (accessed 20 June 2022)

Figure 2 Material footprint (raw material consumption), EU27, 2010 and 2019, tonnes per person



Source: Eurostat (2020) [env_ac_rme] (accessed 4 July 2020)

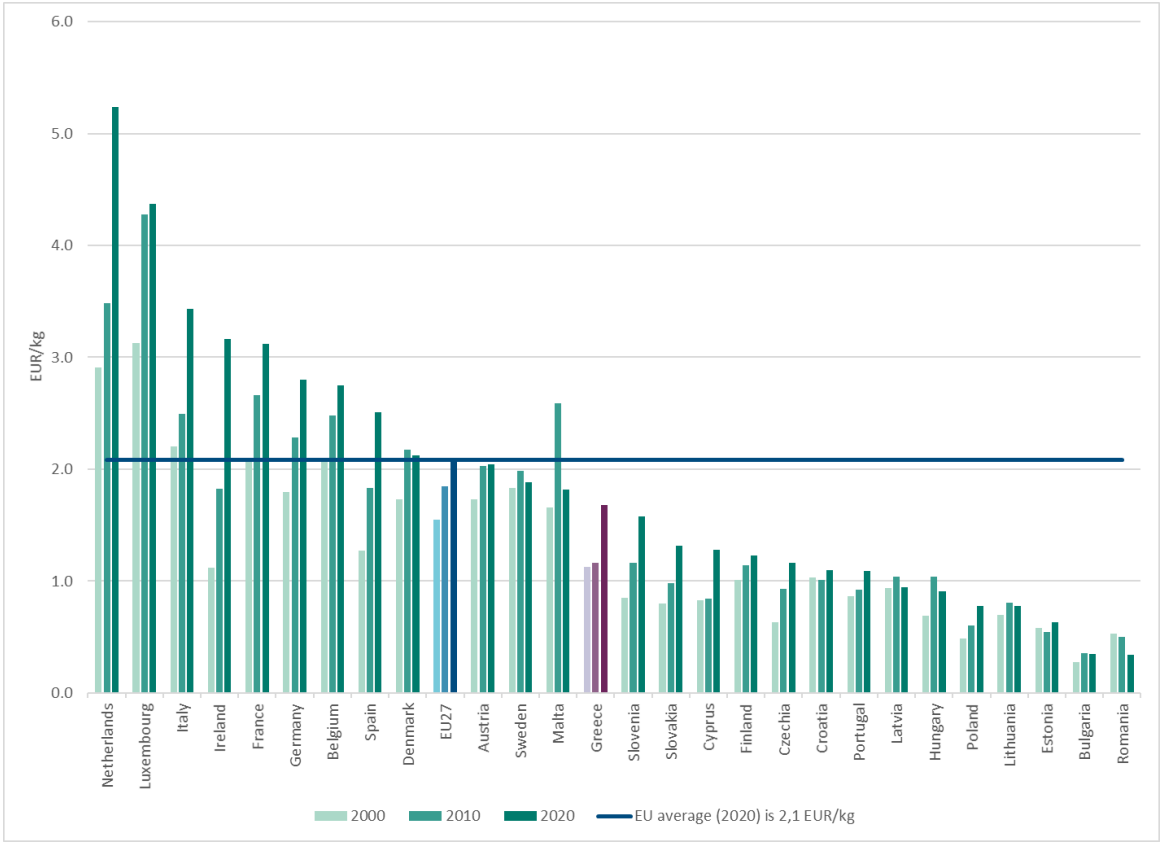
Figure 3 Domestic material consumption by selected material category, EU27 and Greece, 2020, per cent



Note: totals may not sum to 100 % due to rounding

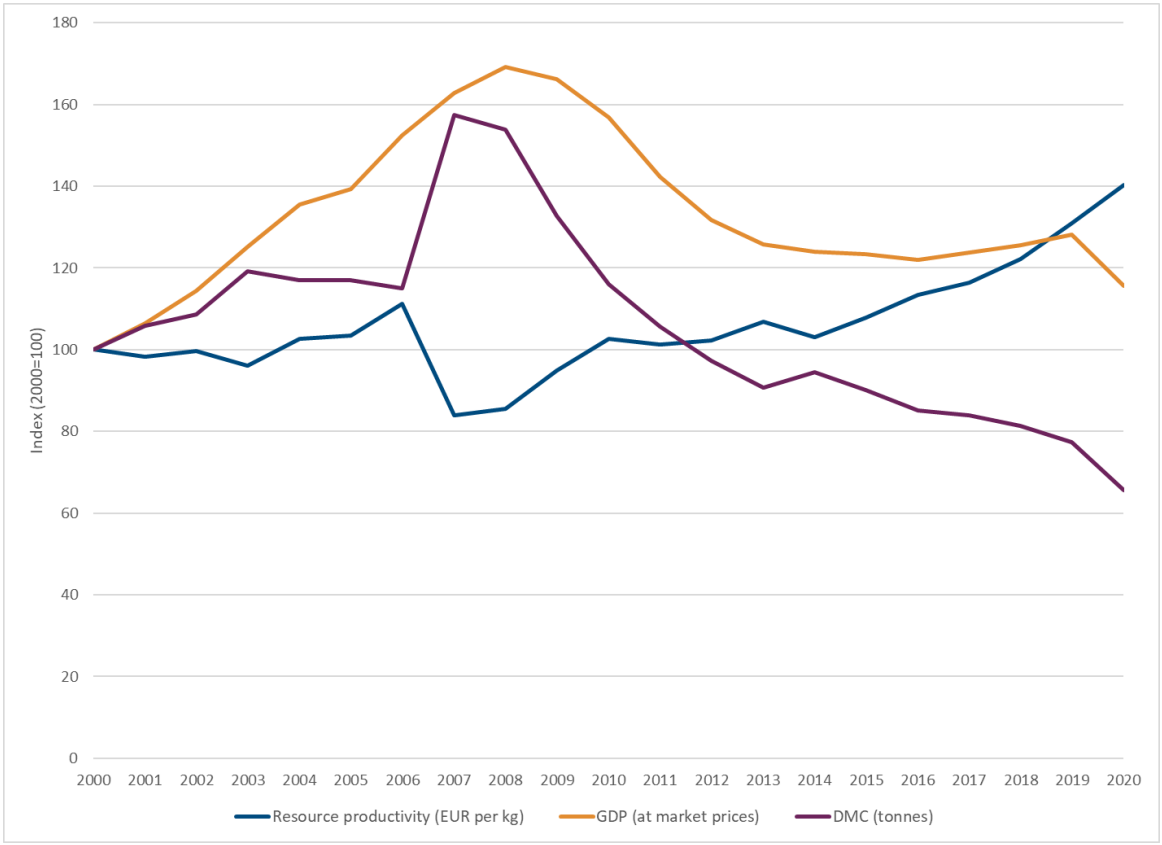
Source: Eurostat (2022) [env_ac_mfa] (accessed 20 June 2022)

Figure 4 Resource productivity (gross domestic product/domestic material consumption), EU27, 2000, 2010 and 2020, EUR per kilogram



