

EY Study on the Circular Economy in Greece

Brief edition

May 2016

Commissioned by:

SEVBCSD
GREECE



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The methodology, delivery and review of the study were also supported by the EY Netherlands Climate Change and Sustainability Services practice, which includes professionals with significant subject matter knowledge and experience on the Circular Economy.

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The conclusions of this study are high level conclusions based on certain preapproved criteria and methodology and in no event can they be considered as definite conclusions, while the proposed initiatives do not constitute a one-way approach to the transition to the Circular Economy.

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About the sponsor

SEV Business Council for Sustainable Development

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Enterprises in:

- ▶ promoting Sustainable Development within the Greek business reality and
- ▶ establishing the necessary engagement framework for discussing and weighing the critical issues of sustainable development among businesses, the State and society at large.

The SEV Business Council for Sustainable Development is a member of the World Business Council for Sustainable Development.

“The objective of this study is to promote the potential for transformational change that the Circular Economy can bring to the status quo of the Greek economy, both upstream and downstream, including the disruptive resolution of chronic confrontation topics, such as waste management, and extending to the provision of investment opportunities, as a catalyst towards sustainable growth”



Dear reader,

On December 2, 2015 the European Commission (EC) adopted an ambitious new Circular Economy Package to “stimulate Europe’s transition towards a Circular Economy, which will boost global competitiveness, foster economic growth and generate new jobs”.¹ The timing of this announcement, just as the Paris Conference on climate change was finalizing its momentous and historic global agreements, the sponsorship by four Commissioners and the fact that the package was co-chaired by First Vice-President Frans Timmermans and Vice-President Jyrki Katainen demonstrate the importance that the Commission places on this initiative.

First Vice President Frans Timmermans, responsible for sustainable development said on the occasion²: “Our planet and our economy cannot survive if we continue with the ‘take, make, use and throw away’ approach. We need to retain precious resources and fully exploit all the economic value within them” and he went on to stress that beyond reducing waste and protecting the environment we will transform the way our entire economy works and “generate new opportunities and create new jobs”. We believe the Commission is absolutely right since Europe is the world’s largest net importer of resources at €760 billion a year, 50% more than the USA.³

The EC offered quantification of the considerable benefits as follows⁴: “Waste prevention, eco-design, re-use and similar measures could bring net savings of €600 billion, or 8% of annual turnover, for businesses in the EU, while reducing total annual greenhouse gas emissions by 2-4 %. In the sectors of re-use, re-manufacturing and repair, for example, the cost of remanufacturing mobile phones could be halved if it were easier to take them apart. If 95% of mobile phones were collected, this could generate savings on manufacturing material costs of more than €1 billion”.

To stimulate and support this policy direction the EC has committed to a long and very ambitious policy agenda to streamline and optimize waste streams, recycling, primary raw materials and obsolescence of products and more, and will support these initiatives: “with €650 million from Horizon 2020 (the EU program for research and innovation) and €5.5 billion from structural funds from waste management and investments in the Circular Economy at national level”².

The objective of this study, commissioned by SEV Business Council for Sustainable Development (SEV BCSD) and authored by EY, is to promote the potential for transformational change that the Circular Economy can bring to the status quo of the Greek economy, both upstream and downstream, including the disruptive resolution of chronic confrontation topics, such as waste management, and extending to the provision of investment opportunities, as a catalyst towards sustainable growth.

The study is based on documentation and analysis of the current legislative and regulatory framework regarding the Circular Economy at EU and national level, as well as on documentation and analysis of the current business approach and perspectives, for selected sectors, based both on primary and secondary research. Specifically we believe that the current EC initiative needs to be well understood and integrated into the policy thinking of Greece with the objectives to:

- ▶ Use the opportunity to possibly help the long awaited investment cycle recommence for business in Greece, as and when the needed fiscal and structural reforms take place in Greece,
- ▶ provide information and benchmarking to Greek businesses to explore transformational initiatives as opposed to simply replicating past experience, by using the incentives and directions inherent in these programs and finally
- ▶ transform the issue of waste management, recycling of wastes, storing and reusing of wastes, from a field of confrontation to an area where cooperation and win-win solutions can be established.

We hope you will find this study informative and useful and are looking forward to further engagement on exploring Circular Economy opportunities for Greece.

Athens, May 2016

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Sources:

¹ European Commission, viewed at 15/03/16, http://ec.europa.eu/environment/circular-economy/index_en.htm

² European Commission, 2015, Press release-Closing the loop: Commission adopts ambitious new Circular Economy Package to boost competitiveness, create jobs and generate sustainable growth, Brussels

³ B.Lee et al., 2012, Resource Futures, Chatham House, London

⁴ European Commission, 2015, Fact Sheet -Circular Economy Package: Questions & Answers, Brussels

Introduction

Why a Circular Economy?¹

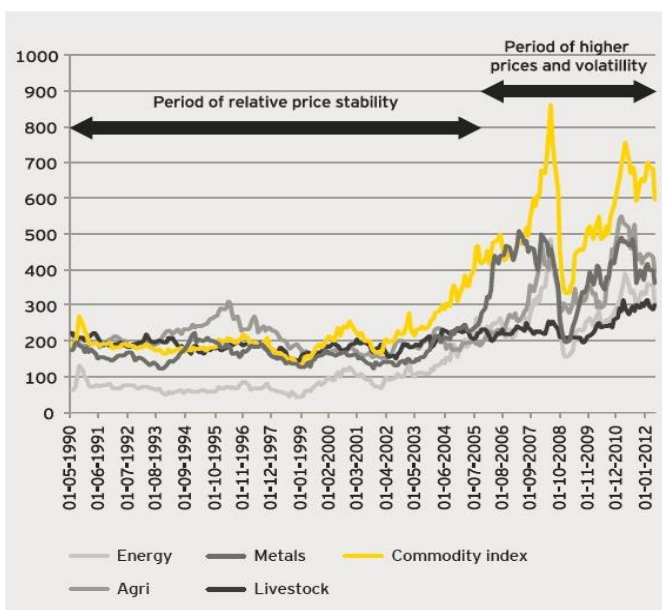
During the last century the world experienced enormous economic growth, which led to more prosperity in developing countries. As populations continue to grow and markets become more globalized, material consumption increases as well. By 2050, global resource use is expected to have tripled. This will further increase pressure on society and the environment.

The world faces an unprecedented number of environmental challenges. These are global in scope and interconnected by nature. The human footprint already exceeds the earth's bio capacity by more than 50%. We exceeded the planetary boundaries for climate change, biodiversity loss and human interference with the nitrogen cycle. Soon, we will also reach the limits of global fresh water use, change in land use, ocean acidification and interference with the phosphorous cycle.

More and more companies feel the responsibility to use their influence and abilities to decrease their environmental impact. They started within their own production sites and offices and are now shifting their focus to their supply chain and beyond. Another incentive to transition into the Circular Economy is the availability of natural resources. At the current consumption rate, some elements are expected to last no longer than 20 years. This creates major risks and challenges for companies, especially in Europe, where 60% of fossil fuels and metal resources are imported.

The Circular Economy addresses these problems. Think of an economy no longer reliant on raw materials. An economy without waste and with full dedication to renewable energy, renewable resources and high-grade recycling. Several studies show that the Circular Economy enables the economy to grow, as employment increases and resources are applied more efficiently.

S&P GSCI price index



Commodity price trends over the past 20 years highlight the new era of resource scarcity

Source: Bloomberg, Rabobank, based on S&P GSCI price index in PATHWAYS TO A CIRCULAR ECONOMY, Rabobank/ Port of Rotterdam (2012)

Source:

¹ EY, 2015, "Are you ready for the circular economy? The necessity of an integrated approach"

Introduction

What is the Circular Economy?¹

The Ellen MacArthur Foundation – the most authoritative think tank on this subject – defines the Circular Economy as an industrial economy that is restorative by intention. It aims to enable effective flows of materials, energy, labor and information so that natural and social capital can be rebuilt. It seeks to reduce energy use per unit of output and accelerate the shift to renewable energy by design, treating everything in the economy as a valuable resource. The final objective is an economy that sustains the value of its products, materials, and resources for as long as possible, while at the same time minimizes the generation of waste throughout production and consumption.

Although the Circular Economy is often bracketed together with recycling, these two are very distinct and different and should not be seen as synonymous. Materials that have been jumbled up in the waste stream or have been contaminated lose much of their value, and the recycling process to clean and convert them into usable products can itself consume a large amount of energy. In the Circular Economy the emphasis is on designing goods to be long-lasting, easy to repair and reuse, easy to disassemble and easy to remake into items that are as good as, if not better than, their virgin equivalents. The Circular Economy is more than squeezing more life from a fixed stock of resources that have been dug from the ground at the expense of the environment.

According to the Ellen MacArthur Foundation², benefits for Europe from a transition to the Circular Economy could be summarized as follows:

- ▶ A Circular Economy could result in overall benefits of €1.8 trillion by 2030, or twice the benefits seen on the current development path (€0.9 trillion)
- ▶ By adopting Circular Economy principles, Europe can take advantage of the technology revolution and increase average disposable income for EU households by €3,000, or 11% higher than the current development path
- ▶ This would further translate into an 11% GDP increase by 2030 versus today, compared with 4% in the current development path
- ▶ The circular model would also benefit households in other ways. For example, compared to the current development path, the cost of time lost to congestion would decrease by 16% by 2030, and close to 60% by 2050
- ▶ Carbon dioxide emissions would halve by 2030, relative to today's levels (48% reduction of carbon dioxide emissions by 2030 across the three basic needs studied, or 83% by 2050)
- ▶ Primary material consumption measured by car and construction materials, real estate land, synthetic fertiliser, pesticides, agricultural water use, fuels, and non-renewable electricity could drop 32% by 2030 and 53% by 2050, compared with today
- ▶ 65 reviewed academic papers indicate that “existing studies point to the positive employment effects occurring in the case that the Circular Economy is implemented”.

Sources:

¹ EY, 2015, “Are you ready for the circular economy? The necessity of an integrated approach”

² SUN, Ellen MacArthur Foundation, McKinsey Center for Business and Environment, 2015, Growth Within: A circular economy vision for a competitive Europe

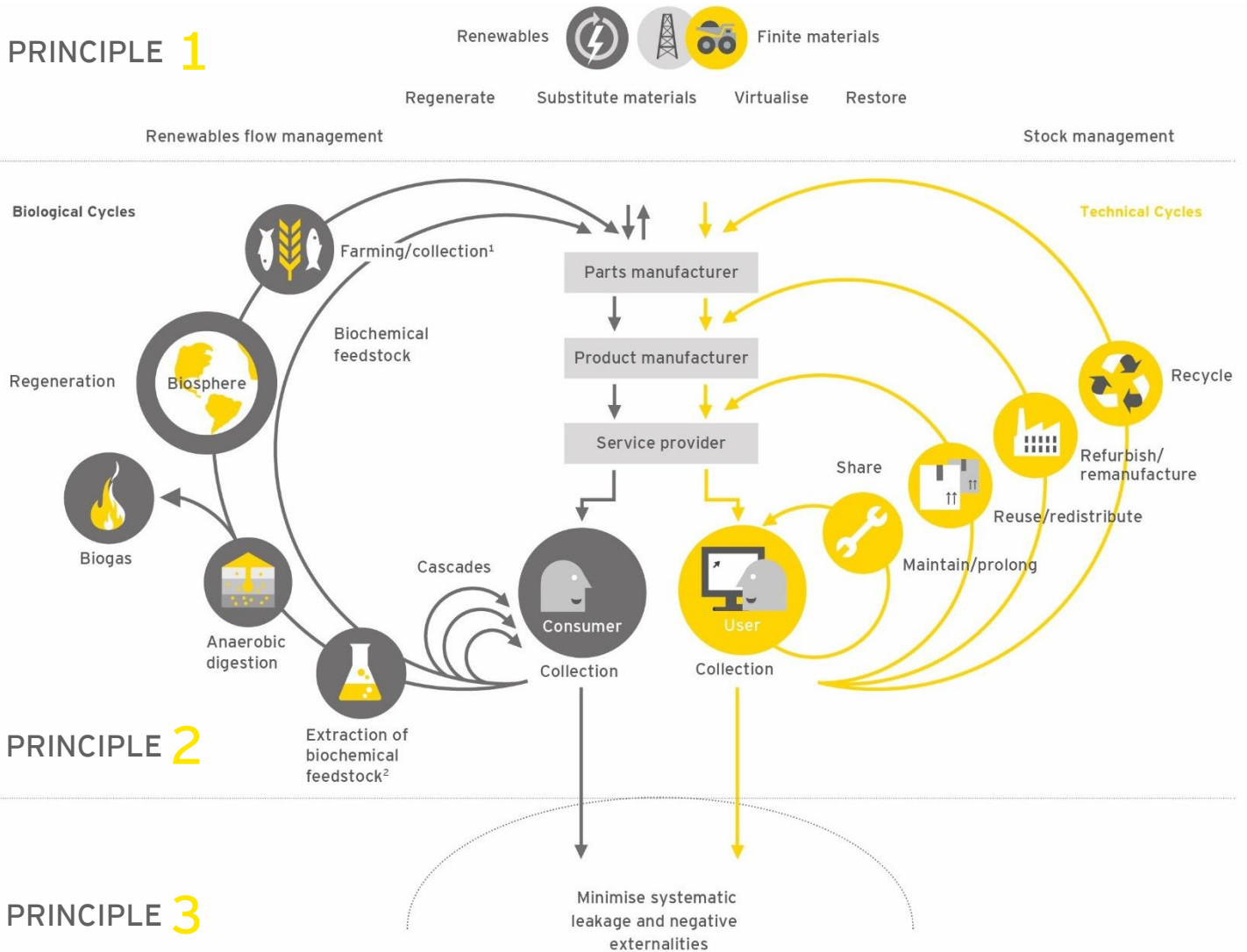
Introduction

The three principles of the Circular Economy¹

PRINCIPLE 1: Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows. “This starts by dematerialising utility - delivering utility virtually, whenever optimal. When resources are needed, the circular system selects them wisely and chooses technologies and processes that use renewable or better-performing resources, where possible. A Circular Economy also enhances natural capital by encouraging flows of nutrients within the system and creating the conditions for the regeneration of, for example, soil.”

