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# The Greek CE approach

## Mapping Circular Economy policies, instrument, initiative & action plans in the public sector

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# Contents

# EXECUTIVE SUMMARY

This report is about the mapping exercise aiming at assisting the Greek Authorities in using its Smart Specialisation Strategy (SSS) thus facilitating and accelerating the transition of the country to the Circular Economy (CE). The combination of these two EU priority strategies and policies, totally distinct in terms of timing and primary target poses significant challenges in terms of methodology, prioritisation and project coordination.

The UN SDGs offer ideas on the regulatory framework, incentives and tools to geode the transition to the CE, but it is the EU which guides the efforts of member States both in its mandatory legal framework as well as with incentives and recommendations. The CE Strategy and Action Plan are guiding this effort. The external pressure exercised by the EU is much more pronounced, both in terms of incentives (ESIF support and competitive funding from other DGs), technical assistance and recommendations as well as by sanctions in the case of non-compliance. The central message of the EU to its Member States is that the CE is expected to not only protect the environment and generate sustainable growth but also create jobs, contribute to boost Europe's competitiveness, modernise its economy and industry. The SSS is the most generous potential incentive and in this sense, it was selected to focus on its role for the CE transition.

Greece is lagging significantly behind the EU average in its transition to the CE; it needs significant acceleration to catch up. Its main advantage are good research skills. Monitoring indicators, European Semester recommendations, fines by the Court of Justice and national/international NGO assessments leave no doubt for that. Given this backwardness the country is caught in a vicious circle of ambitious, yet unrealistic catching up plans. A historic review suggests that until 2019 the CE was not an issue and from its components practically only solid waste management was a main concern. Timid progress has been made in this area, funding has been ensured, even if insufficient given the huge needs of the country, but the crisis, strategic mistakes and a complex governance structure have not allowed the country to escape its path-dependent, embedded deficiencies. A significant step was introduced in December 2018 with the adoption of the National Circular Economy Strategy, yet, once again the endeavour proved more of a theoretical exercise as it came up with an unrealistic shopping list of actions and praises the CE, neglecting its challenges. Unsurprisingly, the actions foreseen for 2019 were not implemented.

The Smart Specialisation Strategies conceived at regional and national level did not address the CE directly, but Energy, Environment and the Agri-food sector are among their priorities giving them the opportunity to incorporate CE actions during the implementation. However, due to administrative delays and path-dependencies the SSS had a less decisive role than planned for.

The pilot exercise could identify a list of potential CE-related activities in all SSS and Sectoral O.P.s studied. Despite actual difficulties because of the late and first-time design of SSS the methodology appears as a valuable tool to convert actions towards long-term, profitable choices using regional competitive advantages coupling classic financial and awareness raising incentives with new instruments like financial engineering and green public procurement. The merit of this coupling is the recognition of challenges and the early discussions with stakeholders when designing the SSS revision.

The main lesson drawn from the Greek exercise is that the CE transition can be accelerated and become profitable, while using the cross-referencing methodology of SSS and CE strategy goals adapted for the needs and competitive advantages of each country or region proves a very helpful tool in the endeavour to accelerate the passage from the linear to the circular economy.

# 1. Introduction

This report is about the mapping exercise aiming at assisting the Greek Authorities in using its Smart Specialisation Strategy (SSS) thus facilitating and accelerating the transition of the country to the Circular Economy (CE). It describes the process of a pilot, supported by the EIT Climate KIC, which can be used as a model by other Member States wishing to couple their own SSS and CE strategies. The methodology followed consisted of desk research, interviews and a stakeholder consultation workshop conducted in September at the Ministry of Energy and Environment.

The project investigated the possibility to obtain synergies from the coordination of two top priority European Union (EU) policies, namely SSS as a major tool of regional development policy and the Transition to the CE as a main concern of environment policy:

*The circular economy strategy*. For a long time, environmental policy in Greece was (unsuccessfully) focusing almost exclusively on waste management. ith few exceptions, CE projects were fragmented, often considered identical to material recycling. Following the EU legislation and the Communication of the Action Plan for the CE the Ministry of Environment and Energy adopted the National Circular Economy Strategy. Suggesting a methodology for refining and implementing the 2019 Strategy was the goal of the project described in this report.

*The Smart Specialisation Strategy*. The adoption of a SSSs was an ex ante conditionality for the first time in the 2014-2020 programming period. Designing such a strategy created some unrest and a concern that focusing on few areas for Thematic Objectives 1 and 2 might discourage investments in the non-prioritised sectors of the economy. In addition, the timing did not allow for a systematic coordination between SSS and Operational Programmes. (OPs) Due to the severe economic crisis, the European Structural and Investment Funds (ESIF) were the main source of development funding. Nationally funded investments shrank to a minimum because of the need to generate budget surpluses.

The combination of two totally distinct strategies and policies both in terms of timing and primary target poses significant challenges in terms of methodology, prioritisation and project coordination.

The rest of the paper is structured as follows: In Section 2 we look at the external influences that have pushed the country towards the CE, their influence and potential incentives. In Section 3 we discuss the Greek context in more detail, looking at the indicators characterising the relative position of Greece in the adoption of the CE, as well as the design and implementation of the SSS. We then, in Section 4 describe the methodology used to assess common elements of the two strategies in the past. This methodology can prove invaluable if used ex ante in the next programming period rather

than ex post. Conclusions, summarising the lessons learned and venturing some recommendations are included in Section 5.

# 2. External influence

CE is mainstream in international organisations. The United Nations (UN) Sustainable Development Goals (SDGs) and the EU Circular Economy Package constitute the most prominent efforts promoting the CE influencing/supporting policy agendas in all their members. The UN SDGs are devised as a global, generic inspirational framework, whereas the EU regulatory framework is partly mandatory and partly discretionary with increasing incentives for its implementation creating obligations and opportunities for the Member States.

## 2.1. The United Nations Sustainable Development Goals (SDGs)

The SDGs address the CE in the context of sustainability. Appendix 1 offers an overview of the CE-related content directly or indirectly included in the Sustainable Development Goals, as well as, their respective targets and indicators.

The distinctive feature of the SDGs is that, unlike the Millennium Development Goals, they address for both developed and developing countries. The SDGs are neither binding nor does the UN directly fund or otherwise support their integrated implementation but uses them as guidance for the developing countries' support by the various UN organisations, like UNDTAD, UNDP etc. For the developed countries they constitute an aid to national policies and are taken over by the OECD and the EU to be translated into more specific recommendations.

For Greece, which is a developed, yet middle-income country, four main lessons are derived for the design of its national CE strategy:

1. *Regulation:* The SDGs suggest regulatory interventions for practically all areas related to the CE with emphasis on the special treatment of hazardous waste, recycling/reuse of waste as well as sea and forest management.
2. *Incentives*: At least equally important to regulation are incentives for the private sector and civil society. The important role of technology for a profitable CE indicates that Research and Innovation (R&I) incentives can be reinforce the role of the business sector and accelerate the transition. Several areas like wastewater treatment, renewable energy and energy efficiency, material consumption and production can benefit from CE-targeted R&I.
3. *One very important sector not to be neglected*: While the primary sector plays a small role for GDP and employment in developed countries its important for the CE is disproportionately relevant: sustainable agriculture, supported by new

technologies, precision agriculture and photonics, will contribute to the CE via sustainable food production. Competent public authorities, ministries or otherwise, are expected to join forces for introducing a CE strategy for agriculture. This is achievable in the short to medium term.

4. Specific *additional tools* from the public sector include green public procurement and monitoring of the carbon footprint and CE indicators, while from the private sector CSR reporting will improve the business contribution.

## 2.2. The Circular Economy Transition in the EU

The EU has been very active early on in its vision for environmental protection and has integrated more aspects and policies in the introduction of the CE for its Member States on 2 December 2015, when the European Commission put forward a package to support the EU's transition to a circular economy[1] including an Action Plan with specific 54 actions. On 4 March 2019, the Commission informed on the complete execution of the action plan claiming that all 54 actions been delivered or are being implemented. This is expected to not only protect the environment and generate sustainable growth but also create jobs, contribute to boost Europe's competitiveness, modernise its economy and industry. Hence, the influence of the EU CE strategy for the Member States is multi-faceted: legally binding, inspirational, and providing incentives.

The EU Action Plan for the Circular Economy outlines a set of both general and material-specific actions. While some obstacles to a circular economy are generic, different sectors and materials face specific challenges due to the particularities of the value chain.

General measures include:

- Product design
- Production process
- Consumption
- From waste to resources (secondary raw materials)
- Innovation, investment and other cross-cutting issues

While actions for specific materials and sectors include:

- ✓ Plastics
- ✓ Food value chain
- ✓ Critical raw materials
- ✓ Construction and demolition
- ✓ Biomass and bio-based products

[1] https://ec.europa.eu/environment/circular-economy/

- ✓ Review of fertilisers legislation

Many Directorates General (DG) of the European Commission, with a prominent role played by DG Environment, DG Grow, DG Research and Innovation and DG Energy are directly or indirectly involved in the transition to the CE, using technical assistance, policy advice and financial incentives to support Member States in their national policies.

For the purposes of this report, since we work with SSS, we focus on the support provided by DG Regional Development, which co-designs the use of European Structural and Investment Funds (ESIF) with the Member States and encourages them to use to support the CE, using the following investment priorities[2]:

*Table 1: Investment Priorities potentially associated with the Circular Economy*

| | |
|---|---|
| 6.1 | investing in the waste sector to meet the requirements of the Union's environmental acquis and to address needs, identified by the Member States, for investment that goes beyond those requirements |
| 6.2 | investing in the water sector to meet the requirements of the Union's environmental acquis and to address needs, identified by the Member States, for investment that goes beyond those requirements |
| 6.6 | promoting innovative technologies to improve environmental protection and resource efficiency in the waste sector, water sector and with regard to soil, or to reduce air pollution |
| 6.7 | supporting industrial transition towards a resource- efficient economy, promoting green growth, eco-innovation and environmental performance management in the public and private sectors |
| 7.3 | developing and improving environmentally-friendly (including low-noise) and low-carbon transport systems |
| 7.5 | improving energy efficiency and security of supply through the development of smart energy distribution, storage and transmission systems and through the integration of distributed generation from renewable sources |

While the ESIF/SSS is an incentive for the CE, in parallel with recommendations and encouragement the European Commission uses the process of the European Semester to provide a framework for the coordination of economic policies across the European Union. It allows EU countries to discuss their economic and budget plans and monitor progress at specific times throughout the year. Each year, the Commission undertakes a

[2] The Partnership Agreement between the EU and the Member States foresees the Operational Programmes to report based on specific Thematic Objectives and Investment Priorities, subject to the priorities decided in each Member State.

detailed analysis of each country's plans for budget, macroeconomic and structural reforms. It then provides EU governments with country-specific recommendations for the next 12-18 months. The Green economy is one of the themes addressed in this context and in includes environmental issues, though not yet directly the CE.

# 3. The Greek context

## 3.1. Snapshot of the Greek CE performance

Compared to the EU average Greece scores rather unsatisfactorily in its transition towards the CE. As demonstrated by Table 2 the country generates more municipal waste per capita or GDP with the exception of Generation of waste excluding major mineral wastes per domestic material consumption, which is the only case it outperforms the EU average. It has a worse than average performance in all Waste management with recycling rates being between 1/4 (in the case of biowaste) and close to the EU average (Recovery rate of construction and demolition waste). The performance is at the order of magnitude of 1 to 10 in all Secondary Raw Material indicators, while it is also underperforming in Competitiveness and Innovation.

In a nutshell Greece is lagging significantly behind the EU average in its transition to the CE and needs significant acceleration to catch up.