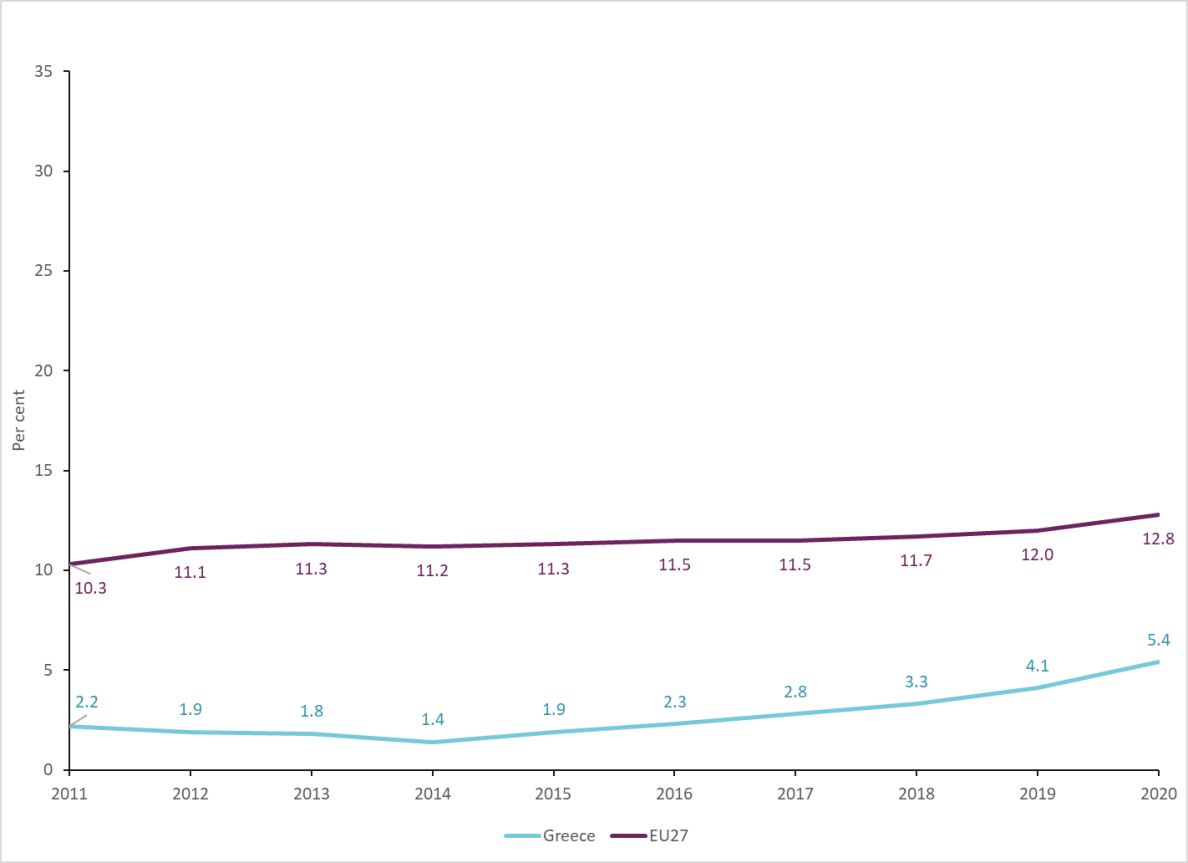
Source: Eurostat (2022) [env_ac_rp] (accessed 20 June 2022)

Figure 5 Gross domestic product, domestic material consumption and resource productivity trends, Greece, 2000–2020, index (2000=100)



Source: Eurostat [env_ac_mfa], [env_ac_rp] & [nama_10_gdp] (accessed 4 July 2022)

Figure 6 Circular material use rate in Greece, 2011–2020, per cent



Source: Eurostat (2022) [env_ac_cur] (accessed 20 June 2022)

Existing policy framework

Dedicated strategy, roadmap or action plan for a circular economy

The Greek Governmental Economic Policy Council endorsed the **National Circular Economy Strategy** in December 2018, with its two-year action plan, that aims to unlock growth potential towards a circular economy in alignment with the development strategy of the country. Its pillars are sustainable resource management, support for circular entrepreneurship and circular consumption.

Due to a lack of tangible results from the two-year action plan, and in the light of the recent developments at the EU level with the European Green Deal and the 2020 EU Circular Economy Action Plan, the Hellenic Ministry of Environment and Energy drafted **a new National Circular Economy Action Plan** (National CEAP) for the implementation period 2021-2025, which has been officially adopted by the Minister's Council Act No 12 of 29.4.2022 ([1]). The plan is in line with the revised national legislation that transposed the 2018 EU CE legislative package and ensures high synergies with the 2030 National Waste Management Plan (NWMP) and the recently adopted 2030 National Waste Prevention Programme (NWPP). More specifically, the new National CEAP aims at fostering a shift towards a sustainable and circular economy model, with the following key objectives:

- increasing the environmental performance of industrial processes and industrial symbiosis to achieve a climate neutral, resource efficient and circular economy;
- promoting the contribution of consumers in the transition to a circular economy and increasing demand for sustainable products;
- reducing waste, increasing high-quality recycling and reuse, and promoting the use of secondary materials;
- accelerating the implementation and monitoring of the action plan.

The new National CEAP has largely integrated the two-year action plan and was enhanced with a set of concrete actions to be implemented by 2025 under the following pillars:

- sustainable production and industrial policy;
- sustainable consumption;
- less waste with more value;
- special action for priority-product value chains that are considered resource intensive and have a high circularity potential, in line with the key product value chains of the 2020 EU CEAP, i.e. electronics and information and communications technology (ICT), batteries and vehicles, packaging, plastics, textiles, construction and buildings, food, water and nutrients;
- horizontal action on governance, regulatory and institutional arrangements and monitoring of the plan's implementation.

To this end, several initiatives of the National CEAP are being implemented to advance circularity at the national level, such as:

- revision of the regional and local waste management plans in alignment with CE principles and the new national legislative framework;
- drafting a specific food-waste prevention programme, specifying the general direction of the 2030 NWPP on food waste;
- preparation of specific CE action plans in lignite-dependent areas;
- programming the financing of new separate collection, recycling and recovery infrastructures, and upgrading of existing ones, to support the achievement of the NWMP targets;

[1] https://ypen.gov.gr/wp-content/uploads/2022/03/SXEDIO-DRASHS-KO-8.pdf (in Greek)

- establishment of economic incentives and disincentives to boost the waste hierarchy and reduce municipal waste generation:
  - a landfill tax was introduced in 2022 and will gradually increase to 2027;
  - a pay-as-you-throw (PAYT) scheme for municipalities with populations exceeding 100 000 by 2023 and 20 000 by 2028;
  - extended producer responsibility (EPR) schemes in additional streams, such as textiles, furniture, agricultural plastics, medicines, toys and fishing gear containing plastic, by 2023;
  - an EPR scheme with a deposit refund system for beverage bottles by 2023;
  - environmental fees for certain single-use plastic products – bags, cups for beverages, food containers and bottles containing polyvinyl chloride (PVC) – and economic incentives for own-use of food containers by consumers by 2022;
  - eco-modulation in an EPR scheme for plastic packaging to encourage reusability, recyclability and recycled content;
  - tax incentives for donations to encourage reuse.
- standardisation of treatment and preparation processes for waste recycling;
- preparation of a guide for municipalities on the PAYT scheme;
- establishment of a platform to provide technical support to municipalities undertaking innovative CE activities;
- development of a guide to circular cities;
- development of CE indicators and the setting of targets;
- establishment of a national CE observatory;
- support CE research and innovation activities through the multiannual financing plan "Research – Create – Innovate" for research infrastructure and certain focus areas, such as industrial materials, including action to promote a toxic-free environment.