PRINCIPLE 2: Optimize yields by circulating products, components, and materials at the highest utility at all times in both technical and biological cycles. “This means designing for remanufacturing, refurbishing, and recycling to keep technical components and materials circulating in and contributing to the economy. Circular systems use tighter, inner loops (e.g. maintenance, rather than recycling) whenever possible, thereby preserving more embedded energy and other value. These systems also maximise the number of consecutive cycles and/or the time spent in each cycle, by extending product life and optimising reuse. Sharing in turn increases product utilisation.”

PRINCIPLE 3: Foster system effectiveness by revealing and designing out negative externalities. “This includes reducing damage to systems and areas such as food, mobility, shelter, education, health, and entertainment, and managing externalities, such as land use, air, water and noise pollution, and the release of toxic substances.”



1. Hunting and fishing
2. Can take both post-harvest and post-consumer waste as an input
Source: Ellen MacArthur Foundation and McKinsey Center for Business and Environment; Adapted from Braungart & McDonough, Cradle to Cradle (C2C).

Source:

¹Ellen MacArthur Foundation, 2015, Towards a Circular Economy: Business Rationale for an accelerated transition

Why Circular Economy in Greece?

Greece continues to suffer from a sustained economic recession, which in addition to fiscal measures requires significant structural and regulatory reform, to create a favorable environment for investment. SEV has calculated that at least €100 billion of investment needs to materialize by 2020, to address the equivalent divestment that has been occurring since 2010. This sustained and prolonged divestment, along with the continuing brain drain that diminishes human capital and innovation potential, handicaps Greece's prospects. The Circular Economy model could help leap frog to a next transformational stage that will enable Greece's return to sustainable growth. By addressing technical and biological product life cycles, both upstream and downstream, across key industrial sectors, the Circular Economy could help shift the way our entire economy works, boost job creation, and enable investment.

On December 2nd 2015, the European Commission adopted an ambitious new Circular Economy Package to stimulate Europe's transition towards a Circular Economy which will boost global competitiveness, foster sustainable economic growth and generate new jobs¹, for Greece and the EU. According to the EC Press Release on the new Package¹: *"this transition will be supported financially by ESIF funding, €650 million from Horizon 2020 (the EU funding programme for research and innovation), €5.5 billion from structural funds for waste management, and investments in the Circular Economy at national level"*. The Package contributes to broad political priorities by tackling climate change and the environment while boosting job creation, economic growth, investment and social fairness.

At the same time, especially in Greece, the Circular Economy could stimulate the necessary dialogue for resolution of chronic confrontational topics, such as waste management including reuse, storage, and treatment. A dialogue of transformation with the State, regional and local government authorities, but also businesses, industry and the civil society, is necessary to change mindsets on the issue of wastes, both municipal and industrial, waste treatment, the location of landfills, avoiding EU penalties levied against unpermitted or dysfunctional waste facilities and landfills, and other dysfunctions of the current context.

In order to avert any setbacks and obstacles on the path towards growth, all existing potential must be fully exploited. *"It is clear that the linear model of economic growth we relied on in the past is no longer suited for the needs of today's modern societies in a globalized world, we cannot build the future on a 'take-make-dispose' model"*². Greece could listen to the European Round Table of Industrialists (ERT), which states that the Circular Economy is an opportunity to handle more efficiently essential resources with the support of new business models and an important step forward for the industrial renaissance of Europe³. Through an enabling, smart and consistent European policy framework, it is now necessary to fully exploit the Circular Economy's potential and contribute directly to climate change solutions⁴.

Greece as a Member State is: *"challenged to develop innovative business models by putting in place the necessary infrastructure, building on economies of scale, promoting cooperation among stakeholders and leveraging best practices"*⁴. The ten steps recommended for exiting the crisis, highlighted in the Bank of Greece Governor's speech at the annual shareholder meeting, which should ideally be incorporated into a national growth plan, are geared towards supporting (a) output and investment; (b) the "knowledge triangle" (education, research, innovation); and (c) the new generation⁵. According to the Climate Change Impacts Study Committee of the National Bank of Greece, the long-term energy planning is the core of climate change mitigation policy; the transition to an economy of low greenhouse gas emissions concerns all sectors of economic activity, consumption and energy production. Subsequent to the 2015 United Nations Climate Change Conference-COP21, the actions⁵ of the committee for 2015 focused on issues related to the adaption of a National Strategy on Climate Change, a Monitoring plan - Observatory for the implementation of National Strategy on Climate Change and the Public "Athens World Wide Views" Consultation for climate and energy.

Sources:

¹ European Commission, 2015, Press Release - Closing the loop: Commission adopts ambitious new Circular Economy Package to boost competitiveness, create jobs and generate sustainable growth, Brussels

² European Commission, 2015, Fact Sheet - Circular Economy Package: Questions & Answers, Brussels

³ ERT, 2015, Position paper on the future Circular Economy package

⁴ ERT, 2015, High-level messages on Circular Economy

⁵ Bank of Greece, 2016, Report of the Governor of the year 2015 - 83rd annual general meeting of Shareholders, Athens

Introduction

Indicative Circular Economy indicators*

INDICATIVE CIRCULAR ECONOMY INDICATORS					
ASPECT	INDICATOR	GREECE	EU28	GREECE / EU28	2030 TARGETS Based on the CE Package
RESOURCES	Resource productivity (EUR/kg) (2014) Economic value generated (GDP in PPS) per kg of raw material consumption	1,6	2,1	76%	N/A
	Artificial land productivity (mil. PPS/km²) (2012) Productivity of artificial land is defined as the gross domestic product (GDP) of a country divided by its total artificial land.	43,7	61,3 (for EU27)	71%	N/A
WASTE	Generation of waste (kg per capita) (2012) All waste generated in a country per inhabitant and year, excluding major mineral wastes, dredging spoils and contaminated soils.	2.042	1.828	112%	N/A
	Municipal waste generation (kg per capita) (2013)	509	477	107%	N/A
	Landfill rate of waste (%) (2012) Waste landfilled as a percentage of total waste generated (excluding major mineral waste)	75	22	341%	20% (for Greece)
	Tons of waste recovered other than energy recovery and except backfilling / total tons of waste treated (%) (2012)	4	36,4	11%	N/A
	Tons of waste treated with energy recovery/total tons of waste treated (%) (2012)	0,2	4,4	5%	N/A
	Recycling rate of municipal waste (%) (2013) Recycled municipal waste / total municipal waste	19,3	42,3	46%	60% (Additional 5 years for Greece)
	Recycling rate of packaging waste (%) (2012)	58,6	64,6	91%	75%

* Selection was based on The Ellen MacArthur Foundation's publication titled "Delivering the Circular Economy - A toolkit for policymakers"

Resources:

- Resource productivity: Eurostat, last viewed at 11/04/16, http://ec.europa.eu/eurostat/statistics-explained/index.php/Resource_productivity_statistics
- Artificial land productivity: Eurostat, last viewed at 11/04/16, http://ec.europa.eu/eurostat/en/web/products-datasets/-/T2020_RD100

Waste:

- Waste per capita: Eurostat, last viewed at 11/04/16, http://ec.europa.eu/eurostat/statistics-explained/index.php/Waste_statistics
- Municipal waste generation: Eurostat, last viewed at 11/04/16, http://ec.europa.eu/eurostat/statistics-explained/index.php/Waste_statistics
- Landfill rate of waste: Eurostat, last viewed at 11/04/16, [http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Share_of_waste_landfilled_from_waste_generated_\(excl_major_mineral_wastes\)_by_country,_2012_\(%25\).png](http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Share_of_waste_landfilled_from_waste_generated_(excl_major_mineral_wastes)_by_country,_2012_(%25).png)
- Tons of waste recovered other than energy recovery and except backfilling / total tons of waste treated : Eurostat, last viewed at 11/04/16, http://ec.europa.eu/eurostat/statistics-explained/index.php/Waste_statistics
- Tones of waste treated with energy recovery/total tones of waste treated, last viewed at 11/04/16, http://ec.europa.eu/eurostat/statistics-explained/index.php/Waste_statistics
- Recycling rate of municipal waste: Eurostat, last viewed at 11/04/16, http://ec.europa.eu/eurostat/en/web/products-datasets/-/T2020_RT120
- Recycling rate of packaging waste: Eurostat, last viewed at 11/04/16, http://ec.europa.eu/eurostat/statistics-explained/index.php/Packaging_waste_statistics

Introduction

Indicative Circular Economy indicators

INDICATIVE CIRCULAR ECONOMY INDICATORS					
ASPECT	INDICATOR	GREECE	EU28	GREECE / EU28	2030 TARGETS Based on the CE Package
ENERGY	Energy productivity (euro per kilogram of oil equivalent) (2014) The indicator results from the division of the gross domestic product (GDP) by the gross inland consumption of energy for a given calendar year. It measures the productivity of energy consumption.	7,6	8,2	93%	N/A
	Share of renewable energy in gross final energy consumption (%) (2014)	15,3	16	96%	20%* (for 2020)
EMISSIONS	Greenhouse gas emissions intensity of energy consumption (2013) The indicator is measured in comparison to the values for the year 2000 (Index 2000 = 100)	95,7	89,8	107%	N/A
	Greenhouse gas emissions per capita (tones of CO₂ eq) (2013)	9,6	8,8	109%	N/A
INNOVATION	Eco-Innovation index (2013) 16 indicators from eight contributors in five areas: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, environmental outcomes and socio-economic outcomes	66	100	66%	N/A

* Based on the National Renewable Energy Policy. The target is 2% above the mandatory 18% level.

Energy:

- Energy productivity: Eurostat, last viewed at 11/04/16, http://ec.europa.eu/eurostat/cache/metadata/en/t2020_rd310_esmsip.htm
- Share of renewables: Eurostat, last viewed at 11/04/16, http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_31&plugin=1

Emissions:

- Greenhouse gas intensity: Eurostat, last viewed at 11/04/16, <http://ec.europa.eu/eurostat/web/products-datasets/-/tsdcc220>
- Greenhouse per capita: Eurostat, last viewed at 11/04/16, http://ec.europa.eu/eurostat/en/web/products-datasets/-/T2020_RD300

Innovation:

- Eco Innovation Index: Eurostat, last viewed at 11/04/16, http://ec.europa.eu/eurostat/cache/metadata/DE/t2020_rt200_esmsip.htm

Study objective and approach

Objective and approach

Objective

The objective of this study is to promote the potential for transformational change that the Circular Economy can bring to the status quo of the Greek economy, both upstream and downstream, including the disruptive resolution of chronic confrontation topics, such as waste management, and extending to the provision of investment opportunities, as a catalyst towards sustainable growth. The study is commissioned by SEV Business Council for Sustainable Development (SEV BCSD) and authored by EY.

Approach

In order to meet the objective of raising awareness and stressing the need for action on the transition to the Circular Economy in Greece, the study was developed in two phases. The first phase included the documentation of the current legislative and regulatory framework regarding the Circular Economy at both the EU and the national level. The second phase included the documentation and analysis of the current business approach for selected sectors, across the product life cycles, and perspectives towards the Circular Economy, based both on primary and secondary research.

Stakeholder engagement

The stakeholder engagement approach was based on stakeholder dialog/conversations with business associations and other third parties, acknowledged on page 48, which was identified early as a key element and objective of the study. This approach was deemed necessary in order to collect sector specific data that may not have necessarily been publicly available, to understand material and product flows, to document current Circular Economy models applied and potential models to be applied in the future, to assess the current state of each sector against specific circularity aspects, as well as to discuss existing barriers and potential policy interventions towards a successful transition. Our methodology on the sectorial assessment can be found on pages 27-28.

A list of the relevant business associations and other third parties was developed and agreed with SEV BCSD. Some of the data capture was made through interviews in which the objectives and purpose of the study were clearly communicated to the stakeholders.

Desk-based research

In order to prepare for the stakeholder engagement meetings, as well as to complement the findings for Greece and research on European level information, we additionally performed a desk-based research. A complete reference list of sources is included as footnotes across the study. Additional sources used for the sectorial research can be found cited as endnotes within the sector chapters. We reviewed various literature publications which included: Circular Economy stakeholder reports (based primarily on publications from The Ellen MacArthur Foundation), academic articles and sector research papers, including publications of European sectorial associations.