*Table 2: Circular Economy Indicators*

| Indicator | Value | |
|---|---|---|
| | EU | GREECE |
| **Production and consumption** | | |
| 1. EU self-sufficiency for raw materials (percentage ) | 36.4 | N/A |
| 2. Green public procurement | N/A | N/A |
| 3. Waste generation | | |
| *Generation of municipal waste per capita (Kg per capita)* | 486 | 504 |
| *Generation of waste excluding major mineral wastes per GDP unit (Kg per thousand euro, chain linked volumes (2010))* | 65 | 78 |
| *Generation of waste excluding major mineral wastes per domestic material consumption (percentage)* | 13.5 | 11.5 |
| 4. Food waste (million tonnes) | 80 | N/A |
| **Waste Management** | | |
| 5. Recycling rates | | |

| | | |
|---|---|---|
| *Recycling rate of municipal waste (percentage)* | 46.4 | 18.9 |
| *Recycling rate of all waste excluding major mineral waste (percentage)* | 57 | N/A |
| 6. Recycling / recovery for specific waste streams | | |
| *Recycling rate of overall packaging (percentage)* | 67.2 | 66.1 |
| *Recycling rate of plastic packaging (percentage)* | 42.4 | 38.2 |
| *Recycling rate of wooden packaging (percentage)* | 39.8 | 21.9 |
| *Recycling rate of e-waste (percentage)* | 41.2 | 34.2 |
| *Recycling of biowaste (kg per capita)* | 81 | 21 |
| *Recovery rate of construction and demolition waste (percentage)* | 89 | 88 |
| **Secondary raw materials** | | |
| 7. Contribution of recycled materials to raw materials demand | | |
| *End-of-life recycling input rates (EOL-RIR) (percentage)* | 12.4 | N/A |
| *Circular material use rate (percentage)* | 11.7 | 1.3 |
| 8. Trade in recyclable raw materials (tonne) | | |
| *Imports from non-EU countries* | 5,905,135 | 536,071 |
| *Exports to non-EU countries* | 36,934,824 | 419,422 |
| *Intra EU trade* | 53,035,741 | 525,195 |
| **Competitiveness and innovation** | | |
| 9. Private investment, jobs and gross value added related to circular economy sectors | | |
| *Gross investment in tangible goods (percentage of gross domestic product (GDP) at current prices)* | 0.12 | 0.04 |
| *Persons employed (percentage of total employment)* | 1.73 | 1.65 |
| *Value added at factor cost (percentage of gross domestic product (GDP) at current prices)* | 0.98 | 0.35 |
| 10. Number of patents related to recycling and secondary raw materials | 338.17 | 0.5 |

*Source*: Eurostat, 2019. https://ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework

The rather disappointing situation of the country concurs with the most recent European Semester Country Specific Recommendations document for Greece (June 2019), where it is stated that: "Treatment of solid waste and urban and industrial wastewater is the main area needing additional investment in order to align the country's environmental

protection standards with the rest of the EU. The management of solid waste continues to be a major structural challenge, with Greece still relying heavily on landfilling and mechanical-biological treatment instead of more modern techniques. In addition, the proportion of municipal waste that is recycled is only about a third of the EU average. Investments are also needed to improve water treatment, combat groundwater salinisation, and support measures to prevent flooding and restore the natural flow of rivers."[3]. Moreover, the EU Court of Justice has imposed more than 100 million Euros of fines on Greece for non-compliance with EU law provisions in the fields of solid waste and urban wastewater treatment[4,5].

The EU is not the only one to express worries, WWF is systematically animadverting the country for its environmental performance, while this is confirmed by many national and international NGOs. The new exploration for oil in the Aegean Sea is one of the controversial issues for these organisations.

## 3.2. Policies and governance for the CE

### *3.2.1. The legal landscape before the introduction of the CE Strategy*

The predecessor to the CE policy in the country was waste management and to a lesser extent R&I support measures for improvements in the energy and environment. The first law on recycling was adopted in 2001 (Law 2939/2001) but Greece has failed to achieve the targets it had set for itself on recyclables collection. This is attributed both to an inadequate mix of policies, to lack of incentives and to inadequate resources to the Municipalities and citizens. The choices made were for very large and expensive recycling units with long delivery contracts processing large quantities of mixed waste. These options failed.

A most recent Law adopted by the Parliament in 2017 (4496/2017) provides for sorting waste at the source, as well as ecological waste management. The aim of the government's policy in the programming period 2014-2020 was to harmonise Greek legislation with the European institutional framework so that by 2020 at least 70-80% of recyclable waste is collected at source. This objective was expected to be achieved at the

[3] European Commission, 5 June 2019. *Council Recommendation*. COM(2019) 508 final.

[4] WWF, 10 January 2019. *WWF's 14th annual environmental law review in Greece.. WWF Greece. Available at:* https://www.wwf.gr/en/news/2203-wwf-s-14th-annual-environmental-law-review-in-greece

[5] European Commission, 4 April 2019. *The EU Environmental Implementation Review 2019 Country Report – GREECE*. Commission Working Paper, SWD(2019) 138 final. Available at: https://ec.europa.eu/environment/eir/pdf/report_el_en.pdf

municipal level with the participation of citizens, so that waste could be used as an important source for saving valuable and endangered raw materials. The characteristics of this Law were:

- The introduction of a fee for plastic bags (which has since been introduced with spectacular impact on the reduction of plastic bags) and the introduction of specific measures to reduce the use of the plastic bag, in line with the provisions of Directive 2015/720/EU.
- The gradual achievement of new national targets and the reduction of waste resulting in landfill, below 30% by 2020.
- Upgrading the recycling quality by requiring separate collection at source in at least 4 streams (containers) for packaging.
- Sort at the source becomes mandatory in public spaces and utilities.
- Optimising operations in municipalities, through incentives and disincentives.
- The formulation of local Management Plans by the Municipalities themselves.
- Sanctions to stop producer avoidance to pay recycling fees.
- Incentives for citizens and municipalities to participate in recycling.
- Encouraging recycling initiatives in the social economy.
- Intensification of controls and the strengthening of sanctions.
- The creation of a National Public Information System.
- Strengthening the Greek Recycling Organization (EOAN) in human resources and organisational structure.

Implementation was a disillusionment, mainly because of critical issues in this effort of modernising:

- There are frictions and opposing interests both at the different administrative levels (national, regional, local) as well as between the public and the private sector.
- There have been significant regulatory omissions and missteps (because of the lack of regulation for recycling cooking oil municipalities abandoned all efforts because they risked being treated as oil smugglers).
- Waste management projects generating revenue, fully or even partially commercial activities, require the control of competition rules and affecting the level of public funding. The control over the application of state aid rules to all operations has evolved into a deceleration factor[6].

[6] Mamalougkas N., 20 June 2019. *Programming Period 2014-2020: Financing OP-TIESD. Critical Assessment and Implementation of IAS Projects*. Ministry of Economy and Development, Hellenic Republic.

### *3.2.2. Policy design and implementation*

Design and implementation for an encompassing environmental protection and energy policy is under the authority of the Ministry of Environment and Energy, while thematic ministries, like the Ministry of Rural Development and Food, the Ministry of Shipping and the Aegean and the Ministry of Health take initiatives in the domain of their responsibilities. The Ministry of Development and Investments plays a decisive role in its role of designing and funding incentives for R&D as well as business investments. The major source of national funding comes from the ESIF, organised in Sectoral Operational Programmes and Regional Operational Programmes. In the latter case an amount is foreseen for each region which is partly executed at the regional level and partly at municipal level. Hence, environmental missions are municipal, regional and national ESIF-co-funded projects. Additional support is offered by the EU competitive calls (H2020, LIFE, COSME, European Territorial Cooperation Programmes, EIT KIC Greek Hub and NGO funded).

Policy Implementation has until now not been sternly centrally monitored. This affects the ability to systematically collect the necessary data to construct pertinent indicators. Beside the centrally coordinated Operational Programme for Transport Infrastructure, the Environmental and Sustainable Development the are many uncoordinated individual projects.

As pointed out in the European Semester Recommendations solid, at this stage:

- Waste management is the most serious challenge for environmental protection and an opportunity for the transition to the CE. It remains heavily reliant on landfill (82% compared to 24% on average in the EU) and mechanical-biological treatment, as opposed to more modern techniques. Greece is at high risk of being unable to meet the EU's revised prevention and recycling targets (50% by 2020), as only 17% of municipal waste is currently recycled compared to an average of 46% in the EU. Despite declining in recent years, there are still some illegal landfills, resulting in costly infringement procedures for failing to comply with EU law on landfill and hazardous waste management. However, progress has been made on the legal and institutional measures taken to increase the recycling of waste and to broaden EPR systems. The strategic framework for waste management is now being implemented with the approval of national and regional waste management plans. However, the use of financial means to incentivise prevention, reuse and recycling is inadequate and existing systems appear to be lagging behind expected performance.

- Recycling has been gaining momentum but is still suffering from friction at the various administrative levels and the lack of a definitive and generally accepted governance structure.

- Production and consumption policies have not been a policy focus in the past.

An initial (admittedly incomplete) mapping of actions includes:

(a) ***Research and innovation, GSRT*** [Gen. Sec. R&D] & NSRF Actions: 39 Integrated Research Proposals for the 2016-17 two-year period; There are two important actions in progress:

- ➔ *Electronic platform of secondary materials at the Balkan level (INTERREG)* at the initiative of EDSNA [Association of Municipalities in the Attica Region – Solid Waste Management] and the participation of the Ministry of Environment and Energy;
- ➔ *Environmental and Circular Economy Park of the Municipality of Heraklion* (UIA) at the initiative of ESDAK [Association of Solid Waste Management of Crete]

(b) ***An inter-Ministerial Committee on Green Public Contracts***: It was established on 13.6.2017 in order to draft an Action Plan to promote Green Public Contracts and submit proposals for planning a national policy within eighteen (18) months of its operation onset. The National Action Plan is approved by a Joint Ministerial Decision of the Minister of Economy and Development and the Minister of Environment and Energy. There is a similar proposal, prepared by a previous committee, for 'greening' 18 product groups and a study-proposal for a National Action Plan;

(c) **A mixed inter-ministerial Working Group titled 'Industry Forum'**, established on 2.2.2016. The conclusions and proposals make an explicit reference-proposal in favour of promoting circular economy in manufacturing through the 'circular economy' model, which guides industrial entrepreneurship towards new productive operation models strongly characterised by innovation, environmental conservation and rational use of energy resources;

(d) **A mixed inter-ministerial Working Group titled "Agri-nutrition, Manufacturing, Tourism"** (16.9.2016);

(e) **A mixed Group of ELOT** [Hellenic Standardisation Organisation] Experts on "The Environment and Circular Economy" to effectively use international standards and to develop national standards concerning the environment, waste and circular economy, monitoring-participating in International & European standardisation activities and

recording domestic needs for models to help select standards of Greek interest (27.7.2017);

(f) **An inter-ministerial Group for the prevention of food waste and the creation of waste from food residues** (27.9.2017);

(g) **A partnership on Circular Economy** (EU Urban Agenda), with the participation of 6 major urban centres (Oslo, The Hague, Prato, Porto, Kaunas and Flanders), 4 states (Finland, Poland, Slovenia, Greece), the European Commission (DG REGIO, ENV, CLIMA, RTD, GROW, etc.) and some organisations (CEMR, EUROCITIES, URBACT and EIB); the aim are the policies of Circular Economy in Urban Centres. The Greek working team includes participants from the Ministries of Environment and Energy, Shipping and Insular Policy, Tourism, and the General Secretariat for Industry, under the coordination of the Ministry of Economy and Development (Special Service for Strategy, Planning and Evaluation – EYSSA).

The major sources of funding include:

- The relevant Sectoral Operational Programmes, namely Competitiveness, Entrepreneurship & Innovation and Transport Infrastructure, Environment and Sustainable Development. A manual search in the open sources Integrated Information System of the ESIF in the current programming period, using Thematic Objectives 4,6 and 7 to identify projects funded until December 2019, which are CE related produced a result of 115 projects with a budget of 1.5 billion €. These are overwhelmingly projects improving waste management:

| **Operational Porgramme** | **Number of projects** | **Total budget** |
|---|---|---|
| Competitiveness, Entrepreneurship and Innovation | 1 | 11750000 |
| Transport Infrastructure, Environment and Sustainable Development | 114 | 1511915967 |
| **Total** | **115** | **1523665 967** |

  There were no similar projects described under the O.P.s Rural Development and Fisheries/Maritime.