Circular economy policy elements included in other policies

Circular economy policy element	Included in policy
- Putting the waste hierarchy into practice, especially by enhancing separate collection and infrastructure to attain high levels of recycling and material/energy recovery. - Support of industrial symbiosis to increase the use of secondary raw materials/fuels and boost the recycling market. - Use of economic instruments to encourage the application of the waste hierarchy (e.g. landfill tax, PAYT, EPR for additional streams). - More effective use of EU and national funds for a fair transition to a circular economy. - Specific planning of the management of municipal waste generated by the tourism sector.	National Waste Management Plan (in Greek)
- Promotion of sustainable consumption and understanding that waste is a resource; enhancement of public awareness to advance waste prevention action. - Adoption of waste reduction targets, such as for single-use plastics and food.	National Waste Prevention Programme (in Greek)
- Making the circular economy a policy priority to attain a reduction in greenhouse gas (GHG) emissions.	National Energy and Climate Plan

Circular economy policy element	Included in policy
- Promotion of a bioeconomy and the valorisation of organic waste as a renewable resource.	
Green public procurement (GPP) targets in 15 categories of products/services, out of which eight (i.e. copying and graphic paper, computers and monitors, interior lighting, air conditioning equipment, lubricants, road transport vehicles and services & road lighting and traffic signals) are mandatory.	GPP National Action Plan

The key national policy tools that have incorporated the circular economy are the revised NWMP and NWPP, which were approved in August 2020 and April 2022 respectively, and cover the period to 2030. These strategic documents are coherent and ensure strong synergies with the implementation of the National CEAP for 2021–2025, whilst their main objectives and initiatives are outlined below.

The 2030 National Waste Management Plan

- Put the waste hierarchy into practice, with an emphasis on achieving high levels of recycling, through developing separate waste collection schemes and adequate waste recovery infrastructure, and reducing landfilling to a minimum.
- Establish an integrated strategy to tackle marine plastics pollution and effectively implement the EU's Single-Use Plastics Directive.
- Reduce food waste and define responsibilities and obligations among local government, businesses and consumers.
- Establish a policy to encourage sustainable product design for the key product value chains, such as electronics, batteries, packaging, plastics and textiles, and a strategy to promote circularity in production processes.
- Promote industrial symbiosis to increase the use of secondary raw materials and fuels.
- Develop at a full-scale collection and recovery network for biodegradable agricultural waste; encourage separate collection and recovery of agricultural plastic waste.
- Adopt a specific plan on the management of municipal waste generated by the tourism sector.
- Make use of economic instruments to encourage the application of the waste hierarchy, such as EPR schemes for additional waste streams, deposit refund schemes, landfill tax, PAYT systems and economic incentives for local authorities and producers.
- Apply funding instruments through a best use of national and EU funds for a fair transition to a circular economy.
- Enhance stakeholder participation through information exchange, capacity building, awareness campaigns and support of synergies among stakeholders.
- Enhance public participation through public information and awareness campaigns.
- Enhance the use of digital technologies for waste monitoring, improve waste data quality and develop indicators to monitor the national and regional waste management plans and the circular economy transition.
- Apply additional instruments to support the circular economy transition, such as through research, innovation and digitalisation, GPP, measures and tools to capture synergies between circularity, and climate change mitigation.
- Enhance the effectiveness, transparency and inspection of EPR schemes.

The 2030 National Waste Prevention Programme

- Promote circular consumption; informing, raising awareness and providing tools for citizens to move from a linear to a circular model of behaviour and consumption.
- Adopt waste reduction targets for specific streams, such as for single-use plastics and food waste.
- Promote the understanding that waste is a resource to be used in the wider context of the circular economy.
- Strengthen waste prevention action by means of integrated and systematic public awareness campaigns.
- Develop and promote a new industrial strategy to encourage circularity in production processes.
- Introduce best available techniques in production processes to the greatest extent possible to prevent waste generation and improve the qualitative characteristics of waste.
- Develop methodologies to minimise the presence of harmful/hazardous substances in recycled materials.
- Promote industrial symbiosis to maximise waste valorisation and reduce waste exports, thus contributing to an increase in business competitiveness.
- Make use of the Just Transition Mechanism in the framework of European Green Deal and the InvestEU programme.

Circular economy policy elements have been also embedded in the **2030 National Energy and Climate Plan** (NECP), which was officially adopted in December 2018. This plan is the roadmap for the country's energy transition in line with the 2030 EU goals and for Greece to become a climate neutral economy by 2050. This requires a higher ambition for reducing GHG emissions, increased penetration of renewable energy sources (RES) in gross final energy consumption, improved energy efficiency for higher energy savings, and the phase-out lignite in power generation and all these objectives are in alignment with CE principles. The CE is also one of the plan's policy priorities for attaining its climate change mitigation objectives, as it has been estimated that shifting to a circular pattern could lead to a significant reduction in GHG emissions through recycling and the reuse of materials, the more efficient use of resources and more eco-friendly product design, as well as through the introduction of new circular business models, especially in industry, transport and the built environment. In close synergy with waste management, an integral part of national energy and climate planning, the circular production model is considered to be easily adaptable to the Greek economy due to various opportunities and possibilities for resource utilisation, with a special focus on promoting the bioeconomy and the valorisation of organic waste as a renewable resource. A revision of the current NECP is due to be completed within 2022.

Recognising GPP to be an instrument that can push the transition to a more circular economy in the public sector, Greece officially adopted a 3-year **GPP National Action Plan** in February 2021 that will be revised every three years, with the following objectives.

- The establishment and implementation of core green criteria in public procurement of products, services and projects.
- A gradual increase in GPP over the next three years in certain sectors of goods, services and projects.
- Wider integration of lifecycle cost estimation in public procurement.
- Dissemination of environmental and economic benefits of GPP.
- Raising awareness, building capacity and active participation of stakeholders – contracting authorities and economic operators – in GPP.
- Monitoring the achievement and updating the objectives.

In the plan there is a strong recommendation that all public authorities should use the EU GPP criteria for all procurement – goods, services and public works. In addition, the plan sets GPP targets in 15 categories of products/services, of which eight (i.e. copying and graphic paper, computers and monitors, interior

lighting, air conditioning equipment, lubricants, road transport vehicles and services & road lighting and traffic signals) are mandatory. All public procurers have gradually to adopt at least the core GPP criteria both for the mandatory and the non-mandatory categories: in the first year, governmental public authorities; in the second, non-governmental public authorities (municipalities and regions); and in the third, all the remaining public authorities. The GPP targets range from 20 % to 80 % of the public procurement depending on the category, with most of the categories having a 50 % target.