Limitations

- ▶ Our work consisted primarily of analysis and synthesis of information and data made available or collected through primary and secondary research. Unavailability of information has been a major challenge throughout this study, which is a limitation that could have potentially impacted the completeness of provided information and relevant conclusions.
- ▶ The transition to the Circular Economy includes significant uncertainties on a global level and across sectors. This study does not provide definite conclusions or a one-way approach to this transition but instead, reaches high level conclusions from the analysis of the current state and proposes initiatives that could provide further insights at sectorial and national level with the aim to facilitate this transition.
- ▶ The Circular Economy obviously applies differently to each sector examined, as each one faces diverse challenges and priority issues across its value chain. In order for this study to provide valuable information for each sector separately, but at the same time be able to reach horizontal level conclusions, we proceeded with identifying specific key aspects of the Circular Economy, such as the source of energy, type and origin of feedstock used, the way main waste streams are treated, and whether any Circular Economy business models are applied as mainstream, in those phases of each sector's product life cycle where each of these aspects are most relevant/material (i.e. for some sectors the aspect of waste was discussed at the "production" phase, rather than on the "extraction" phase). Limitations to this rule are marked separately on each sector.
- ▶ The conclusions on the level of circularity of the sectors under the scope of this study are based on a qualitative analysis, and do not differentiate in exact quantitative terms between the early transitional sectors and the late transitional ones.

01

Legislative and regulatory framework

Is Greece keeping up the EU pace?



Introduction - the EU agenda

EU Circular Economy strategy

During the past few years, the notion of the Circular Economy has started to emerge and is now gaining ground in the agendas of policy makers around the world as a promising alternative model that will facilitate the transition to a more sustainable future. Several initiatives currently exist, at governmental, NGO and business level, with the aim to provide the global community with research and evidence on the value created from the Circular Economy models for businesses and for society at large.

Emphasizing on the importance of resource efficiency and how it affects the competitiveness of the European economy, the European Commission published the communication 'Towards a Circular Economy: A zero-waste programme for Europe' where it described the Circular Economy as being essential for moving to a resource efficient Europe and for achieving sustainable growth. This communication was part of a Circular Economy package adopted by the commission on July 2014, which consisted of additional communications on the resource efficiency of buildings, on green employment and a green action plan for SMEs. The package also included a legislative proposal for the review of the targets included in three Directives, namely the Waste Framework Directive, the Landfill Directive and the Packaging and Packaging Waste Directive.

In February 2015, the Commission officially withdrew its proposal for the review of waste legislation based on the reasoning that (a) the proposal was not ambitious enough, focusing on waste management without considering the wider circular perspective and (b) it should have been more country specific. In response to this withdrawal, the Commission informed of its intention to bring a new Circular Economy package by the end of 2015. Following a Circular Economy conference and a public consultation period, the Commission adopted the new package on the 2nd of December 2015.

The package addresses issues in the entire life cycle of products and includes areas such as the use of secondary materials, product and eco-design, production processes, consumption and waste management. The aim is to promote better product design within the EU in order to increase products' life time, reparability, reuse and recycling^{1,2}. According the respective EC Press Release, the key actions adopted to be carried out under the current Commission's mandate include:

- ▶ Funding of over €650 million under Horizon 2020 and €5.5 billion under the structural funds
- ▶ Actions to reduce food waste including a common measurement methodology, improved date marking, and tools to meet the global Sustainable Development Goal to halve food waste by 2030
- ▶ Development of quality standards for secondary raw materials to increase the confidence of operators in the single market;
- ▶ Measures in the Ecodesign working plan for 2015-2017 to promote reparability, durability and recyclability of products, in addition to energy efficiency
- ▶ A revised Regulation on fertilisers, to facilitate the recognition of organic and waste-based fertilisers in the single market and support the role of bio-nutrients
- ▶ A strategy on plastics in the Circular Economy, addressing issues of recyclability, biodegradability, the presence of hazardous substances in plastics, and the Sustainable Development Goals target for significantly reducing marine litter
- ▶ A series of actions on water reuse including a legislative proposal on minimum requirements for the reuse of wastewater.

The new Circular Economy package consists of the Commission's communication 'Closing the loop - An EU action plan for the Circular Economy' and a set of legislative proposals on waste. These proposals include the following common EU waste targets by 2030:

- ▶ 65% recycling of municipal waste (allowing for a number of countries, including Greece, additional five years to meet the target)
- ▶ 75% recycling of packaging waste
- ▶ landfill to a maximum of 10% of all waste

It is also worth mentioning that the package has been partially criticized for not being ambitious enough to make the move towards the Circular Economy.

Sources:

¹ European Commission, 2015, Circular Economy, Factsheet: Closing the loop: Helping consumers choose sustainable products and services

² European Commission, 2015, Circular Economy, Factsheet: Closing the loop: The Production Phase of the Circular Economy

Methodology for Phase 1: Legislative and regulatory framework

Phase 1 documents EU and Greek legislation, regulation, and other governmental initiatives, regarding the Circular Economy. Given the vast array of issues covered by the Circular Economy, the scope definition and selection of relevant EU and Greek legislation, regulation, and other governmental initiatives was limited to the criteria mentioned in the current state documentation framework agreed with SEV BCSD, per category of required information. Sources used to identify the required information are also found in the framework, along with other key aspects that were part of the documentation and analysis.

Our selection criteria for documenting the Circular Economy related EU legislation were based on the legislation included in the European Commission's roadmap titled "Circular Economy strategy" published on April 2015, the European Parliament's "Report on resource efficiency: moving towards a Circular Economy" published on June 2015, the legislation included in the European Commission's official webpage "Moving towards a Circular Economy", as well as the communication from the European Commission titled "Closing the loop - An EU action plan for the Circular Economy" of 02.12.2015. Our documentation included all types of EU legislation mentioned in the above sources such as Regulations, Directives, Decisions and EU soft law (i.e. communications, opinions, recommendations, guidelines and other). We recorded key information and facts, the status and the analysis of each document.

According to our documentation of the EU legislation, we researched how the European law has been implemented in the Greek legal system and we listed the related laws, draft laws, presidential decrees, ministerial and joint ministerial decisions. We performed a documentation of the Greek legislation similar to the European legislation and then we reviewed the degree of timely implementation of Greek legislation, and recorded the main findings of our analysis.

Finally, in order to provide a more holistic view, we expanded our inventory to governmental initiatives, within the EU, for the development of the Circular Economy. In order to proceed with documentation and analysis, we selected a benchmarking group of EU countries considered frontrunners in relevant implementation, and identified examples worth sharing for both awareness raising purposes, as well as for providing inspiration for policy makers in Greece. Results are presented on pages 19-25. These countries include The Netherlands, Belgium, France, Sweden and the United Kingdom. We also included selected 'Circulars 2016', which are leading Circular Economy awards program finalists for this category of governmental initiatives.

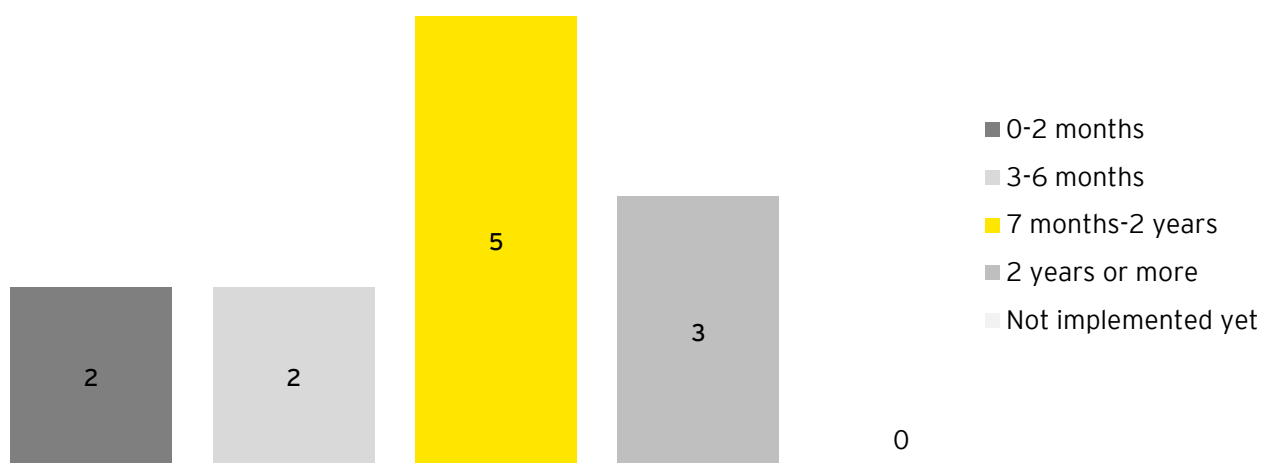
Implementation assessment

Implementation

At first reading it seems that Greece has fulfilled its obligations deriving from the *acquis communautaire*, however, upon further analysis it is evident that no Directive related to the Circular Economy has been implemented within the required deadline. In particular, the delays on implementation appear on the graph below.

Delays in most cases seem to exceed the period of one or two years following the implementation deadline, whereas the actual implementation and application of Directives related to the Circular Economy may have been delayed even more, until the required derivative legislative acts are issued.

Implementation delay in Greece



An indicative example is found on implementation of Directive 94/62/EC on packaging and packaging waste, of 20 December 1994. Member States were required to comply with this Directive before the 30th of June 1996. In Greece, Law 2939/2001 implementing 94/62/EC Directive, was set into force on 6.8.2001, 5 years following the implementation deadline. As per art. 24 of said legislation, the National Organization for the Alternative Management of Packaging and Other Waste was established with the objective to draw the national strategy for alternative management of packaging. However the legislative act for the set-up and operation of this organization was issued only in 2008 (P.D. 170/2008). It is therefore evidenced that there was in fact a delay of 12 years for the actual implementation of this Directive.

Implementation of Directive 94/62/EC on packaging and packaging waste

Issuance Date	Implementation Deadline	Implementation in Greece	Actual Implementation
20.12.1994	30.6.1996	6.8.2001	7.11.2008

Implementation assessment

Implementation

The case of hazardous waste management framework

Deficiencies in actual implementation have been particularly noted in the area of both hazardous and non-hazardous waste management. The aforementioned classification is based on the system for the classification and labelling of dangerous substances and preparations, as laid down in Annex III of Directive 2008/98/EC and are further specified by the Decision 2000/532/EC¹. Greece, as discussed, has already implemented Directive 2008/98/EC into the Greek legal system by virtue of Law 4042/2012.

It seems further that Greece has implemented into its national legislation all related European waste management legislation, covering a wide range of enactments for many waste types, hazardous, non-hazardous, municipal, industrial, hospital etc. Moreover, most means and options for waste management *"are also covered by corresponding technical specifications, from collection, implementation and transfer, to processing, utilization, incineration and final disposal/landfilling. Within this context, a series of more detailed technical enactments regulate particular issues like waste management sites; small sanitary landfills; the technical specifications of management projects; waste incineration; as well as the processes for alternative management of specific waste streams like packaging material, used tires, end-of-life vehicles (ELVs), used lubricants, batteries and accumulators, waste of electric and electronic equipment (WEEEs) etc"*.²

Nevertheless, reality is far distorted as it is indisputably demonstrated by the numerous referrals and cases brought before the Court of Justice of the European Union against Greece. In recent years Greece has been under a constant threat of being convicted for infringement of waste management legislation. Unfortunately, a large number of unlawful landfills still operates all over the country, despite the condemnatory decision of the aforementioned Court in 2005 and to this end in December 2014 the Hellenic Republic was ordered to pay a fine of €10 million and an additional fine every six months if the remaining 70 operating illegal landfills were not closed and the 223 sites which have been closed were not properly restored.³

Greece faced a similar situation in 2014 with regards to hazardous waste management. The European Commission referred Greece back to the Court of Justice of the European Union for poor treatment of hazardous waste, as five years after the first ruling, Greece was still failing to comply with EU standards. The 2009 ruling noted the absence of a management plan to deal with various types of hazardous waste, such as medical waste and chemicals, which persist in the environment for a long time and are likely to cause cancer (polychlorobiphenyls (PCBs) and polychloroterphenyls (PCTs). Greece under this ruling was required:

- ▶ *"To adopt an adequate management plan for hazardous waste*
- ▶ *To create adequate facilities to deal with the hazardous waste generated*
- ▶ *To tackle the issue of "historical waste which has been temporarily stocked until it can be efficiently managed"*.⁴

It is evidenced based on the aforementioned that implementation of the European legislative framework into the Greek legal system shall not be limited to the typical procedure of translating, repeating or rephrasing via a national legislative instrument of what has been agreed at European level, but it shall further include the political will to exercise all powers available to make this agreement operational and effective in practice.