- Using the same methodology we came up with the Regional O.P. spending in the same investment priorities a total of 89 projects were identified absorbing almost 256 million € in 6 years. Again, the majority of these funds are earmarked for waste treatment.

| Region | Nr | € | % |
|---|---|---|---|
| Western Macedonia and Thrace | 5 | 6738603 | 2.63 |
| Attica | 7 | 32465713 | 12.69 |
| North Aegean | 12 | 21198956 | 8.28 |
| Western Greece | 3 | 11469229 | 4.48 |
| Western Macedonia | 5 | 19541720 | 7.64 |
| Epirus | 12 | 68666395 | 26.83 |
| Thessaly | 6 | 21362330 | 8.35 |
| Ionaian Islands | 3 | 3189799 | 1.25 |
| Central Macedonia | 1 | 49600 | 0.02 |
| Crete | 35 | 71212199 | 27.83 |
| **Total** | **89** | **255894544** | **100.00** |

- The Green Fund,[7] which operates in parallel with the O.P. Environment and Sustainable Development. The Green Fund may finance programs drawn up by the Ministry of Environment and Energy or other Ministries and their supervised agencies, decentralised administrations, local authorities, legal entities of the wider public sector, as defined by Article 1 of Law 1256/1982, and associations or other associations of legal and natural persons, which, in accordance with their statutory purposes, aim at the protection, upgrading and restoration of the environment. The Green Fund has a broader mandate but can be involved in CE actions.
- The EU competitive programmes mentioned above (INTERREG, URBACT, H2020 etc.). An overview of the H2020 participations indicates that there are 83 Greek participations in bioenergy projects, 356 in biomass and 110 in various sustainability-related research projects, indicating high research skills.

The deficient implementation, divergence from goals and the relative position of the country compared to the EU average may be attributed mainly to the following bottlenecks and path dependent, embedded deficiencies:

[7] http://www.prasinotameio.gr/index.php/en/

1. *A vicious circle of ambitious, yet less practical design:* In order to catch up the Ministry of Environment and Energy designed a too ambitious to be implemented programme.
2. *Absence of a broader coordinating policy and governance*: Thematic ministries have been following their own policy agendas and regions and municipalities design their policies following major EU and national guidelines but with limited inter-regional interaction.
3. *The business sector is not sufficiently sensitised and involved*[8]. This is attributed both to the overall problems faced by private investment in the country, in particular during the 10year long financial crisis[9] but also to the complexities and long-term nature of profitability of investments in the areas of waste management, recycling and energy/materials efficiency. This has led to tensions between the private and the public sector and resistance to change. An additional issue undermining the profitability of aluminium and glass recycling is that Roma empty the recycle bins and steal the most valuable among streams diminishing the scale and profitability of private undertakings.

### *3.2.3. Governance*

The interaction between the National Authorities, the Regional Authorities and the Municipal Authorities has developed with fragmented actions over the years and is rather complex (see Figure 1) and bureaucratic. The governance structure is determined at the central level by the Ministry of Environment, and Energy, which adopted the National Plan for Waste Management – NPWM (ΕΣΔΑ), conceived with the aim of separating the different streams of waste in order to comply with the EU guidelines and respect the 2025 and 2030 targets.

Four main actors are involved:

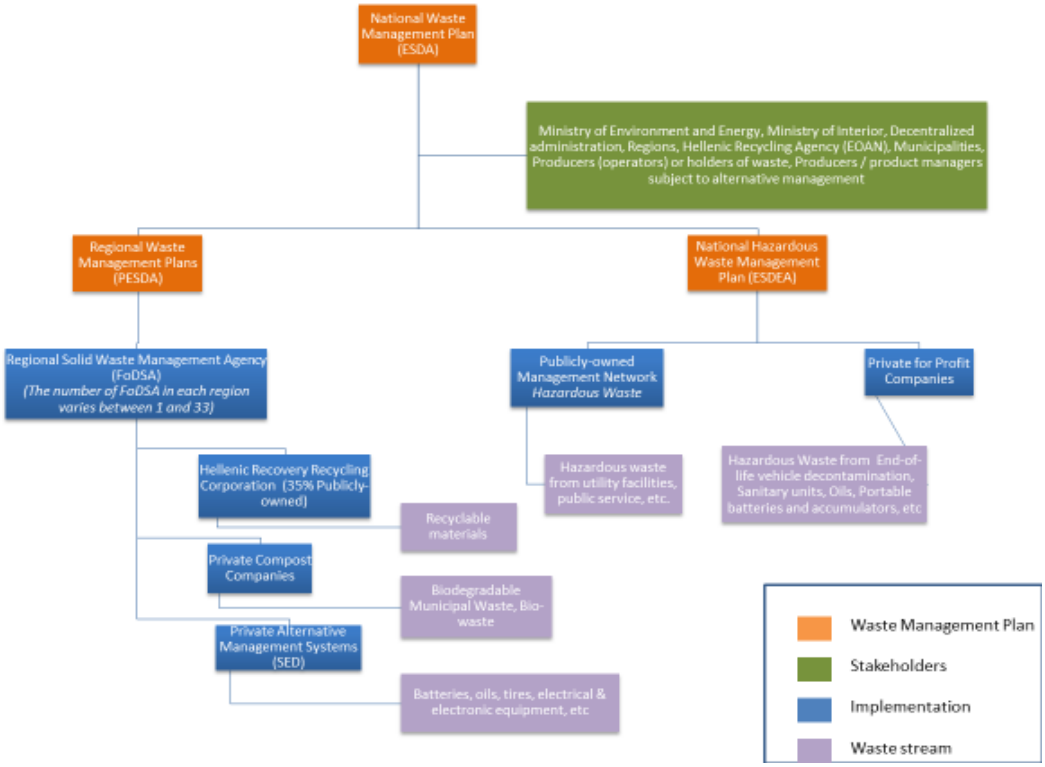
- The Organisations of Solid Waste Management – OSWM (Φορείς Διαχείρισης Στερεών Αποβλήτων - ΦΟ.Δ.Σ.Α.), which are public or publicly owned (inter-municipal) limited liability companies. The most active among them are the ones from Western Macedonia and from Eastern Macedonia-Thrace, as well as the intermunicipal one from Heraklion Crete. Many OSWM face financial liquidity

[8] This is a generic statement, few success stories exist but are small scale for the time being.

[9] Greece ranks 79th in the World Bank list of Ease of Doing Business https://openknowledge.worldbank.org/bitstream/handle/10986/32436/9781464814402.pdf and 59th in the Global Competitiveness report http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

problems and are unable to cover their obligations. In an effort to rationalise the process Law 4555/2018[10] foresees the demolition of the existing OSWM and the creation of one per prefecture. However, due to administrative and financial problems the re-organisation has not yet materialised.

*Figure 1* – Waste Management Organisations in Greece




- The National Organisation of Recycling (E.O.AN.)[11] is the responsible body of the Ministry of Environment and Energy for the design and implementation of policies for the prevention and alternative management of packaging and other products. It is responsible for approving national alternative product management systems, as well as for monitoring Greece's progress in recycling.
- Central-collection facilities of Recyclable Materials. Such centres are not geographically bounded and there are interregional cooperation schemes for that.
- Systems of Alternative Management (Σχέδια εναλλακτικής διαχείρισης- ΣΕΔ), which are private, profit-oriented, officially licensed enterprises collecting specific waste streams for recycling. Such Systems include the large, generic Hellenic Recovery Recycling Corporation – HERRCO (Ελληνική Εταιρεία Αξιοποίησης

10 Lawpost, 2019. Law 4555/2018. Lawpost.gr. Available at: https://www.lawspot.gr/nomikes-plirofories/nomothesia/nomos-4555-2018
11 https://www.eoan.gr/en/

Ανακύκλωσης – ΕΕΑΑ)[12] collecting in the same blue bins the basic recyclable materials and smaller, specialised collection streams (batteries and accumulators, electrical and electronic equipment, packaging and packaging waste, end life cycle vehicles, excavation construction and demolition waste, used vehicle tires and lubricating oil wastes[13]). State aid rules applied here in the past and have caused bureaucratic delays. These systems are now reluctant to nay governance changes, because the SED and the reorganisation of OSWM address the same market.

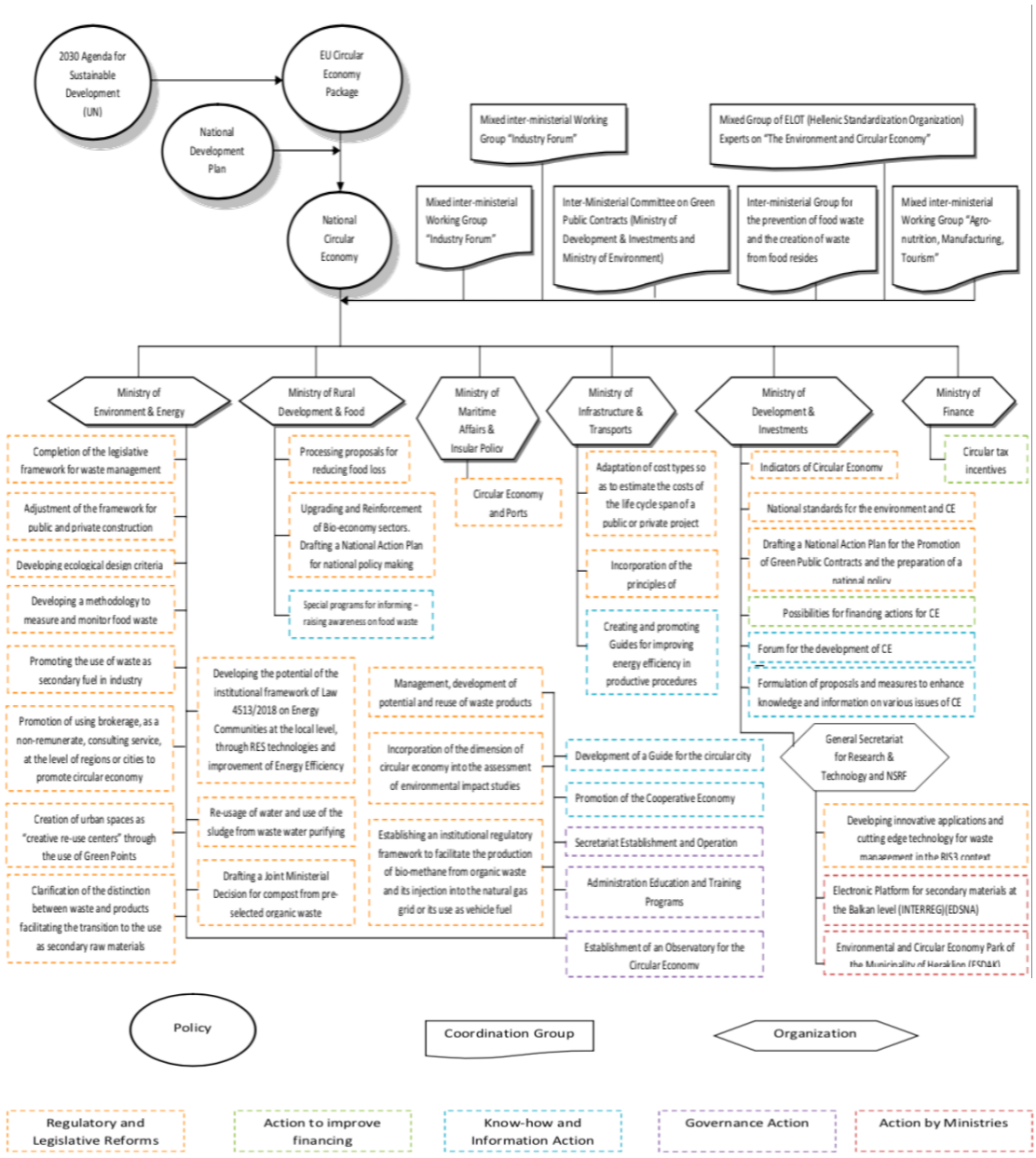
- Few fragmented private or NGO initiatives for smaller streams, like coffee residuals etc., which are not thoroughly registered or documented.