Monitoring and targets

Assessment of circular economy performance

To date, there is no official procedure to assess the progress of the transition towards a more circular economy in Greece. Yet, on the basis of the results of the EU circular economy monitoring framework for Greece, the **new CEAP** shows the need to speed up the assessment process and has embedded **dedicated action to systematically monitor implementation progress**. To this end, a National Observatory on the Circular Economy will operate from 2023 onwards, within the framework of the integrated project LIFE-IP CEI Greece ([2]) that is coordinated by the Hellenic Ministry of Environment and Energy.

It is also noted that a partial assessment on a subset of the CE indicators that are used for the monitoring of the country's performance on waste management exists.

The latest published **assessment on waste management** was carried out by the National Centre for the Environment and Sustainable Development, which has now been replaced by the Natural Environment and Climate Change Agency (NECCA), for the year 2019 ([3]). The Hellenic Recycling Agency (HRA) monitors performance in meeting targets for the management of waste streams falling under EPR schemes, such as for packaging waste, waste electrical and electronic equipment (WEEE) and waste portable batteries, and proposes, accordingly, to the Hellenic Ministry of Environment and Energy relevant measures for improvement. The annual reports of HRA are available on the web ([4]). Additionally, an assessment of the implementation period of the previous waste management plan is included in the 2030 NWMP ([5]).

The main conclusions of these assessments of the country's performance on waste management are outlined below.

- After the recession, an upward trend in municipal waste generation was noted in recent years, which amounted to 516 kilograms per person per year in 2018, relatively close to the EU average of 496 kilograms.
- Based on 2018 data, 78.4 % of municipal waste is landfilled and just 20.1 % recycled – the EU average is 47.2 %. There is slow progress in the recycling rate of biowaste, which has risen from 4.7 % of the weight produced in 2015 to 5.7 % in 2018.
- There is an increase in the overall recycling of packaging waste of 30 % in 2018 compared to 2014. The EU overall packaging waste recycling target was met in 2018, as well as the specific recycling targets for packaging-waste materials, with the exception of glass.
- The recycling targets for WEEE were met for all categories in 2018, showing an improvement in the recycling performance of certain individual WEEE categories compared to the previous years.
- Though there is an increasing trend in the recovery rate of construction and demolition waste, the mandatory EU recovery target is yet to be fulfilled.

The most important issues that explain the differences between the country and the average EU performance are provided below.

- The **current infrastructure is not sufficient** to support municipal waste management that would contribute to the transition towards circularity. The slow progress in the establishment of the required infrastructure prevented Greece from stepping up recycling rates and meeting the EU recycling target on municipal waste.

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2 https://circulargreece.gr/

3 https://eedsa.gr/site/wp-content/uploads/2020/04/2020_353_18-03-2020_ΕΚΘΕΣΗ-ΚΑΤΑΣΤΑΣΗΣ-ΠΕΡΙΒΑΛΛΟΝΤΟΣ-2019_-ΕΚΠΑΑ.pdf (in Greek)

4 https://www.eoan.gr/ ενημέρωση/εκθέσεις-εοαν/ (in Greek)

5 2030 NWMP (in Greek), Section 2.1.2, pp 9857–9863 and 9817–9819.

- The satisfactory recycling performance of individual waste streams, including packaging waste, WEEE, batteries and waste oils, is largely the result of established EPR schemes.
- The regional waste management bodies need to increase their efforts to introduce the required infrastructure, whilst separate collection in municipalities need to be enhanced to ensure high capture rates of recyclable waste, including biowaste.

The revision of the national legislative and policy tools on waste is expected to assist in the transition to a sound municipal waste management in line with the CE, and provide solid enforcement and support mechanisms for achieving high recycling rates. For instance, the introduction of various economic instruments in the new framework law on waste (Law 4819/2021), such as the landfill tax, the PAYT system and the extension of EPR to additional waste streams, is anticipated to divert municipal waste from landfilling and enhance the application of the waste hierarchy. Greece is currently increasing its waste treatment capacity substantially.

Circular economy monitoring frameworks and their indicators beyond the ones from Eurostat

Monitoring the progress of the transition to a more circular economy in Greece is considered vital to following the trends of the key elements of the CE and to assessing the efficacy of the associated policies and objectives. It is also the basis for examining the potential of transforming the national economy from a linear to a circular model of production and consumption and setting new priorities. In this context, the national Circular Economy Strategy calls for the development of indicators for monitoring the implementation of the CE. This is reflected in one of the horizontal actions of its action plan for the period 2021–2025 and will be realised within the framework of the integrated project LIFE-IP CEI Greece ([6]) that is coordinated by the Hellenic Ministry of Environment and Energy.

More specifically, the **National framework for monitoring the CE** in Greece was developed in November 2021. It forms the basis for the **establishment of the National Observatory on the Circular Economy** that is planned to be fully operational within 2023 and will provide CE assessments on a systematic basis. This national framework is largely based on the structure of the EU monitoring framework and has been enriched with focus areas and indicators derived from targets set in national legislation and the objectives of national policy documents associated with the CE that are deemed important to be systematically monitored. In particular, the national CE monitoring framework draws on:

- existing EU monitoring framework for the circular economy, which is structured in four thematic areas and a total of ten groups of indicators ([7]);
- the draft update of the EU monitoring framework to monitor the implementation of the 2020 EU CEAP that was released to the Hellenic Ministry of Environment and Energy for consultation in the second quarter of 2021; it addresses an additional dimension to show the links between circularity, climate neutrality and zero pollution, and includes additional indicators to better cover the existing thematic areas, including key sectors which have great potential for circularity;
- the new National CEAP 2021–2025, which is aligned with the 2020 EU CEAP and its key product value chains, such as plastics, packaging, electronics, textiles, batteries, vehicles and construction;
- national legislation that drives the CE context, such as the new framework law on waste (Law 4816/2021), legislation on specific waste streams and the law on single-use plastics (Law 4736/2020);