Sources:

¹ European Commission, last viewed at 13/04/16, http://ec.europa.eu/environment/waste/hazardous_index.htm

² UN, Greece CSD - Chapter IV- Waste management, available at: http://www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/greece/Greece_CSD18-19-Chapter_%20IV-Waste_Management.pdf

³ JUDGMENT OF THE COURT (Grand Chamber), 2014, European Commission v Hellenic Republic, Reports of Cases, available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A62013CJ0378>

⁴ European Commission, 2014, Press release: Environment: European Commission asks Court to fine Greece for inadequate management of hazardous waste, Brussels

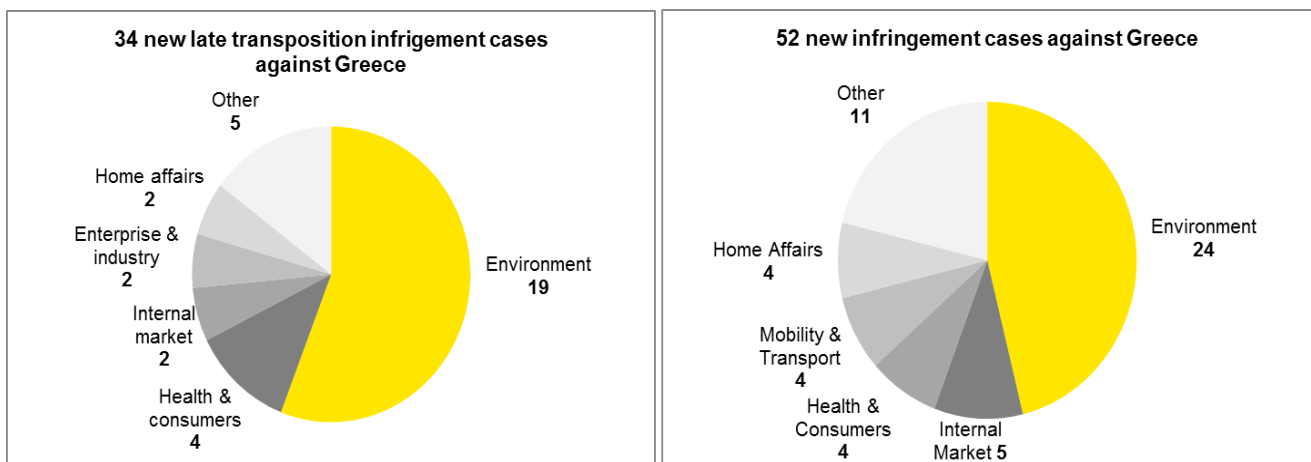
Implementation assessment

Infringements

The late implementations and the failures on actual implementation have led Greece to numerous cases before the Court of Justice of the European Union, in a percentage of 50% of the aforementioned Directives related to the Circular Economy.

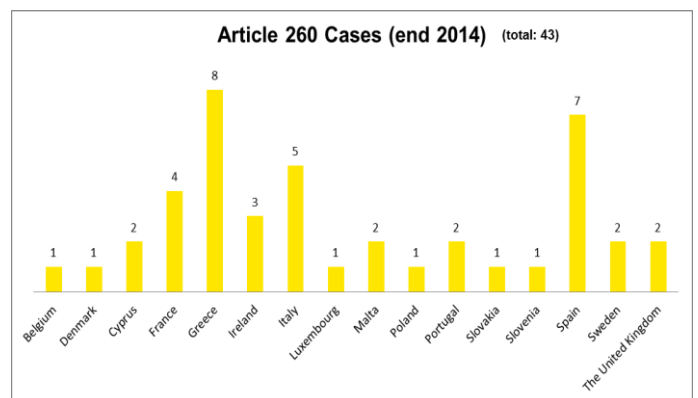
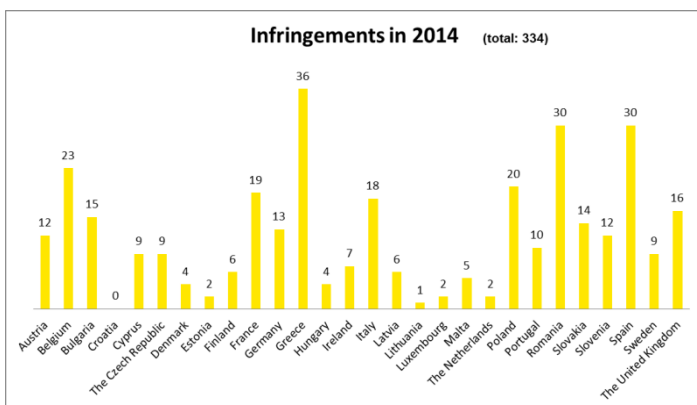
Monitoring the application of EU legislation in Greece

The approach of the Greek State to apply Circular Economy related legislation seems to not differentiate from the State's overall performance and approach towards the application of EU legislation. It is evidenced as shown in the following statistics that environmental issues remain the most vulnerable sector in terms of community law infringement.



Source: European Commission, 2014 Annual Report - Monitoring the application of Union law - Part II: Member States

The following data demonstrate without doubt that Greece is the Member State with the most infringements for environmental issues, whereas it has more open cases pursuant to Article 260 Treaty on the Functioning of the European Union (TFEU), meaning it has already failed to comply with a judgment of the Court of Justice of the European Union and to this the European Commission has brought the case again before the same Court, which may impose fines to Greece.



Source: European Commission, Statistics on environmental infringements, available at: <http://ec.europa.eu/environment/legal/law/statistics.htm>

Conclusion

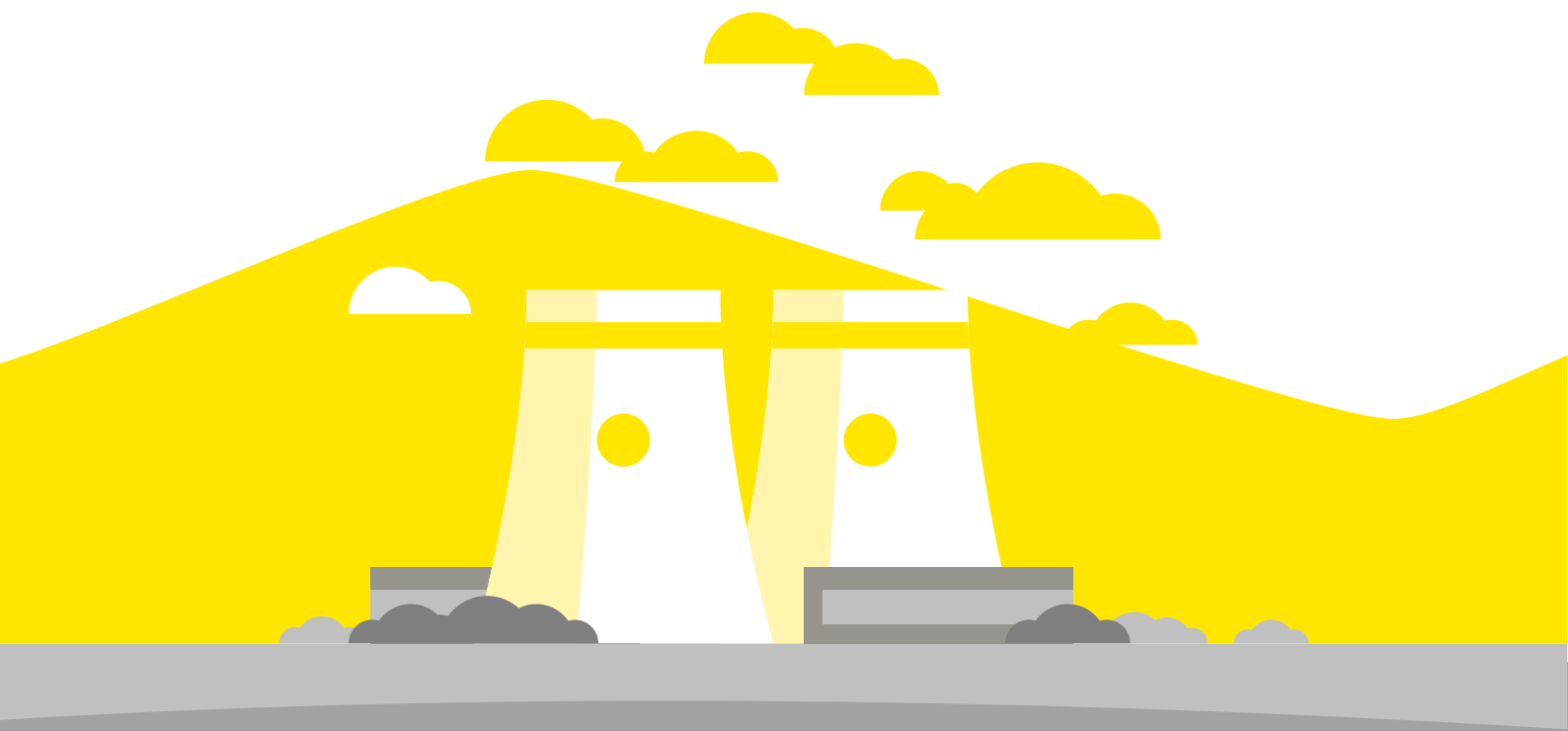
The aforementioned analysis demonstrates that the national level adoption of the legislative and regulatory framework linked to the Circular Economy reflects a short sighted and intermittent perspective. Although economic actors, such as business and consumers, are key in driving the transition process towards the Circular Economy, local, regional and national authorities have the mandate to enable it, while the EU has a fundamental role to play in supporting it. The aim is to ensure that the right regulatory framework is in place for the development of the Circular Economy in the single market, and to give clear signals to economic operators and society at large on the way forward with long term waste targets as well as a concrete, broad and ambitious set of actions, to be carried out before 2020¹.

Unfortunately, at national level this transition remains a chimera. Until April 2016 all Directives related to the Circular Economy have been typically implemented in Greece, however it is indicative that no Directive was implemented within the required deadline. Delays in some cases exceeded the period of one or two years following the implementation deadline. Actual implementation seems to have been delayed even more, until the required derivative legislative acts have been issued. As a direct impact, failures of implementation have led Greece to numerous cases before the Court of Justice of the European Union, with more than 50% of Directives related to the Circular Economy. **Therefore, it comes as no surprise that in 2014 Greece was the Member State with most infringements in the environmental sector within the EU.**

Hazardous waste management has been the most severely breached sector from an environmental perspective. Prolonged and unjustifiable delays in the implementation of basic legislative instruments, such as the Special National Hazardous Waste Management Plan, governmental inertia across several environmental issues, absence of transparent and deficient licensing regimes and lack of enforcement mechanisms have resulted in the imposition of fines which are among the highest within the EU.

The clear message deriving from the aforementioned analysis is that implementation of the European legislative framework into the Greek legal system should not be limited to the typical procedure of translating, repeating or rephrasing European law via a national legislative instrument, but it should further include **the political will to exercise all powers available to make this law operational and effective in practice, setting thus the required underpinnings for the transformation of the Greek economy to progress to the Circular Economy.**

For the main conclusions of this study please refer to pages 34-38.



¹ European Commission, 2015, Closing the loop - An EU action plan for the Circular Economy

Regulatory initiatives in EU benchmarking group of countries



The Netherlands

VANG - "From waste to resource program" [Category: Laws & Regulation, Subsidies, Partnerships]

"Based on the principles of Circular Economy, the Dutch government developed the 'From Waste To Resource programme' (VANG) to stimulate the transition towards a circular, waste-free economy. The programme covers a broad spectrum of waste-related themes and deploys a holistic approach to resource efficiency issues in the Netherlands. VANG's focus is on adapting the current waste policy into a transition to a Circular Economy, developing behavioral incentives for consumers, facilitating information sharing between municipalities, stimulating recycling in specific waste flows, developing market incentives for producers, connecting education to the Circular Economy and simplifying methods, indicators and labels. The government acts as the facilitating network player and, more specifically, is responsible for: shaping a legal framework; eliminating legal barriers; changing policies; providing financial support for research and educational programs; and stimulating both producers and consumers.

Key facts and impacts:

- Resources that 'leave' the economy via landfill or incineration to be halved in 10 years
- Improved household waste separation: 75% in 2020
- The Netherlands should be the 'circular hotspot' by 2020"

[source: <http://govsgocircular.com/cases/vang-from-waste-to-resource/>]

Ex'tax - increasing tax on resources and decreasing tax on labor [Category: Laws & Regulation - proposal]

"Ex'tax proposes a fundamental tax shift from labor to natural resource use to realize a circular, inclusive economy. This shift will make circular business models more successful, boost employment and provide incentives to use natural resources more efficiently. By increasing the tax on resources, the price will go up and demand of unsustainable products will go down. At the same time, lowering the tax on labor will make labor intensive business models more viable, increasing employment. The proposed tax shift can only be realized if international institutions, like the EU or a "coalition of willing member states", develop a long-term, fundamental reform.

Key facts and impacts:

- A case study of The Netherlands showed the possibilities for shifting € 33.7 billion in tax revenues from labor to natural resource use, while increasing employment rates and decreasing environmental impact."

[source: <http://govsgocircular.com/cases/extax-increasing-tax-on-resources-and-decreasing-tax-on-labour/>]

Eco Pro Fabrics [Category: Subsidies]

"EcoProFabrics is a joint project of six companies that close a textile and garment loop and work together to reduce the sector's environmental impact. The garments in this value chain are made of an innovative polyester fibre that can be fully reused. The aim of the project is to supply 30,000 garments to work wear users in a period of 3 years in at least 5 countries. The project is sponsored for 50% by the EU Eco-Innovation Initiative, which was vital for its success. The innovative part of the project, next to fabric and take back chain development is the development of the Circular Content Management System (CCMS).

Key facts and impacts:

- The Trevira fibre requires 99% less water and land than cotton to be produced
- By 2017 the Returnity® collection and a functional closed loop chain is ready for market up-scale
- Commitment of business partners to supply 30,000 garments in 3 years."

[source: <http://govsgocircular.com/cases/ecoprofabrics-value-chain-collaboration-for-circular-clothing/>]

Urban sharing program for electric vehicles [Category: Laws & Regulation, Partnerships]

"The city of Amsterdam has issued 700 city-wide permits specifically to encourage electric car sharing. Car2go, Daimler's subsidiary, is the main electrical vehicle sharing company making use of those permits. By increasing attractiveness of car sharing and the sharing rates themselves, ownership of a car becomes less attractive and the utilization rates of cars will increase. The permits issued by Amsterdam are for shared electric car vehicles without a fixed parking space. Car sharing organizations can apply for those permits, as Car2go has done and pay an annual fee for the privilege. In addition to issuing permits, the local government has also developed a charging infrastructure.