Funding is organised in a top down and bottom up mix: The Ministry, at the central level, has adopted its unrealistically ambitious National Programme for Waste Management (NPWM; ΕΣΔΑ). All 332 municipalities of the country[14] had to come up with local waste management plans (LWMP), which would align with the ambitious targets of the NPWM. An indicative target set centrally was that 60% of bio-waste had to be forwarded for composting. This was unachievable within the time limits foreseen. Once the municipalities adopted their LWMP the corresponding (higher level administration) Regional Authorities[15] aggregated their suggestions into Regional Waste Management Plans (RWMP).

**Error! Not a valid bookmark self-reference.** presents an overview of the system based on the experience of the Programming Period 2014-2020. However, a major change occurred in 2019, with the introduction of the Circular Economy Strategy described below.

[12] http://www.herrco.gr/?lang=en
[13] National Organisation of Recycling, 2019. https://www.eoan.gr/en/
[14] Municipalities carry the responsibility for waste management in their territory.
[15] Regional Authorities carry responsibility for the implementation of the ESIF co-funded regional O.P.

*Figure 2: The broader governance set up directly or indirectly involved with the CE*



### 3.2.4. The Greek National CE Strategy (NCES)

The Ministry of Environment and Energy is now precipitating the CE transition recognising its potential value. Two Secretaries General are appointed, one with a mandate to coordinate waste management and one for the Natural Environment and Waters, carrying responsibility for the CE.

A National Strategy for CE was adopted in December 2018, after stakeholder consultation in an effort to accelerate circular economy actions and unlock growth potential.

The main long-term goals (2030) of the Strategy are the following:

1) Integrating the criteria for ecological design/planning and analysis of product life cycle, avoiding the introduction of hazardous substances into their production and facilitating reparability and extension of product life span. The use of non-hazardous substances also improves the quality of waste during the process of production, thus also reducing environmental income.
2) Effective implementation of prioritisation of waste management, promoting the prevention of creating waste and encouraging re-usage and recycling.
3) Creating and promoting Manuals for improving energy efficiency in procedures of production.
4) Promotion of innovative forms of consumptions, such as the use of services instead of purchasing products or the use of electronic computers and digital platforms.
5) Promotion of a rational consumption model, based on information transparency in regard to the features of goods and services, their life span and energy efficiency.
6) Facilitation and creation of appropriate channels for the exchange of information and the coordination between administrations, the scientific community and the economic and social agencies, so as to lead to synergies compatible with the transition to the circular model.
7) Highlighting the significance of shifting from linear to circular economy, by promoting transparency in procedures, improving information given to citizens, training and raising social awareness.
8) Processing transparent and feasible indices for monitoring the implementation of the transition.

The basic content of the public policy on circular economy are[16] (NCES, p. 4):

- Financing tools

16 Ministry of Environment and Energy, 2018. National Circular Economy Strategy. Hellenic Republic. Available at: http://www.ypeka.gr/LinkClick.aspx?fileticket=pYSLQXgjjOU%3D&tabid=37&language=en-US

- Planning and enactment of a regulatory framework and rules, as well as removal of bureaucratic obstacles
- Connection of small and medium-sized entrepreneurship and social economy to technological innovation and the development and support of pilot/demonstration actions of circular economy
- Improvement of governance and networking, and acceleration of relevant procedures.

In addition to the sectors listed above, in which public policy is required, the following list could enhance the spectrum of implementation actions:

✓ Launching a series of institutional interventions that will reinforce circular economy, modular planning and open innovations;

✓ Setting priorities on the basis of economic, social, and environmental criteria; Defining indicators to assess the circular economy model;

✓ Facilitating circular economy and industrial symbiosis entrepreneurial initiatives (administrative cost curtailing, public procurement premiums, eco-industrial parks, establishment of an appropriate regulatory framework and adjustment of the existing one);

✓ Smart financing tools with aids and tax-reliefs;

✓Utilising public investments, the NSRF, the Investment Bank, the Juncker package and other Funds and resources;

✓ Enacting open licences, promotion of open technologies, utilisation of open innovation products -particularly in academic institutions and public administration;

✓ Establishing specifications;

✓ Creating data bases and use of information for defining indicators to assess circular economy in various sectors;

✓ Incentives for developing social entrepreneurship, synergies and social economy in sectors of resource and material reuse (eco-industrial clusters, patent pools);

✓ Policies facilitating the establishment of 'smart factory' plants, which will be innovative, applying high technology, green, modular and, probably digitised;

✓ Communicative strategy to raise citizens' awareness along with the provision of incentives.

Appendix 2 presenting the Greek Action Plan of the Circular Economy gives a detailed timetable of the Actions expected to be implemented within 2019. The Operational Action Plan envisaged Regulatory and Legislative Reforms in the following areas with a very optimistic attitude towards early implementation:

- Legal amendments necessary to allow/facilitate measures
- Preparatory activities for suggesting regulatory amendments
- Recommendations and studies facilitating activities; it is important to ensure that wherever there are no mandatory regulatory provisions regions will be allowed to proceed with their actions without expecting the national authorities to come up with recommendations

  Also, other areas that require supporting actions include:

- Improving finance (in reality this refers to studies with unclear focus)
  - Investigating financing possibilities
  - Circular tax incentives
- Know-how and Information
  - Forum for the development of circular economy
  - Development of a Guide for the circular city. Why reinvent the wheel? Faster: take 2-3, compare, aggregate
  - Special programmes for informing - raising awareness on food waste.
  - Creating and promoting Guides for improving energy efficiency in productive procedures Rather than creating all these guides create a platform to put all available guides from other countries plus International Organisations and let each region/municipality choose)
  - Formulation of proposals and measures to enhance knowledge and information on various issues of circular economy
  - Promotion of the Sharing Economy
- Governance Actions
  - Secretariat Establishment and Operation
  - Administration Education and Training Programmes
  - Establishment of an Observatory for the Circular Economy.

The NCES is significantly delayed but is an excellent list of topics to be discussed as basic themes for a future implementation plan. While the NCES is a significant step for awareness raising at political, policy and society levels, it should be viewed only as a good starting point: at this stage it constitutes a pertinent shopping list but is characterised with more enthusiasm than reality checks. *It praises the CE and neglects its challenges.* The conviction that the CE is beneficial for competitiveness relies on assumptions and contexts (like long term investments, high profit margins and local manufacturing

traditions) but neglects the significant bottlenecks of path-dependence and finance in the country. Lagging regions, suffering from persistently low private investments and limited bank liquidity tend to adopt short-term, survival solutions. Hence, a prerequisite for the NCES to succeed is a detailed context-specific analysis of cooperation, coordination and synergies to come up with solutions shifting from a short-termist behaviour to a realistic, profitable long-term strategy and the corresponding action plan.

## 3.3. The SSS experience

Since the mid' 80s the EU has adopted a cohesion policy whereby the less prosperous regions receive development aid from the European budget to make up for the uneven consequences of free trade following New Economic Geography and New Trade Theory insights. These transfers have been a major (occasionally, the only) funding source of development funding in Greece. The way policies were designed to absorb these funds has evolved over the years, as initially the funds were mainly spent on physical infrastructure and then gradually investments in a wider array of investment priorities to include technology, competitiveness and human capital.

In the programming period 2014-2020 the European Commission adopted for the first time the idea of Smart Specialisation Strategies as an ex ante conditionality for releasing the ESIF funds. Smart specialisation is an innovative approach that aims to boost growth and jobs in Europe, by enabling each region to identify and develop its own competitive advantages. Through its partnership and bottom-up approach, smart specialisation brings together local authorities, academia, business spheres and the civil society, working for the implementation of long-term growth strategies supported by EU funds[17].

Like all member States the Greek authorities have designed SSSs both at a national level and in the 13 Greek regions, to allow them for selecting their own priorities. Ideally the SSS would be the rationale and background for the adoption of Sectoral and Regional O.P.s. However, because of institutional difficulties the adoption of the SSS was delayed and the O.P.s were adopted earlier, or in parallel, and adopted an extrapolating, path-dependent approach. Therefore, the SSS had a less decisive role than planned for. The Ministry and its sectoral O.P. had the primary role for the design, indicators and governance, leaving limited room for radical changes in case the SSSs had foreseen any

The priorities selected by the regional SSS are presented on Table 3. The CE does not figure anywhere as the priorities are broader but clearly the agri-food sector and energy saving, being indirectly associated with the CE were part of practically all SSS, either as

[17] https://ec.europa.eu/regional_policy/sources/docgener/guides/smart_spec/strength_innov_regions_en.pdf

sectoral or as horizontal priorities. Within these priorities actions or projects adopting CE approaches could be included.

*Table 3: The Greek regional SSS priorities*

| | Priorities | Horizontal |
|---|---|---|
| **Eastern Macedonia and Thrace** | ***Rural***, Manufacturing, Tourism (Culture), Emerging Technologies (Environment, Energy, Innovative Building Materials, Hybrid Technologies) | |
| **Attica** | Agri-food, Design-intensive sectors, Culture - Media, Tourism, Information & Communication Technologies, Environmental technology, Energy ***(RES, energy saving***, smart grids), Drug / Health, Intelligent and Sustainable Transport, Shipbuilding | |
| **North Aegean** | ***Agri-food sector development***, Tourism - ***Nature*** - Culture, Innovation mechanisms and instruments, Equal islands | |
| **Western Greece** | ***Agricultural Production***, Aquaculture and Food, Tourism, Culture, Materials and Microelectronics | ICT, Energy |
| **Western Macedonia** | ***Agri-food sector*** with agri-livestock products, Tourism Sector, ***Waste Management, Energy & RES Heating***, Fur Sector | |
| **Epirus** | Primary Sector, Manufacturing, ***Agriculture,*** Gastronomy, Industry Experience: Tourism, Culture and the Creative Economy, Information & Communication Technologies, Health and Wellness, Academic Institutions, and Youth Entrepreneurship | |
| **Thessaly** | Agri-Food, Creative Tourism, ***Environment*** Energy, Rehabilitation & Advanced Health Services, Metal & Building Materials | |
| **Ionian Islands** | Primary sector, ***agri-food*** and gastronomy, Maritime economy: Fisheries, aquaculture, marine tourism, Industry of experience: Tourism, culture and creative industry | |
| **Central Macedonia** | ***Agri-food***, Tourism, Building Materials, Textiles & Clothing | ICT, Environment |
| **Crete** | ***Agri-food complex***, Cultural-Tourist complex, ***Environmental complex***, Knowledge complex | |
| **South Aegean** | ***Agri-food***, Fisheries and aquaculture, Industry of experience, ***Green energy saving technologies*** | |
| **Peloponnese** | ***Agri-food sector***, Tourism sector, Information & Communication Technologies, Manufacturing and other dynamic sectors (materials) | ***Energy, Environment***, Transport |
| **Central Greece** | ***Agri-food***, Experience industry, ***Green innovation, RES energy saving and production***, Supporting the metal value chain | |

SSS are rather broad and encompassing, the National SSS being the broadest and including eight sectors, practically reflecting the whole of the Greek economy.

# 4. Linking the Smart Specialisation Strategy to the CE Transition: a Greek pilot

After studying the CE transition progress and the SSS experiences in Greece we focused on the main target of this study, which was to investigate the potential mutual reinforcement and synergies between the two. The methodology used was to systematically explore each one of the 14 SSS and complement the search with the relevant Sectoral Operational Programmes[18] trying to assess the extent to which their content corresponds to which NSCE goals.

In the 2014-2020 programming period the crisis influenced the design of the Partnership Agreement with the EU towards favouring short-term projects with absorption targets and immediate, visible results inevitably neglecting longer term investments. Environmental protection and the CE suffered under this approach, as they are by definition front-loaded in funding but profitability only follows later. The adoption of the SSS and the corresponding Sectoral and Regional Operational Programmes (O.P.s) could constitute an opportunity for Greece to embark into the CE transition with incentives for the business sector and knowledge-based investments.