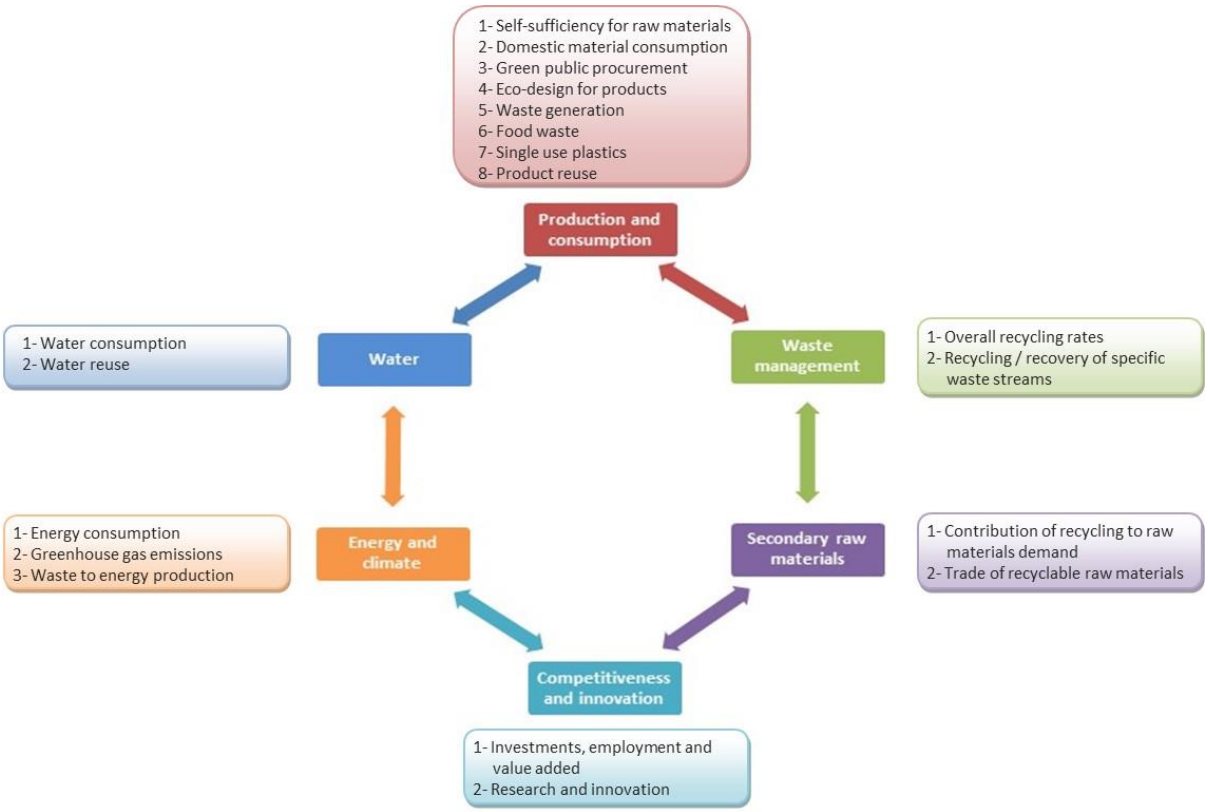
6 https://circulargreece.gr/

7 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A29%3AFIN

- national policy documents that will boost the transition to a CE, particularly the 2030 NWMP and the 2030 NWPP, which are complemented by other policy documents, such as the National Action Plan for GPP and the NECP.

The key elements for monitoring CE in Greece are fully related to the EU monitoring framework, as reflected in the national CEAP for 2021–2025, whilst considering that the national energy and climate policy is closely linked to the CE context, and that water is a sectoral priority policy that drives sustainable water resource management. **Six thematic areas** are defined to structure the national CE monitoring framework (Figure 7). Relying on national statistics and available official data to the extent possible, **19 sets of indicators** cover these thematic areas, which encompass **56 indicators in total**.

Figure 7 The structure of Greece's national circular economy monitoring framework



Circular economy targets

Apart from the EU imposed waste targets, the following targets related to sustainable production and consumption, which are aligned to the national CE Action Plan, have recently been set.

- A 30 % and 60 % **reduction in the consumption of plastic cups for beverages and food containers, relative to 2022 levels,** by 2024 and 2026 respectively in line with the mandate of Single-Use Plastics Directive (art. 4, Law 4736/2020). These are regarded as the most problematic plastic products and the Directive's overall aim is to move to reusable products as well as single-use products with lower environmental footprints, especially in the marine environment.
- A 30 % **reduction of food waste per person,** relative to 2022, at retail and consumer levels by 2030 (art. 20, Law 4819/2021). This is an essential to more sustainable retail and consumer behaviour that will reduce resource and environmental pressures and contribute to the achievement of the Sustainable Development Goal target 12.3.
- **Green public procurement targets** for 15 categories of products/services (GPP National Action Plan 2021–2023), ranging from 20 % to 80 % of the public procurements depending on the category. The

targets are mandatory for eight categories: copy and graphic paper, computers and monitors, imaging equipment, light-emitting diode (LED) lamps for interior lighting, air conditioning machines, regenerated and biodegradable lubricants, road transport, and road lighting and traffic signals.

It is also noted that an ambitious target for **reducing municipal waste landfilling** to 10 % of collected waste by 2030 has been legally imposed, five years ahead of the EU's legal requirement (art. 5, JMD ΥΠΕΝ/ΔΔΑ/90439/1846/2021).

In addition, it is stressed that boosting the introduction of secondary raw materials in domestic production is a tangible goal of the National Strategy for the Circular Economy. This is reflected in its new Action Plan for the period 2021–2025 through actions to promote the production of more circular products and products containing secondary raw materials, industrial symbiosis, the development of the bioeconomy, the formulation of national policy for sustainable products, the development of end-of-waste criteria, and the development of a market for secondary materials and fuels.

Innovative approaches and good practice

Examples of public policy initiatives (national, regional or local)

➔ *Good practice example: product policies*

Within the provisions of the **new Waste Framework Law** 4819/2021, **measures for promoting reuse** have been adopted to **prolong product lifetime**. More specifically:

- Manufacturers or importers of furniture and electrical and electronic equipment are obliged to inform the seller in writing about spare parts and the period for which these will be available. Additionally, manufacturers of products containing software are obliged to inform the seller in writing about the period for which updates will be available (art. 17, Law 4819/2021).

- Municipalities with population exceeding 20 000 and the regional waste management bodies (so called FODSA) in collaboration with the remaining municipalities are due to set up reuse centers. These centers collect used items, such as electrical and electronic equipment, toys, furniture, bicycles, books and textiles, and repair them so that they can be reused (art 18, Law 4819/2021).

- Manufacturers, importers and distributors of textiles, electrical and electronic equipment, daily hygiene products, and footwear, which are not suitable for sale, in particular due to errors , defects or deficiencies in the packaging, labelling or weight, or due to their withdrawal from the market or due to the proximity to their expiration dates, and in compliance with the waste hierarchy, must examine the possibility of donating these products to public benefit/charitable non-profit organisations before treating them as waste (art. 19, Law 4819/2021).

Legislative measures have been set to promote the circularity of the products, especially for plastics (Laws 4736/2020 and 4819/2021). For instance, the following initiatives apply to encourage the increase in the share of reusable, recyclable or compostable plastic packaging placed on the market:

- the use of economic incentives for the plastic packaging producers under an EPR scheme, by revising the fee payment system to encourage reusable plastic packaging and to boost the use of recycled plastic (eco-modulation of EPR fees);
- the exclusion of biodegradable and compostable plastic carrier bags from the environmental fee introduced for the single-use plastic carrier bags;
- the obligation for the food services to provide and label reusable alternatives to single-use food containers at the point of sale;
- the use of accredited validation mechanism to certify reusable plastic packaging placed on the market.