Key facts and impacts:

- 350 cars are rented 10.000 times weekly by its 25.000 thousand members
- A year after the introduction, over 300 members had sold their own car."

[source: <http://govsgocircular.com/cases/urban-sharing-program-for-electric-vehicles/>]

Regulatory initiatives in EU benchmarking group of countries



Belgium

Implementation of the European End-of-Life Vehicle Directive [Category: Laws & Regulations]

"The End-of-Life Vehicle (ELV) Directive was introduced in 2000 to correctly manage the annual 7 to 8 million tons of waste generated by ELVs in the EU. The aim is to increase the reuse, recovery and recycling rates of ELVs by making producers responsible through the setting of clear quantified targets. In 2012, 11 out of the 28 member states had already achieved recycling and reuse rates of 85% or higher. Belgium, in particular, stands out as one of the leading countries with a total recycling and reuse rate of 91% in 2013. The implementation of the Directive is supported by a national management body for ELVs that brings together, informs and supports producers, retailers, various stakeholders."

Key facts and impacts:

- 11 out of the 27 EU member states achieved an 85% reuse and recycling rate in 2012
- Belgium scored amongst the highest with 91% recycling and 94% recovery in 2013."

[source: <http://govsgocircular.com/cases/implementation-of-the-european-end-of-life-vehicle-directive/>]

Creating a market for high quality recycled aggregates [Category: Laws & Regulation]

"Within the construction industry, a lot of debris and demolition rubble is being sent to landfills while holding valuable materials. The introduction of a legal framework and a guarantee system around recycled aggregates enhances the market, increases recycling rates and ensures high quality. In 2011, the regional government established a legal framework to ensure the quality of recycled aggregates. Two existing certification institutions, before acting according to individual governance, are since obliged to base certification procedures on this common regulation."

Key facts and impacts:

- In 2013 a total of 12,6 million tons of recycled aggregates were certified according to the regulation
- The production volume of certified recycled granulates is increasing."

[source: <http://govsgocircular.com/cases/creating-a-market-for-high-quality-recycled-aggregates/>]

E-waste collection and recycling through a producer responsibility organization [Category: Laws & Regulation, Partnerships]

"In 1999, Flanders introduced the Acceptance Duty for waste electrical and electronic equipment (WEEE), which resulted in a environmental policy agreement between government and the federations of producers, and the formation of Recupel. The WEEE policy holds the retailer, intermediary and producer responsible for e-waste, urging the parties to unite and optimize collection and recycling rates. Recycled materials are to be re-introduced in new products, reducing the demand for virgin resources."

Key facts and impacts:

- In Belgium, Recupel collected 115.585 tonnes of e-waste in 2013
- This is 10,4 kg per capita in comparison to 7,7 kg per capita in 2007
- In 2013 there were 4982 collection points."

[source: <http://govsgocircular.com/cases/e-waste-collection-and-recycling-through-a-producer-responsibility-organisation/>]

The Flanders' Materials Programme [Category: Partnerships]

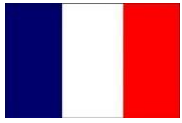
"In the Flanders' Materials Programme of 2012, government, industry, research centers and civil society have drafted a joint public-private agenda and action plan to realize the transition to a Circular Economy. Flanders is a frontrunner in recycling, but as current waste management is reaching its limits the Flanders' Materials Programme broadens the scope to include the whole value chain, with the ambition to let materials flow in closed loops. The programme started in 2012 on the basis of a quadruple helix cooperation agreement. A priority action plan has been drafted and the first results have been achieved on local, regional, national and EU level. Cases include among others, nutrient recuperation, industrial symbiosis and optimized e-waste collection and recycling."

Key facts and impacts:

- BE EU presidency was one of the catalysts for the EU resource efficiency and Circular Economy programme
- Creation of new industrial activity (e.g. in critical raw materials recycling, nutrient recuperation, thermoplastic composites, etc.)."

[source: <http://govsgocircular.com/cases/the-flanders-materials-programme/>]

Regulatory initiatives in EU benchmarking group of countries



France

The Circular Economy Institute [Category: Partnerships]

"The Circular Economy Institute was founded in February 2013, bringing together likeminded stakeholders in France to promote and accelerate the transition towards the Circular Economy. The institute functions as a national multi-stakeholder think-tank allowing the pooling of expertise and good practices of different parties. It also involves many projects that are under development and are expected to emerge in 2015.

Key facts and impacts:

- *The Institute already has over 150 member organizations*
- *In June 2014 the First Assembly of Circular Economy was launched in cooperation with the French National Environmental Agency*
- *The event gathered around 1.000 participants involved in Circular Economy."*

[source: <http://govsgocircular.com/cases/the-circular-economy-institute/>]

Programme Eco-Mobilier [Category: Laws & Regulations]

"Eco-mobilier is a "State-approved" not-for-profit collective private organization, to take care of waste domestic furniture, with shareholders being 12 retailers and 12 manufacturers. Manufacturers and retailers had to register with Eco-mobilier before May 2013 while producers have to add recycling fees to their product prices and pay them back to Eco-mobilier. The municipality and retailer collect furniture, Eco-mobilier recycles and recovers.

Key facts and impacts:

- *About 5000 producers had registered on Eco-mobilier web site by the end of 2013*
- *Almost 8 million euros of fees were collected in 2013 to finance furniture recycling and recovery."*

[source: <http://www.europur.org/>]

Regulatory initiatives in EU benchmarking group of countries



Sweden

E-waste recycling regulation: best practice of implementing the European WEEE regulation [Category: Laws & Regulation]

“Producers of electronic equipment are held responsible for the collection and treatment of their own products in accordance with the European WEEE directive. In Sweden, the measures came into effect years ago and new, more ambitious targets have been set. Sweden now has the highest collected waste per capita in Europe. The successful implementation in Sweden can be attributed to several factors. First of all, the government has set clear rules to ensure a level playing field for all manufacturers within a competitively neutral market. Secondly, from the consumer perspective, there already was a certain regard for sustainability, easing the collection of e-waste. For a fruitful implementation of the directive, manufacturers and municipalities need to work together in order to create efficient and competitively neutral collection and logistics solutions.

Key facts and impacts:

- *In 2010 the total collected e-waste had risen by 50% compared to 2003*
- *Total e-waste collected in 2013 was 17,39 kg per capita or 77% of what was put on the market that year.”*

[source: <http://govsgocircular.com/cases/e-waste-recycling-regulation-best-practice-of-implementing-the-european-weee-regulation/>]

European Insurance Solution PCC [Category: Laws & Regulation]

“The European Insurance Solution PCC, is a commercial party responding to the needs created by regulation and advocates mandating businesses to finance the recovery of future environmental damage to increase the incentives for circular models and to avoid externalization of costs. The financial solution must be reliable over time, and so they provide insurances and other financial guarantees. Handing over the costs of environmental impacts to the businesses that caused them creates incentives to decrease the environmental impact and increase recyclability rates.

Key facts and impacts:

- *All electronic products on the Swedish market are insured to cover future collection and recycling costs*
- *Money is set aside to cover the restoration costs of all new wind turbines in Sweden.”*

[source: <http://govsgocircular.com/cases/european-insurance-solution-pcc/>]

Recycling of ready for consumption beverage packaging [Category: Laws & regulation, Fiscal measures]

“The national government of Sweden employs a regulation stating that all one-way beverage plastic bottles or aluminium cans should be returned and recovered if they are not recycled. Beverage containers that are not registered under an approved recycling system are not allowed to be marketed. Private entities are responsible for operating the system and to comply with the standards set by the government.

Key facts and impacts:

- *The Swedish goal is to recycle 90% of beverage cans and plastic bottles*
- *Today the recycling level is around 89%.”*

[source: <http://govsgocircular.com/cases/recycling-of-ready-for-consumption-beverage-packaging/>]

Regulatory initiatives in EU benchmarking group of countries



United Kingdom

Zero Waste Plan of Scotland [Category: Laws & regulation, Subsidies, Partnerships]

“By publishing the Zero Waste Plan in June 2010, the Scottish government committed itself to shifting towards a more resource efficient economy by reducing resource use, improving the efficiency rates and preventing waste. The ZWP aims to ‘push’ waste up the waste hierarchy towards prevention, so that a greater amount of resources retain maximum value and are kept circulated within the economy, rather than exiting it. Accordingly, Zero Waste Scotland (ZWS), a not for profit company, was established to support the delivery of the plan and other low carbon and resource efficiency policy priorities. The company is principally funded by the Scottish government although it also receives European funds. In addition to providing funds, the Scottish government is involved in the regulation and implementation of the policy.

Key facts and impacts:

- The overall program budget for 2011-12 was £25 million
- Achieved a household waste recycling rate of 42,2%
- 2025 target is to have 70% recycled, and a maximum 5% sent to landfill
- 100% of energy production from renewables by 2020.”

[source: <http://govsgocircular.com/cases/zero-waste-plan-of-scotland/>]

Extending producer responsibility with ‘precycling premiums’ [Category: Laws & Regulation-proposal]

“Every product has a risk of ending up as waste in ecosystems and causing numerous societal issues. In order to tackle these problems and implement the Circular Economy, the UK-based Blindspot Think Tank proposes to extend producer responsibility to cover the risk of products becoming waste. A small insurance premium paid by producers, according to the waste-risk of their products, would be then spent on ‘precycling’ actions that cut waste-risk throughout society.

Key facts and impacts:

- Can be adopted in the EU, which would lead globally
- All sectors gain an EU-wide circular level playing field
- Minimal regulation and intervention by government
- Market based, GDP friendly economic instrument.”

[source: <http://govsgocircular.com/cases/extending-producer-responsibility-with-precycling-premiums/>]

Innovate UK [Category: Laws & Regulation]

“Innovate UK helps companies that see a future in a Circular Economy to innovate more quickly and support technologies and business models that back them. From the Resource Efficiency programme, projects across the entire economy are supported by funding, network events and advice. The agency is also deploying a focus on projects that are rooted in Circular Economy principles. The focus is on business models that reuse, repair, remanufacture or recycle resources.

Key facts and impacts:

- Around 60 business-led projects to date
- Some projects have been very successful and will develop as commercial solutions over the coming years.”

[source: <http://govsgocircular.com/cases/innovate-uk/>]

The Sunderland Partnership with Warp It [Partnerships, Public Procurement]

“The initiative is a private-public partnership between software developer www.warp-it.co.uk and the Sunderland Partnership, the latter of which consists of the University of Sunderland, the Municipal Council Hospital and more than four hundred not-for-profit businesses and schools. It aims to make the acquisition and borrowing of new and second-hand goods easier for staff members. In addition, it assists staff in finding storage for their goods. One of the key-success factors has been the active collaborative role of the government, and the willingness of stakeholders within each institution to join the programme.

Key facts and impacts:

- 50 tons of waste diverted and 4500 tons of supply chain waste was avoided due to not buying new products in 2013
- This led to a diversion of 185 tons of CO₂ emissions.”

[source: <http://govsgocircular.com/cases/the-sunderland-partnership-with-warp-it/>]

Regulatory initiatives in EU benchmarking group of countries



United Kingdom (cont'd)

National Industrial Symbiosis Programme [Category: Subsidies]

"The National Industrial Symbiosis Programme (NISIP) is the first national industrial symbiosis programme. It facilitates business opportunities by the trading of assets, resources, logistics and expertise between industries. By creating networks to find uses for unwanted materials, significant amounts of waste are diverted from landfill whilst companies benefit through reduced disposal costs and the generation of additional revenues resulting from adding value to previously underused resources. The three key success factors are the role of the independent facilitator, quality data, and a proven, cross-sector business engagement model which together combine to "Connect Industry and Create Opportunity".

Key facts and impacts:

- £1 billion cost savings achieved and £1.4 billion generated in additional sales
- Over 10.000 jobs created or safeguarded
- 45 million tons materials recovered and reused, 39 million tons industrial carbon emissions reduced and 71 million tons industrial water savings made."

[source: <http://govsgocircular.com/cases/national-industrial-symbiosis-programme/>]

New resource efficient business models by REBus [Subsidies, Partnerships]

"The REBus project sets out to demonstrate the financial and resource benefits of moving towards more circular business models both in terms of supply and demand. By developing new business cases, piloting them with forward thinking businesses, and evaluating the impact, REBus minimizes the risk and costs to businesses involved. Subsequently, REBus provides guidance to large corporates and SME's in making the transition to and applying the new resource efficient business models (REBMs).

Key facts and impacts:

- Targets for the project include a 5.000 tons direct material savings per annum, 20.000 tons of GHG emissions savings and €12 million financial benefit
- Project focusses on businesses with total annual value of over €350 billion across the EU."

[source: <http://govsgocircular.com/cases/new-resource-efficient-business-models-by-rebus/>]

The reuse and redistribution of furniture in Surrey [Category: Subsidies, Partnerships]

"The Surrey Reuse Network (SRN) was established in 2010 for all individual Furniture Reuse Organizations (FROs) to work collaboratively to deliver more coordinated, efficient and effective reuse services across the county. The SRN supports all its members, through upfront grants to help build capacity, quarterly furniture re-use credits, as well as funding county-wide communication campaigns and ongoing marketing support.