Appendix 3 presents the results of the application of our methodology, namely the Type of Intervention and Description by regional SSS and two Sectoral O.P.s (OP-Competitiveness, Entrepreneurship, Innovation and OP-Transport Infrastructure, Environment and Sustainable Development) for all the cases we consider potentially relevant for the CE. No evidence of explicit reference to the CE was found in the O.P, for Agriculture). The outcome of this desk research was presented and discussed in the Workshop held on September 19th and validated by stakeholders.

While the methodology proved interesting, there are two caveats we need to draw attention to at this pilot phase:

1. As pointed out earlier SSS were adopted late in Greece, usually after the initial activities of the corresponding O.P.s were designed. Hence, whatever is included in the SSS design was not ipso facto translated into budgetary provisions. In the future the SSS are expected to be closely linked, if not identical, with the O.P. and the methodology will prove more effective. In the current programming period, we focused on the SSS only, as this was the target of the study. Would we need a thorough study of the CE (unlinked to the SSS) we would need to differentiate between SSS and regional OPs.

[18] Because of the lags and differences between the late adopted SSS and the important role of the Sectoral O.P.s

2. There are significant delays in the ESIF absorption and project implementation for most O.P.s and corresponding revisions. Consequently, CE actions suggested under the SSS may eventually not be implemented at all or at least not yet.

After extracting the relevant suggestions, we tried to match them to the individual goals of the CE. Appendix 4 presents the distribution of actions per region and NCES, leading to the following initial conclusions:

- Few activities suggested under the regional SSS address the CE directly. But many of the axes and interventions described per region and captured in Appendix 4, which are related to agricultural production, rationalisation of the economy, energy and the environment may (or may not) be implemented in compliance with the NCES approach and principles, even though they were initially not adopted as such.
- The number and type of axes, interventions and related goals vary significantly across regions both in qualitative and in quantitative terms. Appendix 4 shows the relative frequencies per region and type of intervention.
- The highest number of CE-related interventions were found in Central Macedonia, followed by Central Greece and the Peloponnese. The lowest in Western Greece and Western Macedonia.
- The National SSS and Central Macedonia envisage interventions in all goals.
- The CE goals supported by the SSS are mainly goal 1 (Integrating the criteria for ecological design/planning and analysis of product life cycle), goal 2 (Effective implementation of prioritisation of waste management, promoting the prevention of creating waste and encouraging re-usage and recycling), goal 3 (Creating and promoting Manuals for improving energy efficiency in procedures of production) and goal 7 (Highlighting the significance of shifting from linear to circular economy) of the National Strategy for CE. In particular, all regions (except for North Aegean) envisage activities addressing goal 2, followed by goal 7, followed by goal 1 and goal 3.
- Conversely, the lowest number of goals addressed are goal 6 by 2 regions only (Facilitation and creation of appropriate channels for the exchange of information and the coordination), followed by goal 8, addressed by 3 regions (Processing transparent and feasible indices for monitoring the implementation of the transition).

# 5. A stakeholder Validation Workshop

A workshop on "Circular Economy Transition in Smart Specialization Strategy" hosted by the Hellenic Ministry of Environment and Energy and organised by ATHENA RC was organised on 19th September 2019. The goal of the workshop was the communication of the main outcomes of the project related to the synergies among the National Strategy on Circular Economy (CE) and the Research and Innovation Strategies for Smart Specialisation (RIS3) and the discussion on the implementation of these strategies identifying the needs, barriers and strengths in Greece. Ministers, Region officials, Town mayors, firm owners and many more stakeholders relevant to circular economy composed the audience in this participatory workshop, sharing their views on how the challenges of CE can be overcome and the opportunities to be exploited.

Among the speakers of the first session were Julia Panny, Programme Officer of EIT Climate-KIC, who presented the role of EIT Climate-KIC in the implementation of circular economy in European countries, Prof. Phoebe Koundouri, Athens University of Economics and Business, who introduced the project and its main goals, Assoc. Prof. Konstantinos Aravossis, General Secretary, General Secretariat of Natural Environment and Water, Ministry of Environment and Energy, Liogkas Vassilis, expert advisor, General Secretariat of Natural Environment and Water, Ministry of Environment and Energy, who presented the National Circular Economy Strategy, Dr. Agnes Spilioti, Director, General Secretariat for Research and Technology, Ministry of Development & Investments, who demonstrated the National RIS3 (2014-2020) and Prof. Lena Tsipouri, National and Kapodistrian University Athens, Scientific Advisory Group on Pilot Actions on Industrial Transition and Interregional Cooperation, who explained the mapping of CE and RIS and presented the leapfrogging opportunities and challenges.

During the first part of the workshop, EIT Climate-KIC experts exercised system innovation tools to policy makers and other participants aiming to form a picture of their views on CE integration to S3. The stakeholders were asked their opinion regarding CE implementation in S3 in Greece. The main opportunities and challenges identified during this process are discussed below.

**OPPORTUNITIES**

In the class of the opportunities emerging from the workshop, first comes the green growth of the Greek economy. An opportunity that can be achieved through several interventions including the implementation of CE in different aspects such as redefining the regulations on recovered wastewater and creating new possibilities for the use of treated water, increasing the wastewater use. The combination of a shift towards the

growth of the primary sector, the strengthening of the IT market and the creation of specific IT brands will drive the above implementation goals, which in turn will generate more jobs.

There is a real growth scenario for Greece, where it is possible to demonstrate how an economic crisis can represent a moment of industrial transition to the circular economy. Cost deduction and sustainable consumption increase can be the right combination to overcome both economic and environmental critical issues. For example, an interaction between the agri-food and mining sectors could be created to reduce imports of raw materials and circularly manage existing mines. This would promote the creation of a new sector, that of agri-mining. Equally required is the need for the circular economy to be technologically dressed, i.e. the use of deep tech to improve decision making and the optimization of all procedures. Besides that, it is possible to make the shipping repair industry a conservation industry.

The development of the green economy will be possible thanks to greater synergy between governmental bodies and through a public-private partnership. Cohesion in terms of economic development should be increased and a differentiated approach to access to more sustainable resources, especially in the extractive industry, should be ensured. This is the only way to increase competitiveness at international level. Due to the different perceptions of the concepts and expectations for the implementation of the circular economy by the different stakeholders, it is of great importance to start now for the design of the new programming period an intensive discussion on the national concept for the implementation of circular economy issues in any term that can help the sustainable development of the country.

In the preparation of the next programming period, the opportunity to incorporate the circular economy into the sectoral priorities of the new RIS3 should be included as a specific priority. As far as the public sector in the Central Greece region is concerned, it is necessary to:

1) apply the best practices necessary to assess the appropriateness of EC;

2) create synergies and educational programs;

3) show problems to citizens on the decision-making side.

**CHALLENGES**

There are also many challenges to be faced. These include: achieving the objectives of the Circular Economy, creating measures and standards for companies to obtain the label as a "service or product of the circular economy" and developing the private sector more

sustainably. Among the most difficult challenges is the regulation on the exploitation limits of raw materials, a traditional and sensitive sector with low sensitivity to innovation and a rigid legislative and operational framework. More interlocutors need to be found in different ministries to design an integrated approach for CE and RIS3 and create new synergies between the national and regional levels. A new policy and financing framework, strong stakeholder engagement and SME commitment are also needed. A general change of mindset accompanied by a general change in consumer behaviour is essential to make policy implementation possible.

A different perception of doing business should be disseminated, as well as a systematic approach based on motivation and not punishment. Other practical challenges that have emerged related to supporting the shipping recycling industry and deep-tech (big data industries and blockchains) and limiting the phenomenon of greenwashes. Another theoretical challenge concerns the consumer economy, which implies the affirmation of the principle that to own is to be, thus pushing to maintain the ownership of values for individual things. In particular, it shows that the greatest problems in Sterea Ellada are:

1) Solid waste;
2) Recycling of AEG;
3) Sea plastic pollution.

Two of the tools used during the workshop were the pentagonal problem and the context map, aiming at exploring the climate, societal and technical challenges from different perspectives and at identifying the major drivers of the status quo.

**PENTAGONAL PROBLEM**

**PROBLEM STATEMENT**

It is necessary to start from the fact that S3s and CE are two different policy areas and then understand how to implement the Circular Economy Transition (CE) in the Smart Specialization Strategy (S3). The workshop showed that a progress has been made in recent years in Greece in relation to the use of renewable energies and their more affordable prices. It is important to continue to use the learning by doing approach. However, this is a delicate moment that sees 13 regions in Greece working to align with the new European Transaction Plan to the circular economy for the period 2020-2027. According to the estimation, the implementation of the S3 will bring less pollution, more revenue from waste management and more jobs.

**CLIMATE CHANGE CHALLENGES**

The strategy to be followed in order to reduce the effects of climate change involves renewing policies on materials and waste management, an area in which Greece is unfortunately very far from the other European countries. The approach must be systematic and wide-ranging. This seems to be the only way to reduce greenhouse gas emissions by 60% by 2020. A focus on plastics is also recommended, reachable through the adoption of clear measures for disposable plastics.

**SOCIETAL CHALLENGES**

It is well known that sustainability implies the involvement of the social sphere. In order to achieve any objective, the support of all central administrations, starting with the municipalities, is indispensable. In the transition to a circular economy, it is necessary to adopt regulations from Europe, the State, the regions on time. First of all, there is the need to provide the municipalities with the necessary structures and infrastructures for the collection and disposal of waste. To do this, it is also essential to understand from the cost-benefit analysis whether resources exist to finance such projects. But the first step is to spread a new culture, to make people understand the importance of differentiating waste and to encourage them to do it properly. It is necessary to implement the strategies of circular economy in a horizontal way making citizens protagonists of this turning point because there is no local development without citizens' participation. Encourage everyone to a change of course that will bring widespread benefits. But unfortunately, Greece is also lagging behind in its awareness-raising plan. There is still no strong coordination between the various public and private bodies on environmental management and economics.

**TECNICHAL CHALLENGES**

On the technical side, the challenge is to implement the best available technologies in all regions of Greece. This process requires a top-down approach, which allows to cut red tape, invest in educational activities and ensure greater cooperation and complementarity. Unfortunately, insularity is a barrier to circular economic structures. The announced waste plan is too ambitious and unrealistic if not supported by private investment.

**RESOURCES GAP**

So far, a considerable gap has been found between the resources allocated and those effectively made available. The nation's previous sustainable development plan has proved too ambitious. Other previous European projects have not been implemented

either. Public spending on the environment is still very low. There is also a lack of experience, dialogue, synergies and there is no a concrete calendar of activities.

**CONTEXT MAP**

**STATUS QUO**

The national strategy is aimed at strengthening the agro-food sector, public health, clean energy production, blue economy, tourism and ICT in order to increase the level of sustainability of the whole country.

Below are the tools needed to implement the development strategy: industrial symbiosis, law for energy communities, water reuse and attention to islands. The Ministry of the Environment has prepared national plans for public procurement for the management of projects relating to: compost for food, setting up a reuse centre and wastewater treatment, to be implemented by June 2020.

**SOCIETAL TRENDS AND FACTORS**

The predominant trend must be to create direct citizen involvement and to intensify education, starting with the primary one. The region between the island of Crete and Central Macedonia should be the main showcase for the implementation of CE policies.

**INNOVATIONS INITIATIVES**

A research programme worth €542 million has been established to support creative and innovative projects related to the CE. There are currently 79 projects on the calendar, funded with 45 million euros public and 10 million euros private.

In Greece SDGs are below the European average level. However, institutional, national and international bodies, as well as European environmental organizations such as Climate-Kic, can help to speed up the transaction towards the Smart Specialization Strategy. The creation of hubs, of training events that also involve young people in the search for solutions aimed at facing the climatic challenges of the moment, such as Climathon, represent a concrete means to educate, transfer knowledge and skills and push for innovative solutions as much as possible. Among the most relevant projects underway in Greece are: Blue Cycle, aimed at making fishing activity more sustainable, and INVALOR aimed at waste recovery. New calls for proposals for the creation of innovation clusters and round tables planned to involve stakeholders.