➔ *Good practice example: change in consumption patterns and consumer behaviour*

Pursuant to the provisions of national legislation, Producers' Responsibility Organisations (PROs) on packaging are obliged to organise annual **awareness-raising programmes** under supervision by the Hellenic Recycling Agency. Programmes are also planned to incentivise responsible consumer behaviour regarding **single-use plastic products** and to inform consumers about the impact of littering and other inappropriate waste disposal practices, the availability of reusable alternatives and proper waste management options.

➔ *Good practice example: implementation of the National Waste Management Plan, the National Waste Prevention Programme and the National Circular Economy Strategy*

Integrated LIFE project on the circular economy

The integrated project LIFE-IP CEI-Greece, Implementation of the Circular Economy in Greece (LIFE18 IPE/GR/000013), one of the most significant projects for the shift towards a circular economy in the country, aspires to support the implementation of the NWMP, the NWPP and the National Circular

Economy Strategy by encouraging practices and behaviour change to maintain products in the economy as long as possible, to turn waste into resources and to effectively implement the new EU legislative package on waste.

The eight-year project was launched in November 2019 and is coordinated by the Hellenic Ministry of Environment and Energy in collaboration with 19 partners. These include the Hellenic Recycling Agency (HRA), a key national authority for waste reuse and recycling; the Hellenic Organisation for Standardisation (ELOT) to support action to the promote the use of secondary materials; the Harokopio University of Athens to support action on food waste prevention; two non-governmental organisations (NGOs), the Ecological Recycling Society and the DAFNI Network of Sustainable Greek Islands; nine municipalities, one regional waste management body, and two companies. Additional core partners of the project are the Natural Environment and Climate Change Agency (NECCA), and the Green Fund, a key national body mandated to finance environmental related projects.

The project has a nationwide scope, aimed at maximising the application of the waste hierarchy through waste-prevention demonstration activities, recycling in pilot areas with different characteristics and needs, and replication activities of good practice. The key thematic areas of the project are reuse, separate collection of wastes, food waste prevention, application of PAYT schemes, valorisation of agro-food sector waste, the development of secondary materials' standards, the development and operation of the national CE monitoring framework, and capacity building among key stakeholders. Emphasis is placed on the Geek islands, which are of critical importance not only for their economic value due to tourism, but also because they are considered as a fertile ground for full scale application of waste management in a CE.

➔ *Good practice example: research and innovation*

Business Innovation Greece

A new programme for Greek innovative enterprises was launched in March 2019. Business Innovation Greece ([8]) aims to increase the competitiveness and profitability of Greek enterprises and develop more **innovation in products, services, and processes**. It includes the financing of enterprises engaged in green industry innovation that could contribute to the implementation of the CE. This could involve the development of new or improved green products and services, investment in more environmentally friendly production processes or a green organisational innovation. This will encourage Greek enterprises to improve their competitiveness through reduced energy, water and oil consumption, better utilisation of raw materials and increased productivity. The Programme is part of the European Economic Area and Norway Grants 2014–2021 and is implemented by Innovation Norway, the Norwegian government's most important instrument for innovation and development. The programme can fund a wide range of business practices that will improve the economic performance of Greek enterprises and their environmental footprint, in addition to having positive social impacts through the creation of new jobs.

A project example is **ELDIA** – **A Greener Way to Manage Waste** ([9]). The focus of this was to sort and recycle waste in a greener, more efficient way and learn from Norway's experience. The project consisted in constructing and operating a state-of-the-art waste sorting facility to process large volumes of mixed recyclables, as well as other diverse materials. The new state-of-the-art waste management facility opened in 2022 and is able to sort 20 000 tonnes of waste per year and to use that waste as an asset.

Operational Programme on Competitiveness, Entrepreneurship and Innovation

In the context of the National Research and Innovation Strategy for Smart Specialisation (RIS3), the Operational Programme on Competitiveness, Entrepreneurship and Innovation for the period 2014–2020

8 https://www.innovasjonnorge.no/en/start-page/eea-norway-grants/Programmes/business-development/greece--business-development-innovation-and-smes/

9 https://www.innovasjonnorge.no/en/start-page/eea-norway-grants/success-stories/greece-eldia---waste-management

seeks to meet the needs of enterprises and enhance their global competitiveness under specific areas by modernising, diversifying and exploiting new opportunities in the Greek economy. One of its key activities, Research – Create – Innovate aims to promote research activities and apply innovation by encouraging collaboration between enterprises and public research organisations. This single research and innovation state-aid action supports environmental and sustainable development, which incorporates the **CE** concept **in the field of waste management**. Some CE related projects financed by the programme, which were launched in 2018, are presented below.

- The **PHOTOREC project** ([10]) is a public-private partnership, with the objective of recovering maximum materials possible from photovoltaic panels. It includes the establishment of a mobile unit for dismantling of panels and the development of a prototype process for the laboratory recovery of materials/metals.
- The **wastes-to-biopolymers project** ([11]) is a public-private partnership working to develop environmentally friendly and economically feasible bioconversion processes for turning food industry wastes into bioplastic products. It focuses on the utilisation of liquid waste streams, derived from the production of dairy products and from fruit and vegetable juicing, and turning them into plastic products with applications in food packaging.
- The **MagWasteVal towards sustainability project** ([12]) is a public-private partnership, the objective of which is within the framework of the CE by developing and demonstrating, both in a laboratory and on an industrial scale, an added value product that is produced by the conversion of enriched magnesite industrial waste. Utilisation of this type of mining waste is essential for magnesite mines, since the mining waste, after the proposed treatment can be used for the production of refractories.

Examples of private policy initiatives (sectoral)

Examples of good CE practice developed by specific economic sectors in Greece are presented for food, plastics and electronics, including the bioeconomy and secondary fuels.

Food

A **National Alliance to Reduce Food Waste** ([13]), launched in September 2020, is a coordinated national effort by the state, the market and society that is led and coordinated by the NGO Boroume along with a company and operates under the auspices of the Hellenic Ministry of Environment and Energy. The Alliance brings together key stakeholders, such as professional and industry associations, companies from across the food supply chain, civil society organisations, and the academic and research community, with, to date, around 67 stakeholders having signed a voluntary cooperation agreement. In March 2021, the American College of Greece presented the first report, which included a total of 57 activities, best practice and initiatives concerned with the prevention and reduction of food waste ([14]).

Plastics

The **Blue Municipalities Network** was created in 2021, with the donation of the Stavros Niarchos Foundation (SNF), and operates under the auspices of the Hellenic Ministry of Environment and Energy. It is based on a memorandum of cooperation between Aegean Rebreath, a multi-sectoral organisation working on the protection and renewal of the marine environment, and municipalities that have installed marine litter collection stations to respond to the urgent need to clean the seabed, whilst encouraging

10 http://photorec.chemeng.ntua.gr/ (in Greek)
11 http://www.wastes-to-biopolymers.gr/root.en.aspx
12 http://magwasteval.gr/en/the-project-en
13 https://foodsavingalliancegreece.gr/ (in Greek)
14 https://www.acg.edu/news-events/news/national-alliance-for-the-reduction-of-food-waste-acg-featured-in-the-first-report-on-food-waste-prevention-and-reduction-best-practices/

recycling and upcycling of marine plastic litter following CE principles . The Network aims to exchange and promote of good practice, the implementation of joint action and the provision of direction to the relevant ministries. The Network contributes to the collection of marine plastic litter from the seabed, the sea and the coasts; its distribution to companies involved in upcycling, with the aim of using them in the production of new plastic products; and cooperation with recyclers and waste management companies. To date, the Network consists of 15 member-municipalities throughout Greece. In 2021, about 112 000 recyclable items and 20 tonnes of fishing gears have been collected from the sea, and about 20 000 items were removed from beaches.