Key facts and impacts:

- Currently diverting 660 tons of furniture from landfill each year
- In 2013 the diversion to reuse is up by 22% and recycling by 100% compared to 2011-2012
- Assisting over 5,000 low-income households, and offering volunteering/ work-based training opportunities to 400 people a year."

[source: <http://govsgocircular.com/cases/the-reuse-and-redistribution-of-furniture-in-surrey/>]

Additional regulatory initiatives

The Circulares 2016 selected finalists

City of Sydney, Australia [Partnerships]

"In Sydney, Australia, 80 percent of the 25,000 tons of waste generated by office space release goes to landfill. The Better Buildings Partnership, a collaboration of 23 major property owners and influencers, overseen by the City of Sydney, has seized the opportunity for radical market change. Via large scale collaborations, proof-of-concept trials and changes to waste management processes, the Better Buildings Partnership has already demonstrated that it can achieve 60 percent recovery at no additional project cost. In addition, the City of Sydney formed a partnership with Good 360, to distribute unwanted commercial goods to charities through a national distribution network, and has rehomed 200 tons of materials since 2013 to those who need them most.

Key facts and impacts:

- 60 percent recovery at no additional project cost."

[source: <https://thecirculars.org/finalists#the-award-for-circular-economy-governments-cities-regions>]

City of Citrus Heights, California, USA [Partnerships]

Citrus Heights, California signed on for the first-ever Energy Bag Pilot Program, a public-private collaboration with Dow and other partners to mine fuel from typically non-recycled plastics (NRP), keeping them from landfills. Citrus Heights was introduced to a new way to recycle, requiring virtually no extra effort by its residents. Approximately 26,000 households received "Energy Bags" to collect plastics not currently eligible for mechanical recycling.

Key facts and impacts:

- Approximately 6,000 pounds were diverted from landfills and 512 gallons of synthetic crude oil were produced."

[source: <https://thecirculars.org/finalists#the-award-for-circular-economy-governments-cities-regions>]

The business perspective

Where do the Greek sectors stand against the Circular Economy?



Methodology for Phase 2: The business perspective

The second phase of our methodology consisted of a sector by sector analysis based on a documentation of the main material and product flows within the respective life cycles, a current state assessment and gap analysis against specific aspects of the Circular Economy for the selected sectors in Greece and the EU, an identification of specific Circular Economy models currently applied as mainstream practices in Greece and the EU, inclusion of indicative international leading practice examples for the selected sectors, as well as main barriers and proposed policies for facilitating the transition to the Circular Economy in Greece.

The sectors under the scope of this study include the following, in alphabetical order:

1. Aluminium
2. Cement
3. Construction
4. Electricity
5. Food & Beverage
6. Information and Communications Technology (ICT)
7. Refining
8. Steel

Note: The ICT sector has been approached from a product-based perspective, focusing on telecommunication services and equipment, which represent almost 70% of the ICT's market's value in Greece¹.

Apart from these sectors discussed above, our study includes a high level overview of the role of logistics, in the context of the transition to the Circular Economy. The recently adopted, by the European Commission, Circular Economy Package, published on December 2, 2015, includes among its priority areas the need for horizontal measures that will enhance the transition to the Circular Economy, especially given its systemic nature. In this context, reverse logistics is expected to play an integral role in the context of the transition to the Circular Economy. Reverse logistics is the return of the products that reached their end of usage to their source of origin and by doing so capturing value that was destined to be lost. According to the Ellen MacArthur Foundation, *"the global dimension of the Circular Economy and supply chains is prominent in areas such as sustainable sourcing, marine litter, food waste, and an increasingly globalized market for secondary raw materials"*².

The Circular Economy obviously applies differently to each sector of our study, as each sector faces diverse challenges and priority issues across its value chain. In order for this study to provide valuable information for each sector separately, but at the same time be able to reach horizontal level conclusions, we proceeded with the following approach:

1. Identification of main Circular Economy topics for each specific sector

We identified main Circular Economy topics for each specific sector through desktop review, stakeholder engagement and identification of leading practices, mainly at European level. A comprehensive list of leading practices per sector has been submitted to SEV Business Council for Sustainable Development.

2. Documentation of material and product flows

In order to identify whether these main Circular Economy topics apply for each of the Greek sectors, we proceeded with an understanding and high level documentation of each sector's main material and product flows, based on desktop review, including aspects selected from the European Commission's Circular Economy Package, published on December 2, 2015 and discussions with the involved stakeholder groups (mainly sectorial business associations acknowledged on page 48).

Sources:

¹ EITO/SEPE, 2015, ICT Market Report 2015/ 2016-Study for the Information Technology and Communications market 2015/ 2016, Athens

² Ellen MacArthur Foundation, 2015, Growth Within: A circular economy vision for a competitive Europe

Methodology for Phase 2: The business perspective (cont'd)

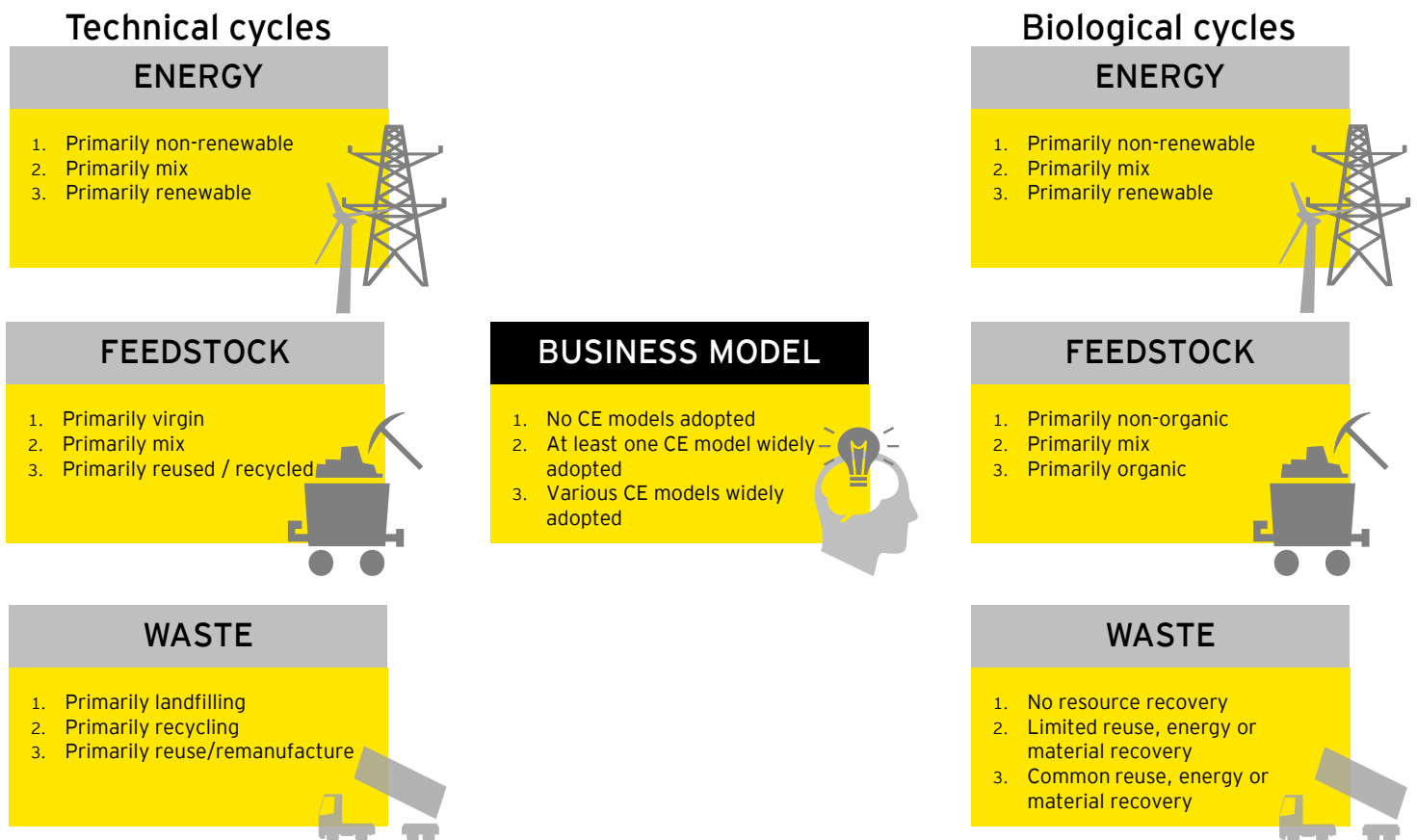
3. Development of assessment criteria for the sectors under scope

Our approach to assessing the level of circularity for the selected sectors in Greece, aims to provide valuable information for each sector separately. However, to be able to also reach horizontal level conclusions, we identified key aspects of the Circular Economy and assessed each sector against these. The three out of the four selected aspects include (i) the main source of energy used, (ii) the main type and origin of feedstock used, and (iii) the way main waste streams are treated, in those phases of each sector's product cycle where each of these three aspects are most material (i.e. for some sectors the aspect of waste was discussed at the "production" phase, rather than on the "extraction" phase). Limitations to this rule are marked on the chapter of each sector, included in the main edition of this study, on a case by case basis.

Apart from these three aspects, the assessment was also based on a final fourth aspect (iv) which was whether the five circular business models coined by Accenture ("Accenture Strategy, 2014, Circular Advantage Innovative Business Models and Technologies to Create Value in a World without Limits to Growth, Accenture") are applied as a mainstream business practice for these sectors in Greece. These models are described on page 29.

A high-level qualitative scaling system was then developed for each of these four in total aspects, as found below. The principal idea behind the scale was to reflect the linear (scale #1), the transitional (scale #2), and the ideal circular (scale #3) approach per aspect. This scaling system was applied to each sector under scope, reflecting a high level current state description against the selected aspects for both Greece and EU28, thus allowing a triple level gap assessment (Greece VS EU28 VS ideal CE state).

In order to better adjust the scale to the technical and biological cycles we proceeded with the alterations in scaling descriptions for "Feedstock" and "Waste". In cases that additional Circular Economy aspects (i.e. energy efficiency, carbon intensity) were found through our research to be primarily important for specific sectors, we have included these in the respective sector chapter, included in the main edition of this study, but not on the gap assessment spider diagram as such.



Circular business models

The Circular Economy requires businesses to develop new business models that will emerge as the medium for transformation. These business models are based on an earnings model, with a personal return for the business operator. Accenture¹ (2015) has distinguished 5 different models, that were adopted by Rabobank (2015) and ING (2015), and are used in this study in order to assess the maturity of selected Greek sectors. A brief description and an indicative example for each business model can be found below.



Circular supplies

Description: This first business model, arguably one of the pillars of the Circular Economy, should help companies shift from finite, non-renewable input resources to ones that are renewable, bio-based and biodegradable. This way companies can stop putting pressure on finite and in many times scarce stocks all the while safeguard themselves from resource availability and price volatility issues.

Example: Neste, the Finnish refining company, has established in the Netherlands the first bio-LPG production installation in the world. The installation will capture bio-LPG from the side stream gases of its Rotterdam facility that produces biodiesel from various wastes and vegetable oils.

[Source: <https://www.neste.com/en/neste-breaks-ground-worlds-first-bio-lpg-facility-rotterdam>]



Resource recovery

Description: The resource recovery business model builds upon existing recycling and reverse logistics structures and through innovative initiatives aims to minimize waste by recovering every possible remaining value from products that have reached their end-of-life or from by-products. For example, energy could be recovered from organic by-products or waste and products that have been designed with eco-design principles could be used in the manufacturing of new and different products.

Example: A USA firm, Ecovative, is using agriculture byproducts to create compostable alternatives to petroleum-based plastics. The byproducts are combined with mycelium and this mixture produces a material that performs a lot like plastic and is fully biodegradable.

[Source: http://www.ellenmacarthurfoundation.org/case_studies/ecovative, <http://www.ecovatedesign.com/how-it-work>]



Product life extension

Description: By applying the product life extension business model, companies can maintain a product in a working condition for a longer period of time via repairing, refurbishing or remanufacturing. By doing so, the company can capture additional value, a value that would otherwise be lost, by selling the repaired product to a secondary market or by just benefiting from its continued use. This model would greatly benefit from products that are designed with the end-of-life in mind in order to be more easily handled.

Example: A UK based company called Re-Tek, is for years now collecting WEEE from many companies and businesses and after repairing the ones that could be repaired, it sells them on secondary markets. The company processes around 7000 ICT items per month and aims to expand to Consumer IT.

[Source: <http://re-tek.co.uk/>]



Sharing platforms

Description: Companies or individuals who wish for the improvement of their product and/or asset utilization rates could benefit from this business model. Product/asset users with different needs could work together and by sharing, they could create value out of otherwise underutilized products or assets.

Example: Snappcar, introduced in the Netherlands, is a mobility platform that allows the renting of private cars. When a car is not used regularly it can be rented out to individuals, and Snappcar by offering insurance guarantees wants to incentivize more people to list their cars on the website.