Although at a low to medium pace, the innovative aspect is gaining ground in Greece. The island of Tilos is making progress in the field of energy and also from the port of Piraeus there are signs of growth, thanks mainly to private investments. Among other initiatives to mention: the NTUA organizes Greentech Challenges, which allows for the presentation of environmental solutions by start-up/students. And again Bl.EU, a project aimed at understanding, identifying and solving the problem of pollution of the seas due to plastic waste.

**ECONOMIC TRENDS AND FACTORS**

The ERDF is one of the main providers of funds for S3. Total public funding for research, innovation, programme creation exceeded €542.5 million. EquiFund is also planned for spin-offs and start-ups. Regional excellence is required, especially for the islands and Western Macedonia for CSR capacity building. Focus on alternative energy sources to electricity as the costs for the islands are sometimes up to 5 times higher than on land. Invest more in R&I and R&D can be a winning idea.

The second session was composed of two parts; a panel and case study discussion. The panel included Dr. Efi Tritopoulou, president NoWaste21, vice-president Greek women's engineer association, Lydia Papadaki, researcher and PhD candidate Athens University of Economics and Business and Maria Argirou, PhD candidate National and Kapodistrian University Athens and focused on identifying the main concerns and fears on issues such as governing, policy implementation, priorities, degrees of freedom etc.

The discussion evolved around the following thematic areas:

- Key actors, who can influence the process of governing in relation with CE

The discussion showed that although Municipalities and other Government bodies should play an important role in this process, it is the private sector driving the CE implementation, such as restaurants, energy communities etc

- Integrated in stakeholders' agendas strategies

Waste management (liquid- and bio-waste) appeared to be the most common priority for both start-ups, companies and policy makers.

- Policy making implementation

There was a big debate among horizontal and vertical implementation, with top-down approach being the most preferable one in the organisational level and bottom-up in terms of societal engagement. Horizontal implementation is more preferable when different expertise and experience across Governmental bodies need to be aligned.

- Degree of freedom for regions in the context of RIS3

Mr. Kottakis, General Secretariat of Industry emphasised that there should exist a common framework of implementation, while Mrs. Agni Spilioti, Ministry of Development, emphasised that the importance of having the same area of expertise in each region, such as Ioannina, which focuses on the agriculture.

- EU Guidance to implement RIS3 priorities

Mrs. Agni Spilioti referred to an EU platform composed of researchers, joint workshops with other countries and specific seminars conducted by the University of Losagne, which is an important tool for the RIS3 alignment to EU Guidance.

- Start-ups and entrepreneurship as Circular Economy implementation mobilisers in a regional level

Besides, the low survival percentage of start-ups, they seem to be a significant driver of regional and national innovation as demonstrated in many cases, such as Trikala.

Following the Q&A part of the workshop, four case studies on Pireaus port decarbonization by Vera Alexandropoulou, Vice President, Thalassa Foundation and EIT Cimate-KIC associate, waste management and recycling by Dr. Efi Tritopoulou, president NoWaste21, vice-president Greek women's engineer association, Marine Plastic waste recycling by Elia Nikitopoulou, Director of BlueCycle programme and the first The 1st ever implemented Hybrid Power Station (HPS) in Europe (Tilos project) by Zissimos Mantas, Senior Business Development Officer, Eunice Energy Group inspiring further discussions and ideas regarding CE implementation in Greece.

# 6. Conclusions

This pilot EIT project are very timely for Greece, which at the moment is ready to adopt a revised SSS in view of the 2021-2027 programming period and needs to proceed with the revision of the adopted NCES.

The methodology proved operational and was positively received by the stakeholders involved in the November Workshop, despite some shortcomings deriving from the lack of experience and time constraints under which both the SSS and the NCES were designed in the past. In the new programming period, with the experience gained, the methodology coupling the two strategies can be mutually reinforcing and in particular help shift from a short to a longer-term needed horizon, which is crucial for the CE success. The involvement of profitable activities by the business sector is an integral element to be incorporated in this co-design effort.

**A: The report identified a series of problems in the Greek case, namely:**

- The limitation of CE in waste management until 2019 and a below EU average performance of the country even in this one aspect of the CE.
- Past efforts to gain ground were too ambitious to be implemented and led to disillusionments.
- The finally adopted NCES is more a list of potential actions than a real, country-specific strategy. In an effort to sensitise stakeholders it praises the CE and neglects to warn about challenges. The ambitious Action Plan could not be implemented within the timeframe foreseen.
- The governance is not based on synergies and private investments (a prerequisite for the NCES to succeed) and profitability are not sufficiently involved.
- The multi-level/multi-actor interaction between National, Regional, Municipal Authorities, the business sector and NGOs is rather complex, bureaucratic and interests are often conflicting not complementary.

**B: These problems are not insurmountable, if resolved and linked to the SSS synergy opportunities can arise:**

- Regional design based on competitive advantages can provide the long-term perspective and public-private cooperation the CE needs.
- Natural resources are available in the country and so are untapped secondary resources and waste. Using them as inputs for the revision of the SSS can lead to the generation of new competitive edges exploiting the scientific skills and expertise as well as productive tradition and know-how in technical trades.
- A primary sector with growth potential that requires modernisation and reduction of production costs. Agri-food is a priority in almost all SSS so it is important to link it to its CE dimension in terms of production, consumption and waste management. A similar aspect can be exploited in the case of renewable energies.

**C: Policy ideas**

Good governance, the exploitation of all available funding opportunities including good practices for new tools will be necessary to catch up with the EU average and even leap frog:

- Devise a generally acceptable coordination structure with clear demarcations of competences to ensure smooth cooperation between all administrative levels and the business sector.
- Use new instruments, such as financial engineering and green or technology public procurement to enhance the role of business.
- Learn from the profitable CE investment in other countries, using EU peer learning opportunities.

- Pilot the more mature Greek Regions, which, as demonstrated by this exercise (Crete, Attica, Epirus in terms of R&D; Western Macedonia and Eastern Macedonia and Thrace in waste management) advance faster than others, so that the revised SSS in these regions could be used as pilots for the CE.
- Redesign the National Strategy for Circular Economy in order to be more implementation-oriented. That is, include more explicit goals, set specific targets, propose a practical framework and create a roadmap to enhance cooperation between the different levels of public administration, as well as to develop synergies across the wider public and private and public sectors.

**D: Lessons learned for other SEE Member States**

The revised SSS can be instrumental to help allocate more funds for projects promoting the Circular Economy in both national and regional level and by developing a modern strategy, which will incorporate the SDGs and EU Action Plan, address upcoming challenges, while it will also transform the production model to become more sustainable and competitive in the long-term.

Using the cross-referencing methodology of SSS and CE strategy goals adapted for the needs and competitive advantages of each country proves a very helpful tool in this endeavour. This is the main lesson drawn from the Greek exercise.

# Appendices

## Appendix 1: SDG related to the CE

| Goal | Target | Indicator |
|---|---|---|
| **2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture** | 2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality | 2.4.1 Proportion of agricultural area under productive and sustainable agriculture |
| **6. Ensure availability and sustainable management of water and sanitation for all** | 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally | 6.3.1 Proportion of wastewater safely treated<br>6.3.2 Proportion of bodies of water with good ambient water quality |
| | 6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes | 6.6.1 Change in the extent of water-related ecosystems over time |
| **7. Ensure access to affordable, reliable, sustainable and modern energy for all** | 7.2 By 2030, increase substantially the share of renewable energy in the global energy mix | 7.2.1 Renewable energy share in the total final energy consumption |
| | 7.3 By 2030, double the global rate of improvement in energy efficiency | 7.3.1 Energy intensity measured in terms of primary energy and GDP |
| **8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all** | 8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead | 8.4.1 Material footprint, material footprint per capita, and material footprint per GDP<br>8.4.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP |

| Goal | Target | Indicator |
|---|---|---|
| **9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation** | 9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all | 9.1.1 Proportion of the rural population who live within 2 km of an all-season road<br>9.1.2 Passenger and freight volumes, by mode of transport |
| | 9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities | 9.4.1 $CO_2$ emission per unit of value added |
| **11. Make cities and human settlements inclusive, safe, resilient and sustainable** | 11. 6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management | 11.6.1 Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities<br>11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted) |
| | 11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning | 11.a.1 Proportion of population living in cities that implement urban and regional development plans integrating population projections and resource needs, by size of city |
| | 11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels | 11.b.1 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 |
| **12. Ensure sustainable consumption and production patterns** | 12.1 Implement the 10-year framework of programmes on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries | 12.1.1 Number of countries with sustainable consumption and production (SCP) national action plans or SCP mainstreamed as a priority or a target into national policies |

| Goal | Target | Indicator |
|---|---|---|
| | 12.2 By 2030, achieve the sustainable management and efficient use of natural resources | 12.2.1 Material footprint, material footprint per capita, and material footprint per GDP<br>12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP |
| | 12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses | 12.3.1 (a) Food loss index and (b) food waste index |
| | 12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment | 12.4.1 Number of parties to international multilateral environmental agreements on hazardous waste, and other chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement |
| | 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse | 12.5.1 National recycling rate, tons of material recycled |
| | 12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle | 12.6.1 Number of companies publishing sustainability reports |
| | 12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities | 12.7.1 Number of countries implementing sustainable public procurement policies and action plans |
| | 12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature | 12.8.1 Extent to which (i) global citizenship education and (ii) education for sustainable development (including climate change education) are mainstreamed in (*a*) national education policies; (*b*) curricula; (*c*) teacher education; and (*d*) student assessment |

| Goal | Target | Indicator |
|---|---|---|
| **14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development** | 14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution | 14.1.1 Index of coastal eutrophication and floating plastic debris density |
| | 14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans | 14.2.1 Proportion of national exclusive economic zones managed using ecosystem-based approaches |
| | 14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels | 14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations |
| | 14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics | 14.4.1 Proportion of fish stocks within biologically sustainable levels |
| | 14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation | 14.6.1 Degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing |
| | 14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries | 14.a.1 Proportion of total research budget allocated to research in the field of marine technology |
| **15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat** | 15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements | 15.1.1 Forest area as a proportion of total land area<br>15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type |
| | 15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally | 15.2.1 Progress towards sustainable forest management |

| Goal | Target | Indicator |
|---|---|---|
| **desertification, and halt and reverse land degradation and halt biodiversity loss** | 15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation- neutral world | 15.3.1 Proportion of land that is degraded over total land area |
| | 15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development | 15.4.1 Coverage by protected areas of important sites for mountain biodiversity<br>15.4.2 Mountain Green Cover Index |
| | 15.c Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities | 15.c.1 Proportion of traded wildlife that was poached or illicitly trafficked |
| **17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development** | 17.4 Assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries to reduce debt distress | 17.4.1 Debt service as a proportion of exports of goods and services |
| | 17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed | 17.7.1 Total amount of approved funding for developing countries to promote the development, transfer, dissemination and diffusion of environmentally sound technologies |

*Source*: United Nations, 2019. https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202019%20refinement_Eng.pdf