The Blue Municipalities Network collaborates with **Blue Cycle** ([15]), a blue and CE initiative funded by the Athanasios C. Laskaridis Charitable Foundation, to develop an expanding material collection network for marine and coastal plastic waste and partnerships with the plastic industry, public research organisations and the fishing community. The marine plastic waste is reprocessed to produce furniture and playpods with the use of robotic 3D printing. BlueCycle, a significant effort in Greece to recycle and upgrade marine plastic waste following the circular economy model, was nominated for the Earthshot Prize 2022.

The **Fishing for Litter** project ([16]) aims to reduce marine litter with the participation of the fishing community and to contribute to the CE by sending the litter for recycling/upcycling.
North Greece: the project started in 2019 and is funded by the Athanasios C. Laskaridis Charitable Foundation with the collaboration of the environmental organisation iSea. Participating trawler fishermen commit to recording the litter caught up in their nets during their ordinary fishing activities, as well as to delivering it to port reception facilities, which handle it in an environmentally friendly manner. The findings are recorded by the fishermen on a special form, which is analysed by the project's scientific team, with the aim of understanding the nature of pollution at the bottom of the sea and searching for appropriate interventions to reduce it. In 2020, 18 trawlers participated in the areas of Thessaloniki (Michaniona), Kavala and Alexandroupolis, collecting 17 312 kilograms of waste, which consisted of more than 23 000 items. In 2021, the northeast Aegean islands and Crete were included and 10 Greek ports were participated.
South Greece: a pilot project started in 2019 to clean plastic from the sea floor, with the collaboration of 10 fishing boats and the non-profit social enterprise Enaleia. To date, 159 fishing vessels are collaborating, which have removed a total of 120 tonnes of plastic. The collected plastic is re-introduced to the economy, either through recycling or upcycling. Plastic bottles are sent to a fashion company in Madrid which turns them into clothes, while nets are sent to the environmental organisation Healthy Seas, which turns then into useful products such as swimwear and socks.

Electronics
The LIFE REWEEE project **Development and demonstration of Waste Electrical and Electronic Equipment prevention and reuse paradigms** ([17]) (LIFE14/ENV/GR/000858), launched in January 2016, is coordinated by Appliances Recycling SA, the Greek Producer Responsibility Organisation for WEEE, in partnership with the Hellenic Recycling Agency, the Ecological Recycling Society, the Green Fund, RREUSE and Harokopio University of Athens. The overall goal of the project is to promote the reuse of electrical and electronic equipment (EEE) and preparing WEEE for reuse. Two sorting centres have been established for the collection, storage and sorting of used EEE and, depending on its condition, its repair or preparation for either reuse or further treatment – one in Attica and the other in Central Macedonia. Technicians inspect devices to see if they can be repaired, clear any data from computers and repair them so that they can either be sold them at affordable prices or donated to NGOs and vulnerable groups.

15 https://bluecycle.com/en/the-products/
16 https://fishingforlitter.org/
17 https://www.reweee.gr/en

Bioeconomy

The **Cluster of Bioeconomy and Environment** ([18]) is a non-profit organisation established in 2014 by local stakeholders, research institutions and enterprises in West Macedonia. The Cluster seeks to develop synergies between local and regional players and businesses in bioeconomy, bioenergy and the environment, and aims to develop and introduce innovation in the sector and reinforce smart, bio, green and CE activities in the region and others areas.

Secondary fuels

The **Hellenic Cement Industry Association** ([19]) signed an updated voluntary public-private agreement with the Hellenic Ministry of Environment and Energy in July 2019. The agreement provides a specific framework for the use of secondary fuels in the cement industry in the context of industrial symbiosis and CE, thus contributing to the reduction of waste materials that would otherwise end up in landfills and the strengthening of the market for secondary fuels, whilst ensuring the protection of the environment. This practice has been already recognised as a Best Available Technique under the Industrial Emissions Directive.

18 https://clube.gr/en/

19 http://www.hcia.gr/el/news/?&EntityID=d020e968-f6c2-4c4c-b9cf-8cbc3fb28108 (in Greek)

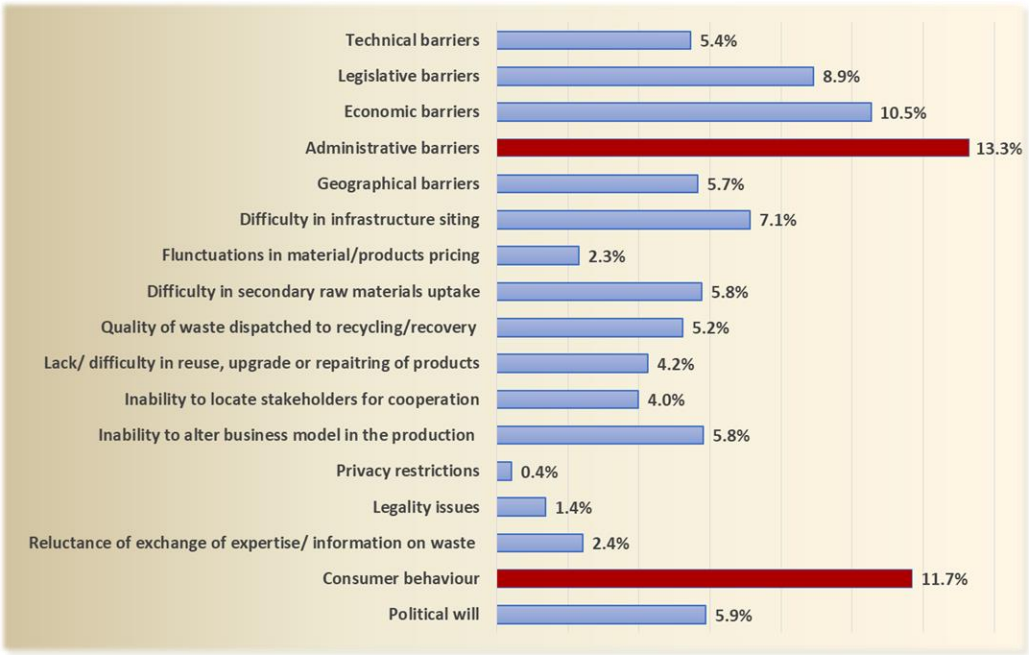
The way forward

Addressing barriers and challenges

Within the framework of the integrated project LIFE-IP CEI Greece ([20]) that is coordinated by the Hellenic Ministry of Environment and Energy, a **nationwide survey on the CE** was carried out in December 2020 and January 2021. This involved all types of stakeholders that could contribute to the transition to a more CE in Greece, covering a broad range of players, from public authorities, waste management bodies and industry actors to academic and research institutions, and other organisations representing the economic, business and civil society of the country. The survey aimed to gain an insight into the views and perceptions of the stakeholders regarding their areas of interest, the key challenges, priorities and enablers, including the trends in the practices and avenues of growth in the implementation process of the CE.