[Source: http://www.eco-innovation.eu/index.php?option=com_content&view=article&id=437%3Asnappcar&catid=68%3Anetherlands&Itemid=68]



Product as a service

Description: This final business model, focuses on providing the use of a product instead of the product itself. Customers will not own it, but instead rent it or pay for it depending on the use they make. Companies that wish to apply this model will have a better control of the product and thus what happens to it after its end-of-life and will have more incentive to capture any residual value and keep it as utilized as possible. In order for this to work, products should be chosen with different criteria: durability, reparability and end-of-life design should top the list of desired attributes.

Example: A company in the Netherlands called Bundles, is offering pay-per-use washing machines. Clients are charged only according to the number of times they used the washing machine, while the company, by using Internet of Things, is being able to monitor the use and make custom made suggestions about the more efficient use of the product.

[Source: http://www.ellenmacarthurfoundation.org/case_studies/bundles]

Key findings from the Greek sectors under scope

Circular models currently applied as mainstream



Circular supplies

0



Resource recovery

5



Product life extension

1



Sharing platforms

3



Product as a service

0

The Circular Economy business model most widely implemented by the sectors under scope is resource recovery. The sharing platforms model is second, implemented mostly in the Electricity and ICT sectors. Indicatively:

Resource recovery model currently applied in Steel sector:

The Steel industry, being completely independent of iron ore, uses exclusively scrap as its primary resource for the production of steel, thus reclaiming this valuable resource which would otherwise end up in landfills. All Greek steel makers apply the model of resource recovery, currently also widely applied by the steel makers in the EU.

Product life extension currently applied in Construction sector:

Product life extension is currently a mainstream practice for the Construction sector. This is the case for maintenance and reparation of construction projects, as well as renovations in buildings. Extending the lifetime of a construction project is generally the preferred option against starting a new construction project from the beginning.

Sharing platforms model currently applied in the Electricity sector:

All electricity producers share a common transmission and distribution platform. The sharing platforms business model aims at increasing the utilization and value obtained from products and assets by promoting sharing among different users. Energy producers benefit from the use of the common networks avoiding unnecessary infrastructure development costs and at the same time the utilization of the existing transmission system and distribution network is maximized.

Key findings from the Greek sectors under scope

Overall level of circularity

Linear	3	Out of the 8 sectors under the assessment, 5 were found at a transitional phase and 3 were found at linear. The main characteristic of the sectors assessed as being at the transitional phase, relates to the “waste” aspect. These sectors usually implement some circular activity of lower value, mainly resource recovery and/or recycling, contrary to the sectors assessed as being at the linear phase, the waste of which is primarily disposed. No differences were identified at the “business model” aspect, where at least one CE business model is implemented for all sectors. Nevertheless, one should bear in mind that a key feature of the Circular Economy is to be restorative and regenerative by design. The recovery of materials and products should not only be addressed at the end-of-life stage, but should also be taken under consideration at the design stage, along with quality, durability, upgradability, efficiency, modularity and easy maintenance.
Transitional	5	
Circular	0	

Energy

Linear Primarily non-renewable	8	Non-renewable sources are the main source of energy for all sectors under scope, a key characteristic of a linear economy. This is due to the fact that all of the sectors under the scope of the study use electricity from the national grid as their primary source of energy, which mainly originates from non-renewable sources. According to the Ellen MacArthur Foundation ¹ : “The energy required to fuel the Circular Economy should be renewable by nature, in order to decrease resource dependency and increase systems resilience (to oil shocks, for example). This will be further enabled by the reduced threshold energy levels required in the Circular Economy”. Therefore, relying primarily on non-renewable sources is considered as a linear approach while a transitional economy would use both types of energy sources in a more balanced way.
Transitional Primarily mix	0	
Circular Primarily renewable	0	

Source:

¹ Ellen MacArthur Foundation, 2015, Towards a Circular Economy: Business Rationale for an accelerated transition

Biological feedstock (Food & Beverage Sector)

Linear Primarily non-organic	1	The Food & Beverage sector is using primarily non-organic feedstock for its production processes, a linear economy feature. The use of organic feedstock is also adopted by the sector at a lesser extent. The use of organic feedstock can be considered as a metric of circularity since it contributes in preserving and enhancing the natural capital (Circular Economy principle 1). Use of non-organic feedstock can be considered as a linear approach. The transitional economy would use mixed sources of feedstock. Although Greece is one of the six EU countries that have more than 10% of their total utilized agricultural area under organic farming, the majority of agricultural products originate from non organic farming. Regarding fish farming, total organic farming for sea bass and sea bream is approximately 1% of total production in Greece.
Transitional Primarily mix	0	
Circular Primarily organic	0	

Key findings from the Greek sectors under scope

Technical feedstock (Aluminium, Cement, Construction, Electricity, ICT, Refining, Steel)

Linear

Primarily virgin

6

With the exception of the Steel sector, which uses only steel scrap for producing steel, all the other sectors are primarily relying on virgin materials as feedstock, following the linear approach. This is mainly due to the fact that the demand for secondary or recycled materials is low, either because these materials are not competitive or because there is a low supply in the market. In a Circular Economy the technical materials would primarily be non-virgin, either reused, remanufactured, or recycled. In a transitional economy, both virgin and non-virgin would be used in a more balanced way.

Transitional

Primarily mix

0

Circular

Primarily reused/recycled

1

As an indicative example from the linear category, in the case of the Cement sector, input resources are primarily mined virgin materials which constitute 85% of total feedstock, while 15% are alternative raw materials, originating from waste, such as fly ash from the combustion of lignite, furnace slag and other.

Waste (Aluminium, Cement, Construction, Electricity, ICT, Refining, Steel)

Linear

Primarily landfilling

3

In a linear economy, waste is primarily disposed after use, whereas in a transitional economy, waste is treated based on lower value circular activities, such as recycling or other recovery activities. In a Circular Economy, higher value activities such as sharing, reusing, repairing and remanufacturing are mainstream.

Transitional

Primarily recycling

3

Circular

Primarily reuse/remanufacture

1

Three of the sectors under scope use recycling and resource recovery as their primary waste treatment method (Aluminium, Refining, Steel), while the majority of waste for another three of the remaining sectors under scope (Construction, Electricity, ICT) is disposed. In the case of the Cement sector, the majority of waste produced up until the cement production phase is reused as an input in production. For the purposes of this study the Cement sector is examined only up until the cement production phase. The concrete production and construction phases are excluded and examined in the Construction sector.

Waste (Food & Beverage Sector)

Linear

No resource recovery

0

Transitional

Limited reuse, energy or material recovery

1

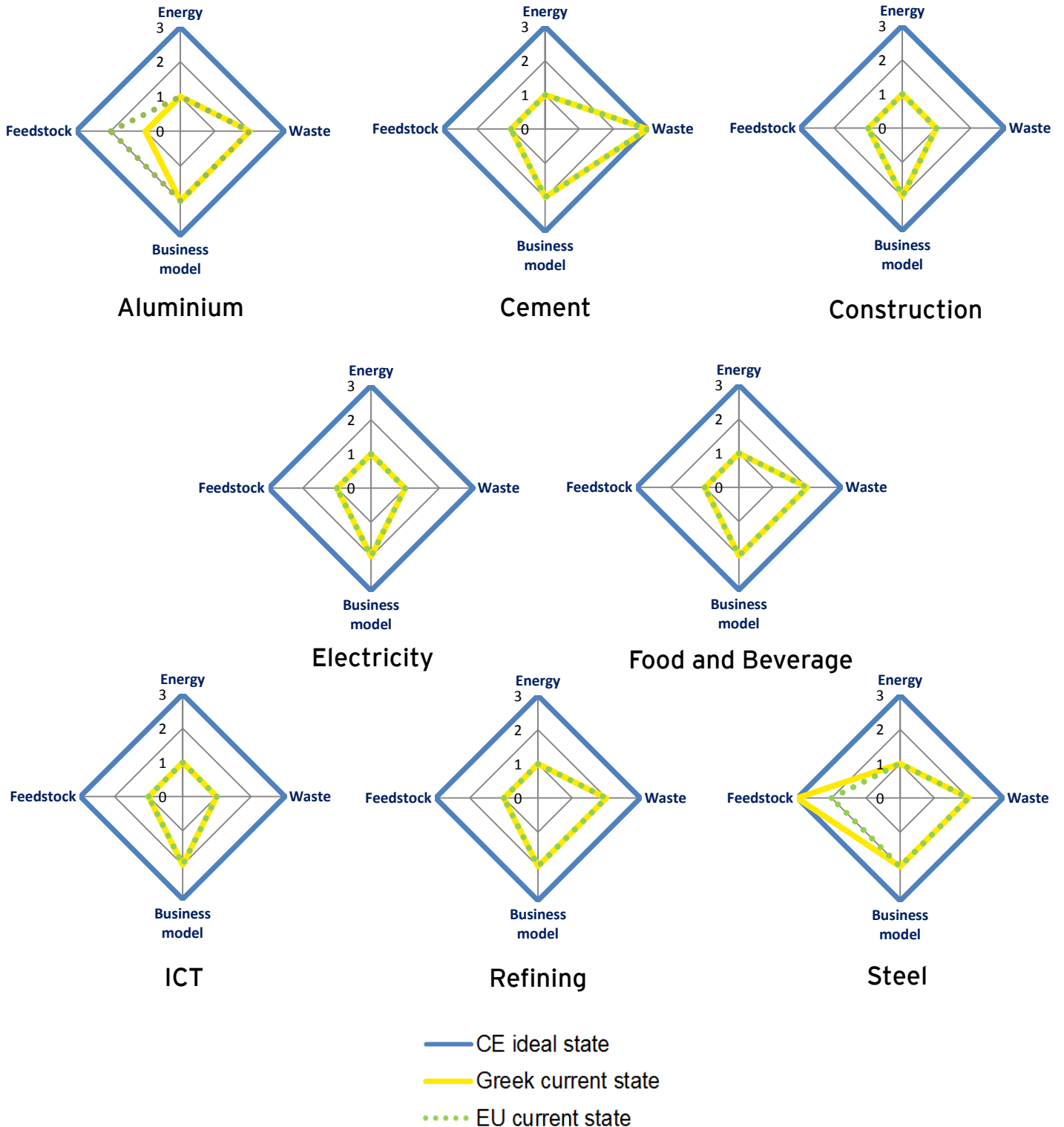
Circular

Common reuse, energy or material recovery

0

In a linear economy, biological waste is primarily disposed with no energy or material recovery. In a Circular Economy, biological waste would be treated in order to extract valuable materials for further use and to recover energy, without disposal. In a transitional economy, limited forms of recovery are present as in the case of the Greek Food and Beverage sector. Mixed waste in Greece is collected by local authorities in cooperation with the Hellenic Recovery Recycling Corporation. The collected waste is either landfilled or subject to treatment in mechanical biological treatment (MBT) plant. Household bio-waste in Greece is mostly food waste (resulting from the consumption phase) and according to the national waste management plan approximately 44% of municipal waste is bio-waste; the majority of which being food waste, and overall, municipal waste is currently landfilled with only 19% getting recovered. However, during the processing phase, resource recovery takes place and bio waste produced is used by the same and other industries as input resources. For example, bio waste is used for the production of animal food.

Gap analysis overview



Main conclusions & the way forward

**What is the current state of the
Circular Economy in Greece?**

Main conclusions on the current state of the Circular Economy in Greece

Need for legislative and regulatory reform towards the Circular Economy

1

Our review of the EU and Greek legislative and regulatory framework on the Circular Economy, as well as the legislative and regulatory barriers identified through our cross sectorial assessment, revealed: a) delays in implementation and failures in actual implementation of the European legal framework on the Circular Economy and the existence of concurrent and contradictory legislations and regulations, b) non transparent and deficient licensing regimes for Circular Economy activities, c) lack of law enforcement and absence of sufficient audit mechanisms and subsequent delays in the imposition of administrative fines. The consequences of this context relate, among others, to a perceived tolerance of illegality and cultivation of an unfair competition status. A consolidated view of barriers identified per sector is included in the main edition of this study.

Fragmented adoption of circular models, in the context of inefficient systemic approach

2

The study reveals that most of the sectors included under scope are in an early transitional phase towards the Circular Economy. This is true in terms of the adoption of mostly one type of circular model, which for most sectors was found to be 'Resource Recovery'. Nevertheless, despite worthwhile efforts for enhancing existing Resource Recovery models and building efficiencies and synergies with other sectors, such as in the case of waste used as feedstock in the cement sector, emphasis on adoption of single circular models across sectors implies the lack of a systemic approach. Leading practices included in the study showcase how additional business models for value creation can be adopted, such as the 'Circular Supplies' model in the food and refining sectors, the 'Product as a Service' model for the construction sector and the 'Product Life Extension' model for the ICT sector. Obviously, the lack of a systemic approach is interlinked with conclusion #1 on the need for legislative and regulatory reform towards the Circular Economy, but is also linked to the lack of awareness around the business opportunities associated with these models.

Emphasis is placed on the 'end-of-life' stage, rather than on the design stage

3

The study identified wide adoption of Resource Recovery models in Greece, mainly in the Steel, Aluminium, Cement and Refining sectors. According to The Ellen Macarthur Foundation, "*a key feature of a Circular Economy is to be restorative and regenerative by design. The recovery of materials and products is not only addressed at end-of-use, but is enabled at the design level (e.g., by the choice of materials or a design for disassembly)*"¹. The adoption of mainly Resource Recovery models in Greece, for the sectors assessed in the scope of this study, implies the lack of investment in building core competencies, information and technologies that will reassess the product from its design phase, in order to facilitate "tighter" cycles at the collection phase (i.e. product reuse, recycling and cascading). The role of capital investments, financing, and R&D will be pivotal in this transition.