## Appendix 2: The Greek Action Plan of the CE

| Description | Time of Implementation in 2019 | Promoting - Coordinating Party |
|---|---|---|
| Waste management | 1st half | Ministry of Environment and Energy (Ministry of the Interior- Ministry of Economy and Development) |
| Green Public Contracts, Greening 18 Product Groups | 1st half | Ministry of Economy and Development (Ministry of Environment and Energy, Ministry of Infrastructure and Transport, Ministry of the Interior) |
| Proposals for reducing food loss | 2nd half | Ministry of Agriculture and Food (Ministry of Environment and Energy) |
| Construction projects framework | 2nd half | Ministry of Environment and Energy (Ministry of Infrastructure and Transport) |
| Distinction between waste and products facilitating the transition to the use as secondary raw materials | 1st half | Ministry of Environment and Energy (Ministry of Economy and Development, Ministry of the Interior) |
| Re-usage of water and use of the sludge from wastewater purifying plants | 2nd half | Ministry of Environment and Energy (Ministry of Economy and Development, Ministry of Agriculture and Food, Ministry of the Interior) |
| Developing innovative applications and cutting-edge technology for waste management in the RIS3 context | 2nd half | General Secretariat for Research & Technology, Ministry of Economy and Development |
| Indicators of Circular Economy | 1st half | Ministry of Economy and Development (Ministry of Environment and Energy, Ministry of the Interior) |
| Developing a methodology to measure and monitor food waste | 1st half | Ministry of Environment and Energy (Ministry of Economy and Development, Ministry of the Interior) |

| | | |
|---|---|---|
| Developing ecological design criteria | 2nd half | Ministry of Environment and Energy (Ministry of Economy and Development, & ELOT [Hellenic Standardisation Organisation], Ministry of Infrastructure and Transport) |
| National standards for the environment and circular economy | 2nd half | Ministry of Economy and Development (ELOT [Hellenic Standardisation Organisation], Ministry of Environment and Energy, Ministry of Infrastructure and Transport, Ministry of the Interior) |
| Incorporation of the dimension of circular economy into the assessment of environmental impact studies | 1st half | The Ministry of Environment and Energy in cooperation with the competent Ministries at any given case: Ministry of Economy and Development (concerning entrepreneurial activities), Ministry of Infrastructure and Transport (concerning infrastructure), Ministry of the Interior (concerning licensing and municipal regulations). |
| Promotion of using brokerage, as a non-remunerated, consulting service, at the level of regions or cities to promote circular economy | 2nd half | Ministry of Environment and Energy (Ministry of Economy and Development, Ministry of the Interior) |
| Creation of urban spaces as 'creative re-use centres'through the use of Green Points/KAEDISP [Centre for recycling, training and sorting at source], turning them into 'Green Centres' | 1st half - 2nd half | Ministry of Environment and Energy (Ministry of the Interior) |
| Promoting the use of waste as secondary fuel in industry | 1st half | Ministry of Environment and Energy (Ministry of Economy and Development, Ministry of the Interior) |
| Establishing an institutional regulatory framework to facilitate the production of bio-methane (green gas) from organic waste and its injection into the natural gas grid or its use as vehicle fuel | 2nd half | Ministry of Environment and Energy (Ministry of the Interior |

| | | |
|---|---|---|
| Drafting a Joint Ministerial Decision for compost from pre-selected organic waste | 1st half | Ministry of Environment and Energy (Ministry of Economy and Development) |
| Upgrading and Reinforcement of Bio-economy sectors. Drafting a National Action Plan for national policy making | 2nd half | Ministry of Agriculture and Food (Ministry of Environment and Energy) |
| Developing the potential of the institutional framework of Law 4513/2018 on Energy Communities at the local level, through RES technologies and improvement of Energy Efficiency | 1st half | Ministry of Environment and Energy |
| Management, development of potential and reuse of waste products | 2nd half | Ministry of Environment & Energy (Min. of Infrastructure & Transport) |
| Adaptation of cost types so as to estimate the costs of the life cycle span of a public or private project | 2nd half | Ministry of Infrastructure and Transport |
| Incorporation of the principles of circular and sharing/cooperative economy in Sustainable Urban Mobility Plans (SVAK) | 1st half | Ministry of Infrastructure and Transport (Ministry of Environment and Energy) |
| Circular Economy and Ports | 2nd half | Ministry of Insularity and Island Policy (Ministry of Environment and Energy, Ministry of Infrastructure and Transport) |

## Appendix 3: OP and ROP interventions possibly linked to CE

| Programme | Level | Type of Intervention | Description |
|---|---|---|---|
| OP-Competitiveness, Entrepreneurship, Innovation | National | Action | RESEARCH-CREATION-INNOVATION |
| OP-Competitiveness, Entrepreneurship, Innovation | National | Action | Enhancement of the Environmental Industry |
| OP-Competitiveness, Entrepreneurship, Innovation | National | Action | Green Point Network, Development of separate waste collection systems and composting |
| OP-Competitiveness, Entrepreneurship, Innovation | National | Action | Open Trade Centres |
| OP-Competitiveness, Entrepreneurship, Innovation | National | Fund | Infrastructure |
| OP-Transport Infrastructure, Environment and Sustainable Development | National | Priority Axis | Priority Axis (14): CONSERVATION AND PROTECTION OF THE ENVIRONMENT - PROMOTING EFFICIENT USE OF RESOURCES |
| OP-Transport Infrastructure, Environment and Sustainable Development | Regional - Attica | Call | Integration and completion of integrated waste management infrastructure. |
| OP-Transport Infrastructure, Environment and Sustainable Development | Regional - Crete | Call | "Integration and completion of integrated waste management infrastructure". |
| OP-Transport Infrastructure, Environment and Sustainable Development | Regional - Epirus | Call | "Integration and completion of integrated waste management infrastructure". |
| OP-Transport Infrastructure, Environment and Sustainable Development | Regional - Ionian Islands | Call | Integrated municipal solid waste management actions in islands and small remote settlements in Transition Regions |
| OP-Transport Infrastructure, Environment and | Regional - North Aegean | Call | Integrated municipal solid waste management actions in islands and small remote settlements in Transition Regions |

| Programme | Level | Type of Intervention | Description |
|---|---|---|---|
| Sustainable Development | | | |
| OP-Transport Infrastructure, Environment and Sustainable Development | Regional - Peloponnese | Call | "Integration and completion of integrated waste management infrastructure". |
| RIS | National | Action | Increase investment in existing companies to introduce new products and services to the market and to develop and implement modern production methods |
| RIS | National | Action | Support businesses to build and expand advanced capabilities to develop new products and services in new areas |
| RIS | National | Target | Assist enterprises in the research and development of technologies for the collection, sorting, separation and exploitation of products derived from recyclable materials |
| RIS | National | Target | Development of technologies for the recovery, recycling and reuse of materials, development of alternatives for the absorption and economic recovery of materials recovered from special waste streams. |
| RIS | National | Target | Development of innovative applications and cutting-edge technologies for the management of municipal waste (with a focus on bio-waste), industrial waste and special waste streams, such as agri-food waste and tires |
| RIS | National | Target | Produce high quality environmental services to society to enhance transparency and mitigate social reactions, facilitating business involvement in the study and conservation of environmental resources and biodiversity. In this context, research and development of innovations in natural disaster planning, tackling the effects of climate change, exploiting genetic information on biodiversity, improving access to environmental information, and involving businesses in conservation will be pursued. of ecosystems and biodiversity. |
| RIS | National | Target | An ecosystem-based approach to sustainable development through the creation of pilot research centres (e.g. |

| Programme | Level | Type of Intervention | Description |
|---|---|---|---|
| | | | upgrading laboratory equipment for the measurement of solid fuels, biofuels and secondary fuels from municipal waste), economic mapping of ecosystem services, etc. |
| RIS | Regional - Attica | Indicative actions | Products and processes for the management and exploitation of waste, trash and residues |
| RIS | Regional - Attica | Indicative actions | Trash and waste utilization |
| RIS | Regional - Attica | Indicative actions | Products and processes for the management and exploitation of trash, residues and waste |
| RIS | Regional - Attica | Indicative actions | Development of innovative products and processes for the management and exploitation of waste, trash and residues for energy production and high value-added products |
| RIS | Regional - Attica | Indicative actions | Management and exploitation of waste, trash and residues for energy production and high value-added products |
| RIS | Regional - Attica | Indicative actions | Technologies and methods for reducing environmental footprint |
| RIS | Regional - Central Greece | Action | Modernizing and applying sustainable farming methods |
| RIS | Regional - Central Greece | Action | Improvement of cover crops and introduction of hydroponics and aeroponic methods |
| RIS | Regional - Central Greece | Action | Certification, standardization and introduction of innovations in the processing of agricultural and livestock products |
| RIS | Regional - Central Greece | Action | Support for new innovative manufacturing companies |
| RIS | Regional - Central Greece | Action | Development and introduction of innovations for the modernization of farming methods and production protocols |
| RIS | Regional - Central Greece | Action | Use of green technologies in manufacturing and tourism |
| RIS | Regional - Central Greece | Action | Industrial coexistence program to exploit waste and reduce resource use |
| RIS | Regional - Central Greece | Action | Small-scale investments in energy production in production units and holdings |
| RIS | Regional - Central Greece | Action | Documentation of the potential of biomass utilization from various sources for energy production |

| Programme | Level | Type of Intervention | Description |
|---|---|---|---|
| RIS | Regional - Central Macedonia | Action | "Technological Development Projects to Improve Product Quality (Sustainability, Eco-Friendly)". |
| RIS | Regional - Central Macedonia | Action | "Synthesis of artificial marble using recyclable aggregates" |
| RIS | Regional - Central Macedonia | Action | "Manufacture of materials from renewable raw materials" |
| RIS | Regional - Central Macedonia | Action | "Water recycling in materials production processes" |
| RIS | Regional - Central Macedonia | Action | "Exploitation of by-product of fly ash from lignite combustion" |
| RIS | Regional - Central Macedonia | Action | "Utilization of by-products and by-products - feed enrichment (bio-active foods)" |
| RIS | Regional - Central Macedonia | Action | "Utilization of by-products and waste by biotechnological methods for the production of new products" |
| RIS | Regional - Central Macedonia | Action | "Knowledge platform in collaboration with operators and market" |
| RIS | Regional - Central Macedonia | Action | "Creation of permanent research - industry - consumer education & interconnection networks" |
| RIS | Regional - Central Macedonia | Priority | Reducing the Environmental Footprint of the Agri-Food Processes |
| RIS | Regional - Central Macedonia | Priority | Reduce Generation Costs with emphasis on Reducing Energy Consumption |
| RIS | Regional - Central Macedonia | Priority | Reducing the Environmental Impact of Construction Products and Reducing their Energy Footprint (carbon footprint) |
| RIS | Regional - Central Macedonia | Priority | Smart buildings |
| RIS | Regional - Central Macedonia | Priority | Reduce Generation Costs with emphasis on Reducing Energy Consumption (2) |

| Programme | Level | Type of Intervention | Description |
|---|---|---|---|
| RIS | Regional - Central Macedonia | Priority | Reducing Environmental Footprint - Saving Resources |
| RIS | Regional - Central Macedonia | Specific Strategy | Specific Strategy 2 (HS2) "Empowering human capital in the direction of innovation - knowledge based on market needs". |
| RIS | Regional - Central Macedonia | Specific Strategy | Specific Strategy 3 (HS3) "Emphasis on strategic areas of specialization, utilization of Key Enabling Technologies / KETs and development of extroversion strategy". |
| RIS | Regional - Central Macedonia | Supporting Strategy | "Strategies to support knowledge absorption and business dynamics". These include, inter alia, (a) lifelong learning activities in enterprises (high maturity), (b) awareness-raising of businesses and stakeholders about the benefits and prospects of innovation, entrepreneurship-enhancing actions (average maturity) and (c) supporting demand for innovation through actions such as innovation vouchers (low maturity). |
| RIS | Regional - Central Macedonia | Supporting Strategy | "Strategies to Support Recovery of Lost Soil in Regions with High Intensity in the Primary Sector." These include, inter alia, (a) regional offices for the promotion of entrepreneurship (high maturity) and (b) lifelong learning and skills development (high maturity). |
| RIS | Regional - Crete | Indicative Implementation Priorities | Precision agriculture in the country (climate and business organization of production) |
| RIS | Regional - Crete | Indicative Implementation Priorities | Utilization of agricultural waste products for the production of high nutritional value feed |
| RIS | Regional - Crete | Indicative Implementation Priorities | Develop protocols, reduce production costs and improve the quality of cheese products in Crete |
| RIS | Regional - Crete | Indicative Implementation Priorities | Improving efficiency (reducing energy consumption of water systems, irrigation, wastewater management, solid waste management and generally large infrastructure) |
| RIS | Regional - Crete | Indicative Implementation Priorities | Development of technological applications to reduce the environmental footprint of economic activities (hotels, industries, hospitals and other public buildings). |