The outcomes of the survey with regard to the challenges in implementing CE, presented in Figure 8, show that **administrative barriers and consumer behaviour are considered to be the most significant factors hindering the transition to a CE** in Greece. Other important barriers are associated with economic and legislative obstacles that largely influence the companies' opportunities for moving to a CE

Figure 8 Barriers to implementing a circular economy in Greece



It has, however, to be noted that the significance of legislative barriers could be less than shown since the survey was carried out before the completion of the revision process on the key legislative and policy tools related to CE, such as the legislation on waste, the new National CEAP and the GPP National Action Plan. In addition, economic barriers associated with the availability of financial resources could also be of less significance since the new finance framework now boosts investment in the CE.

According to the results of the survey, the **financial tools** for promoting investment related to the CE and the strengthening of **capacity building among stakeholders and education of citizens** are shown to be the **main enablers**. Other policy initiatives that would fuel the transition to a CE are economic instruments for the promotion of sustainable products/services, information/awareness campaigns, economic instruments for waste-to-energy production, the development of a recycling market, and GPP.

20 https://circulargreece.gr/

Ranking types of barrier

High barrier	Institutional challenge to develop policy for a complex cross-sectoral issue
↑	Consumer behaviour/awareness
	Companies' ability to grasp opportunities
	Market barriers for recycled resources
Low barrier	Good indicators and targets

Future policy plans

Circular economy related activities have been included in the **National Recovery Plan** ([21]) under the green transition pillar. A number of investments and reforms contributing to a green transition and related directly or indirectly to the CE, are embedded in broader national plans, such as the NWMP, the National CEAP and the National Energy and Climate Plan. The action included in the investments and reforms are at the final-approval stage of the financial contribution of the Recovery and Resilience Fund. Examples of investments and reforms that are considered directly relevant to the CE are presented below.

- Renovate (component 1.2)

This comprises targeted investments to reduce carbon dioxide emissions, support for the achievement of the climate neutrality of urban areas and the enhancement of the climate resilience of cities and their building stock. The investments in the renovation of buildings, i.e. energy renovation of residential buildings, improvement of energy efficiency of buildings and processes of private companies, energy upgrades of public sector buildings, require the economic operators to carry out the construction work to ensure that at least 70 % (by weight) of non-hazardous construction and demolition waste generated on the construction site are prepared for re-use, recycling and other material recovery, including backfilling operations, using waste as a substitute for other materials in accordance with the waste hierarchy and the EU Construction and Demolition Waste Management Protocol.

- Recharge and refuel (component 1.3)

This comprises investments that will contribute to the green transition through providing support to enterprises carrying out operations related to the low-carbon economy and climate change resilience. The Product-E Green investment aims, among other things, at the supply-side of e-mobility. It will provide support for the development of more than 10 sites with research and development departments for innovative products and services, such as the recycling of electric car batteries and the regular reuse of raw materials, including lithium and cobalt, or the design of electric vehicles and regular or high-power charge points.

- Sustainable use of resources, climate resilience and environmental protection (component 1.4)

This includes reforms and investments that are anticipated to increase the efficiency in using natural resources and support the transition towards a CE based on waste prevention, reuse and recycling.

- The **Urban wastewater and sludge management infrastructures from wastewater treatment investment** promotes circular and sustainable water consumption. The upgrading, expansion and modernisation of wastewater treatment plants involve the reuse of treated water, whilst the implementation of sewage sludge management infrastructure is expected to contribute to an increase in sewage recovery/recycling.
- The **Waste management law for the implementation of sustainable landfilling and recycling reform** includes the establishment of a National Waste Regulator to boost the implementation of the waste hierarchy and supports the transition towards a CE. It comprises a revision of the existing waste management legislation with a view to enabling the transition towards a CE – the updated legislative

[21] https://ec.europa.eu/info/system/files/com_328_1_en.pdf

package on waste is already in force. In particular, the reform will introduce incentives for municipalities to achieve higher recycling rates; enforce separate collection of biowaste, metal, paper, glass and plastic; extend existing EPR schemes, upgrade the operation of recycling sorting facilities, and simplify the legislation around green points, i.e. centres that collect recyclable waste and used items separately. The reform supports the achievement of targets to increase reuse and recycling rates of municipal solid waste to 60 % and reduce the landfill rate to 10 % by 2030 (Law 4819/2021). The national waste regulatory authority that will be put in place in the context of this reform, shall, *inter alia*, be responsible for ensuring the soundness of the pricing policy, supervising the implementation of waste management across the country, and supervision of the proper functioning of the regional and local waste management utilities.

- The **Drinking water supply and saving infrastructure investment** aims to improve the availability and quality of drinking water, and reduce infrastructural leaks and public health risks.
- The **new Water and Wastewater Regulatory Authority** will establish a single body responsible for implementing the rational management of water resources designed by the Hellenic Ministry of Environment and Energy.

Other important CE initiatives not included in the National Recovery Plan, which have mostly been introduced by revised national legislation on waste, are presented below.

- **Reuse**: the establishment of reuse centres in municipalities with population exceeding 20 000 by 2024 and encouragement of inter-municipal cooperation schemes by the regional waste management bodies to serve the remaining municipalities (art. 18, Law 4819/2021).
- **Extended producer responsibility schemes**: new EPR schemes will be established for textiles; agricultural plastic products, such as greenhouse plastics and irrigation pipes; medicine intended for home consumption; mattresses; furniture; toys and sports equipment; light personal electric vehicles and electric bicycles (art. 10, Law 4819/2021).
- **Separate collection schemes**: the introduction of separate collection obligations on specific economic activities for individual waste streams in order to speed up recycling rates (Law 4819/2021):
  - four packaging waste streams in public areas, such as cinemas, theatres, concert halls, commercial centres, hotels, hospitals, restaurants, airports and ports; the same obligation in areas of municipal jurisdiction, such as sports facilities, nurseries and playgrounds;
  - printed paper in central government bodies' buildings;
  - printed paper and packaging waste, portable batteries and biowaste in primary and secondary schools;
  - suitable areas for the separate collection of at least four waste streams in new buildings;
  - biowaste resulting from major biowaste producers' operations, such as catering companies, food processing facilities, food markets, supermarkets and hotels.
- **Food waste**: introduction of the food waste hierarchy; setting of a national food waste reduction target at retail and consumer level for achievement by 2030; establishment of an electronic food-waste registry to monitor food-waste generation; promotion of food donation by setting minimum requirements and economic incentives for donors (art 20, Law 4819/2021).
- **Plastics**: signing of the New Plastics Economy Global Commitment by the Hellenic Ministry of Environment and Energy in May 2022.

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