| Programme | Level | Type of Intervention | Description |
|---|---|---|---|
| RIS | Regional - Crete | Indicative Implementation Priorities | Pilot program for the development and introduction of new technologies to reduce water losses |
| RIS | Regional - Crete | Indicative Implementation Priorities | Development of innovative municipal, industrial, livestock etc. solid waste management systems and pilot applications (prevention, collection, treatment, recovery / exploitation) |
| RIS | Regional - Crete | Indicative Implementation Priorities | Development of innovative municipal and / or industrial wastewater management systems and pilot applications (reuse, biofuel production, etc.) |
| RIS | Regional - Eastern Macedonia & Thrace | Action | Modernize the agri-food complex and improve regional added value by using technologically driven innovation. |
| RIS | Regional - Eastern Macedonia & Thrace | Action | Support for agri-food business investment plans for the introduction of RES technologies. |
| RIS | Regional - Eastern Macedonia & Thrace | Action | Support business investment plans for the introduction of RES technologies |
| RIS | Regional - Eastern Macedonia & Thrace | Priority of Intervention | Utilizing modern production technologies and systems to reduce inputs into the production process |
| RIS | Regional - Eastern Macedonia & Thrace | Priority of Intervention | Reduce the cost of production and disposal of products (including energy and transport). |
| RIS | Regional - Eastern Macedonia & Thrace | Priority of Intervention | Utilizing alternative uses of primary by-products, including their use as an energy resource. |
| RIS | Regional - Eastern Macedonia & Thrace | Priority of Intervention | Utilizing technologies to reduce the volume and toxicity of waste along the value chain of the agri-food complex and further reduce its environmental footprint. |
| RIS | Regional - Eastern Macedonia & Thrace | Priority of Intervention | Rational management and utilization of natural resources (water, agricultural land, forest wealth, pastures, etc.) |

| Programme | Level | Type of Intervention | Description |
|---|---|---|---|
| RIS | Regional - Epirus | Action | Development of applied research for food processing and by-product processing companies |
| RIS | Regional - Epirus | Action | Production of new innovative food products |
| RIS | Regional - Epirus | Action | Networking businesses that embody innovation |
| RIS | Regional - Epirus | Action | Improvement of existing farming methods |
| RIS | Regional - Epirus | Action | Utilizing local potential for fish production |
| RIS | Regional - Ionian Islands | Action | Production of agri-food products |
| RIS | Regional - Ionian Islands | Action | Use of green technologies in agricultural production |
| RIS | Regional - Ionian Islands | Action | Use of green technologies in the processing of agricultural products |
| RIS | Regional - Ionian Islands | Action | Development and use of green technologies in tourism |
| RIS | Regional - North Aegean | Project | 3 pilot projects for waste management - treatment of waste mills - dairies - kernels for the purpose of creating new products |
| RIS | Regional - North Aegean | Project | 3 pilot projects for the management of organic plant materials and waste for compost and / or pellet production |
| RIS | Regional - North Aegean | Project | Pilot project on green technology in accommodation or tourist service units |
| RIS | Regional - North Aegean | Action | Waste management |
| RIS | Regional - North Aegean | Action | Upgrading tourism offer-business networking |
| RIS | Regional - Peloponnese | Area for Intervention | Promoting Precision Agriculture |
| RIS | Regional - Peloponnese | Area for Intervention | New technologies to promote and record water savings for irrigation |
| RIS | Regional - Peloponnese | Area for Intervention | Developing innovative methods for the utilization of waste, by-products and residues to reduce energy consumption & compost production (in collaboration with research institutes in the country) |
| RIS | Regional - Peloponnese | Axis | Development of tourism in harmony with the environment |

| Programme | Level | Type of Intervention | Description |
|---|---|---|---|
| RIS | Regional - Peloponnese | Specific Target | Reducing Environmental Footprint, Adaptation to Climate Change in the Agri-Food Sector |
| RIS | Regional - South Aegean | Action | Modernizing and applying sustainable farming methods |
| RIS | Regional - South Aegean | Action | Improvement of cover crops |
| RIS | Regional - South Aegean | Action | Introducing innovations in the processing of fish and aquaculture products |
| RIS | Regional - South Aegean | Action | Use of green technologies in agricultural production. processing and tourism |
| RIS | Regional - South Aegean | Action | Small-scale investments in energy production in production units and holdings |
| RIS | Regional - Thessaly | Area for Intervention | Use of modern production technologies and systems to reduce inputs into the production process. |
| RIS | Regional - Thessaly | Area for Intervention | Reduce the cost of production and disposal of products (including energy and transport) |
| RIS | Regional - Thessaly | Area for Intervention | Utilizing alternative uses of primary sector by-products, including their use as an energy resource. |
| RIS | Regional - Thessaly | Area for Intervention | Implementation of innovative tools in the agri-food chain to reduce the volume and toxicity of their waste and further reduce their environmental footprint. |
| RIS | Regional - Thessaly | Area for Intervention | Reduce thermal energy costs by redesigning / modernizing energy-efficient thermal processes and utilizing biomass or waste, while reducing the environmental footprint of the plants. |
| RIS | Regional - Thessaly | Specific Target | Support existing and new businesses to exploit patents and / or innovations, as well as support services to improve their productivity and / or to develop new products and services. |
| RIS | Regional - Western Greece | Indicative actions | Development of innovative technologies for the protection and ecological restoration of water bodies (rivers, lakes, wetlands) in tourist areas and areas important for fisheries and aquaculture etc. |
| RIS | Regional - Western Greece | Indicative actions | Development of materials recovery, recycling and reuse technologies |

| Programme | Level | Type of Intervention | Description |
|---|---|---|---|
| RIS | Regional - Western Greece | Indicative actions | Development of innovative applications and cutting-edge technologies for the management of bio-waste and industrial waste and their energy utilization especially in the agri-food sector. |
| RIS | Regional - Western Macedonia | Indicative actions | Localized district heating systems with biomass utilization |
| RIS | Regional - Western Macedonia | Indicative actions | Pilot waste refinery unit to optimize material sorting and align with the principles of industrial coexistence. |
| RIS | Regional - Western Macedonia | Indicative actions | Development of Cluster Bioenergy and Environment (CLUBE) activities in Western Macedonia |
| RIS | Regional - Western Macedonia | Indicative actions | Exploitation of western Macedonia's marine mining and quarrying by-products for the production of innovative / high value-added environmentally friendly materials. |
| RIS | Regional - Western Macedonia | Indicative actions | Upgrade and expansion of biological cleaning (sludge compost management and safe disposal projects) of the Macedonian MABIK Meat Industry of Western Macedonia |
| RIS/EAFRD | Regional - Peloponnese | Action | Development of standard pasture management methods |
| RIS/EAFRD | Regional - Peloponnese | Action | Design-Installation-operation of standard forage parks |
| RIS/EAFRD | Regional - Peloponnese | Action | Utilization of by-products of Dairies, Olive Mills with pilot application in demonstration units |

## Appendix 4: CE-related actions per region and NCES goals

*Number of Interventions per Region (5 in brackets)*

| | Goal 1 | Goal 2 | Goal 3 | Goal 4 | Goal 5 | Goal 6 | Goal 7 | Goal 8 | No of Interventions |
|---|---|---|---|---|---|---|---|---|---|
| **Attica** | | 6 | 2 | | | | 6 | | 7 |
| **Central Greece** | 3 | 4 | 2 | 1 | 1 | | 4 | 2 | 9 |
| **Central Macedonia** | 8 | 9 | 4 | 2 | 2 | 2 | 2 | 1 | 20 |
| **Crete** | 1 | 5 | 3 | 1 | 1 | | 3 | 1 | 9 |
| **Eastern Macedonia and Thrace** | 3 | 2 | 4 | | | | 7 | | 8 |
| **Epirus** | 2 | 2 | | | | 1 | 3 | | 6 |
| **Ionian Islands** | | 2 | | | | | 4 | | 5 |
| **North Aegean** | | 4 | | 3 | 3 | | | | 6 |
| **Peloponnese** | 3 | 6 | 1 | | | | 3 | | 9 |
| **South Aegean** | 1 | 1 | 1 | | | | 3 | | 5 |
| **Thessaly** | 3 | 4 | 2 | | | | 2 | | 6 |
| **Western Greece** | 1 | 3 | 1 | 1 | 1 | | 2 | | 3 |
| **Western Macedonia** | | 4 | 2 | | | | 2 | | 5 |
| **National RIS** | 7 | 3 | 2 | 3 | 1 | 1 | 1 | 1 | 7 |
| National total | 32 | 55 | 24 | 11 | 9 | 4 | 42 | 5 | 105 |

*Share of Goal per region (%)*

| | Goal 1 | Goal 2 | Goal 3 | Goal 4 | Goal 5 | Goal 6 | Goal 7 | Goal 8 | No of Interventions |
|---|---|---|---|---|---|---|---|---|---|
| **Attica** | | 11% | 8% | | | | 14% | | 7% |
| **Central Greece** | 9% | 7% | 8% | 9% | 11% | | 10% | 40% | 9% |
| **Central Macedonia** | 25% | 16% | 17% | 18% | 22% | 50% | 5% | 20% | 19% |
| **Crete** | 3% | 9% | 13% | 9% | 11% | | 7% | 20% | 9% |
| **Eastern Macedonia and Thrace** | 9% | 4% | 17% | | | | 17% | | 8% |
| **Epirus** | 6% | 4% | | | | 25% | 7% | | 6% |
| **Ionian Islands** | | 4% | | | | | 10% | | 5% |
| **North Aegean** | | 7% | | 27% | 33% | | | | 6% |
| **Peloponnese** | 9% | 11% | 4% | | | | 7% | | 9% |
| **South Aegean** | 3% | 2% | 4% | | | | 7% | | 5% |
| **Thessaly** | 9% | 7% | 8% | | | | 5% | | 6% |
| **Western Greece** | 3% | 5% | 4% | 9% | 11% | | 5% | | 3% |
| **Western Macedonia** | | 7% | 8% | | | | 5% | | 5% |
| **National RIS** | 22% | 5% | 8% | 27% | 11% | 25% | 2% | 20% | 7% |
| National total | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

*Goals per Region (%)*

| | Goal 1 | Goal 2 | Goal 3 | Goal 4 | Goal 5 | Goal 6 | Goal 7 | Goal 8 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Attica** | | 43% | 14% | | | | 43% | | 100% |
| **Central Greece** | 18% | 24% | 12% | 6% | 6% | | 24% | 12% | 100% |
| **Central Macedonia** | 27% | 30% | 13% | 7% | 7% | 7% | 7% | 3% | 100% |
| **Crete** | 7% | 33% | 20% | 7% | 7% | | 20% | 7% | 100% |
| **Eastern Macedonia and Thrace** | 19% | 13% | 25% | | | | 44% | | 100% |
| **Epirus** | 25% | 25% | | | | 13% | 38% | | 100% |
| **Ionian Islands** | | 33% | | | | | 67% | | 100% |
| **North Aegean** | | 40% | | 30% | 30% | | | | 100% |
| **Peloponnese** | 23% | 46% | 8% | | | | 23% | | 100% |
| **South Aegean** | 17% | 17% | 17% | | | | 50% | | 100% |
| **Thessaly** | 27% | 36% | 18% | | | | 18% | | 100% |
| **Western Greece** | 11% | 33% | 11% | 11% | 11% | | 22% | | 100% |
| **Western Macedonia** | | 50% | 25% | | | | 25% | | 100% |
| **National RIS** | 37% | 16% | 11% | 16% | 5% | 5% | 5% | 5% | 100% |
| **National total** | 18% | 30% | 13% | 6% | 5% | 2% | 23% | 3% | 100% |

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