Main conclusions on the current state of the Circular Economy in Greece

4 Recycling and recovery of construction and demolition waste requires considerable improvement

In 2012, 815 thousand tons of construction and demolition waste (CDW) was produced in Greece, excluding soils. If soils were included, then the actual generated CDW would be 6-10 times higher¹. The recovery and recycling rate of CDW in Greece is very low and based on various sources it ranges from 0%-15%. More recent data suggest that the actual recovery rate is closer to 12%-15%². Only a very limited amount of CDW is currently treated for reuse or recycling. Most of this waste is either landfilled, left on site or illegally disposed. Current reliable data do not exist, as traceability for this kind of waste stream is limited and Greece is not officially reporting to the EU. This very low recovery rate, compared to the EU target set by the Waste Framework Directive regarding the reuse, recycling and other material recovery of CDW, which should be increased to a minimum of 70% by weight, reveals that Greece is significantly behind in terms of resource recovery³. CDW is one of the priority areas of the new Circular Economy Package adopted by the European Commission on December 2015.

5 Energy is largely dependent on non-renewable sources and efficiency is relatively low

In a true Circular Economy all energy originates from renewable energy sources. Renewable energy sources in Greece currently represent 15% of total energy consumption and according to recent projections⁴ it is not certain if the country will meet its EU target, which is to reach 20% for 2020. More specifically, the share of gross electricity consumption from renewable energy sources in Greece was 16,5% compared to 23,5% at EU28, the respective share in heating and cooling was above the EU28 average at 24,5% compared to 15,5% and the share in transport was 1,1% compared to 5,1% at EU28 for 2012⁵. Additionally, an equally important indicator in terms of the Circular Economy is energy efficiency. According to the European Environment Agency, the efficiency of electricity and heat production from conventional thermal plants in Greece was 37% in 2013⁶, compared to 48% for EU28. Countries such as Denmark, Sweden and Lithuania have efficiencies above 60%. With regards to emissions intensity, the CO₂ emissions per kWh generated were 1057g CO₂/kWh in Greece, while the EU average was 558g CO₂/kWh respectively⁷.

6 Bio-waste and food waste recovery is limited, resulting in significant economic and environmental impacts

According to the National Waste Management Plan approximately 44% of municipal waste is bio-waste (the majority of which is food waste). Overall, municipal waste is currently landfilled with only 19% getting recovered. Under the new Circular Economy Package, the revised EU recycling target for 2030 for municipal waste is 65%, while Greece is given additional five years to meet the target. Significant opportunities exist for energy and material recovery from bio-waste through composting and anaerobic digestion. Although separate collection of organic waste is promoted through Regional Waste Management Plans, there is no adequate infrastructure for the separation at source and collection of biowaste in Greece. Food waste is a priority area of the Circular Economy Package adopted by the European Commission on December 2, 2015.

Main conclusions on the current state of the Circular Economy in Greece

7 Need for law enforcement of hazardous waste legislation

Hazardous waste management has been the area with the most deficiencies with regards to law enforcement of the relative European legislative framework. Prolonged and unjustifiable delays in the implementation of basic legislative instruments, such as the Special National Hazardous Waste Management Plan and governmental inertia across several critical issues, including the operation of illegal landfills, have rendered Greece defendant in several cases before the Court of Justice of the European Union. Concurrently, the fines imposed on Greece on this ground are among the highest within the EU and therefore it is evidenced that the impacts of this failure are not limited to the environmental consequences or the international outcry, but they extend to significant economic consequences.

From a business perspective, the costs associated with the treatment of hazardous waste are high and include the costs for transporting this waste to other countries as a result of the lack of adequate treatment infrastructure in Greece. Improving the legislation concerning the establishment of hazardous waste treatment facilities in the country and also enhancing and assisting existing treatment facilities, will contribute to reducing these costs, since exportation of waste will and should be minimized.

Adequate infrastructures for the treatment and valorization of all hazardous waste are not available in Greece. There are mainly facilities for the treatment/recovery of liquid oily waste, and also for the pre-treatment of many hazardous waste streams, which are serving CE principles, designed and licensed in accordance with current European, international technical standards and Best Available Techniques.

8 Addressing waste market barriers

The waste market in Greece faces several distortions most important of which is that the established price mechanism does not reflect the environmental benefits of recycled materials, hindering their competitiveness and resulting in low demand. Distortions also include inconsistencies among legislation of EU member states and lack of law enforcement. Other market failures are the inadequate separation and collection systems for certain waste streams and increased irregular activity. In order to correct these failures and according to waste hierarchy, the use of recycled materials should be promoted, for example through public procurement criteria, by lowering tax rates, by improving law enforcement and by introducing new criteria for product design to support the use of recycled materials.

Sources:

¹ Ellen MacArthur Foundation, 2015, *Towards a Circular Economy: Business rationale for an accelerated transition*

² Bio by Deloitte, 2014, *Construction and demolition waste management in Greece*, Deloitte

³ European commission, 2011, *Service contract on management of construction and demolition waste-SRI*, Bio Intelligence Service, Paris

⁴ European Commission, *Renewable Energy, Moving towards a low carbon economy*, last viewed at 13/04/16
<https://ec.europa.eu/energy/en/topics/renewable-energy>

⁵ Eurostat, 2014, *Eurostat Pocketbooks Energy, transport and environmental indicators*, European Union

⁶ European Environmental Agency, last viewed at 13/04/16, <http://www.eea.europa.eu/data-and-maps/indicators/efficiency-of-conventional-thermal-electricitygeneration-4/assessment>

⁷ European Environmental Agency, last viewed at 13/04/16, <http://www.eea.europa.eu/data-and-maps/indicators/overview-of-the-electricity-production-1/assessment>

Indicative focus areas towards the transition to the Circular Economy

Development of a national roadmap for the transition to the Circular Economy

Development of a consistent and realistic national roadmap towards the Circular Economy, based on stakeholder engagement and actual dialogue, and guided by the Circular Economy package, adopted by the European Commission on December 2015 (including implications to National Law by the proposals to amend Directive 2008/98/EC on waste, Directive 94/62/EC on packaging and packaging waste, Directive 1999/31/EC on the landfill of waste, Directive 2000/53/EC on end-of-life vehicles, Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators and Directive 2012/19/EU on waste electrical and electronic equipment, which form part of a Circular Economy Package). This roadmap could include:

- ▶ Identification and repeal of relevant contradictory provisions (i.e. Law 3854/2010 and the JMD 36259/2010 concerning the alternative management of CDW and the Law binding National Technical Specifications)
- ▶ Actual and full implementation of current European framework related to the Circular Economy (such as Regulation 305/2011)
- ▶ The possibility of applying the proximity and self-sufficiency principles, taking into account the technical and economic feasibility, as specified in European Directive 2010/75/EU on industrial emissions-IPPC
- ▶ The valorization of industrial waste generated in Greece as national resources, emphasizing primarily on R waste recovery operations in plants which are licensed according to the European Directive 2010/75/EU on industrial emissions-IPPC
- ▶ Expansion of assessment and action plan based on a sector-by-sector approach, for high impact sectors (i.e. Construction, Food & Beverage)
- ▶ Establishment of audit mechanisms and regular inspections regulated by law and imposition of administrative fines
- ▶ Establishment of fair market conditions
- ▶ Alignment of public procurement criteria to promote circular activities across the value chain
- ▶ Review and alignment of the National Waste Management Plan within the proposed roadmap
- ▶ Fiscal measures and incentives (i.e. incentives for eco-design and the use of recycled input materials can take the form of reduced fees in Extended Producer Responsibility schemes, consider increasing tax on resources and reducing the tax on labor)
- ▶ Establishment of the Environmental Product Declaration (EPD)
- ▶ Incentives for the use of recycled materials in order to correct market failures.

Development of collaboration platforms

A systemic approach to the Circular Economy, including cross-sector collaboration, is imperative in order for the applied circular models to reach their potential. According to the Ellen MacArthur Foundation, *"joint product development, IT-enabled transparency and information sharing, joint collection systems, industry standards, aligned incentives, and match-maker mechanisms could all be enabled by the establishment of collaborative platforms, across sectors or between businesses and policy makers"*. Further research is required on a cross-sectorial level, in order to identify and prioritize cross-sector and cross-chain specific opportunities. Access to R&D funds can stimulate breakthrough technologies (resource efficiency, energy efficiency, carbon sequestration and reuse, product efficiency, sustainable construction). In this context, a cost/benefit analysis should be conducted for priority sectors, including monetization of impacts, in order to better understand and communicate possible benefits and full costs of negative externalities. Finally, the impact entrepreneurship can have in promoting the Circular Economy in Greece can be very significant. In conjunction with the discussed top-bottom approach based on further research and analyses, company driven bottom-up approaches (e.g. training seminars, experimentation labs) could become the catalyst in the transition.

Sectorial level assessments

Further sectorial and business level assessment of main circularity drivers and potential, including (i) identification of hotspots based on material upstream and downstream flows (circular hotspot analysis), (ii) identification of main risks and opportunities in the value chain, including mapping of key stakeholders across the value chain, (iii) analysis of current business models available and their potential for the sector/business (iv) design of circular solutions, including necessary features and development needs, including costs and risks analysis, as well as cross-chain and cross-sector opportunities.

Awareness raising at consumer level

Consumers should be informed on the benefits of the Circular Economy and the associated impacts for their households. According to 'Towards a Circular Economy: Business rationale for an accelerated transition, Ellen Macarthur Foundation, 2015', opportunities exist for citizens to improve their income by bringing down financial costs and improving quality of life. Changing current linear consumer habits and understanding the value of circular products and business models might require education, take back schemes, consumer incentives, pricing policies, labelling of products and other. In the early stages of the transition to a Circular Economy and until its core principles and benefits have started to become more clear to the public, it would be beneficial to focus on raising the awareness on more established ideas like environmental benefits and cost savings, rather than the concept of the Circular Economy per se.



Appendices

Appendix I; Case studies by country and sector

Circular Economy indicative practices for the Aluminium sector

The Netherlands



01

Alueco

Circular Economy model applied: Resource recovery

Foundation

Alueco

According to VMRG¹: "Alueco stimulates sustainable construction/engineering. Participating organisations are obliged to realize recycling of aluminium. This ensures a guaranteed and sustainable use of aluminium. In addition Alueco uses modern technologies for front-construction of sustainable buildings. The members have committed themselves (by signing the agreement) to taking back (in case of demolition activities) the aluminium as an input for the recycling supply chain. Alueco supervises the process to make sure that the recycling activities will result in high value (construction) products with a minimal environmental impact."

Project

Take-back guarantee

¹ VMRG, viewed at 20/12/15, <http://www.vmr.nl/themas/green-inspirations/over-alueco/>

U.S.A.



02

Novelis

Circular Economy model applied: Resource recovery

Company

Novelis

As stated in the Circulars website¹: "In early 2011, Novelis set out to increase the recycled content in its products from 33% to 80% by 2020, making it the world's most sustainable aluminum company and closing the loop on global aluminum production and consumption. It aims to cut embedded carbon in its products in half and remove 10 million tons a year of carbon from customers' supply chains. In 2012, it opened a new research center to improve recycling technology and develop new product design for recycling and sustainability". According to Novelis' 2015 Sustainability Report²: "In order to meet the growing demand, Novelis, has made approximately \$2 billion in capital investment in strategic locations, achieving to triple its automotive sheet capacity. During 2015, Novelis opened the world's largest and most technologically advanced aluminium recycling center in Nachterstedt, Germany, expanded their portfolio of certified, high-recycled-content products with the introduction of evercycle™ specialty sheet for food containers and debuted a new, high-recycled-content alloy -designed jointly with Jaguar Land Rover- for the automotive industry. By the end of 2015, Novelis used nearly 50% recycled metal, decreased the water intensity by 22% compared to 2007-2009 average baseline and cut its absolute GHG emissions by 13% in five years, while increasing aluminium production by 5% over the same period. In Novelis they believe that the business case for the circular model is clear, led by significantly improved supply chain efficiency and continuity. The new model means they are less reliant on third party primary aluminum producers and have reduced their reliance on carbon intensive primary aluminum."

Project

Closed-looped manufacturing system

¹ The Circulars, viewed at 02/02/16, <https://thecirculars.org/finalists-2015/>

² Novelis, 2015, Capturing Opportunities Sustainability Report 2015, Atlanta, USA

Appendix I; Case studies by country and sector

Circular Economy indicative practices for the Cement sector

The Netherlands



01

SmartCrusher bv

Circular Economy model applied: Resource recovery

Company

SmartCrusher
bv

Project

Concrete
recycling

"The purpose of SmartCrusher's systems and services is the separation of heterogeneous composite products and waste materials into pure raw materials that are suitable for further use. With the technology presented by SmartCrusher, using the hydrated cement that is released when 'SmartCrushing' the concrete rubble and by using climate-neutral electricity from bio-fuels, cement can be produced 100% CO₂-neutral, resulting in closed-loop recycling. As the SmartCrusher does not crush sand and gravel, the cement and hydrated cement will not become polluted by fine broken sand and can straight away be reused to produce new cement/paste. 'SmartCrushing' of concrete rubble does not leave any worthless residual fractions, unlike with traditional processing. Subsequently, the sand and gravel retrieved from concrete rubble, is better in new concrete than new sand and gravel, increasing the strength by 25%, reducing cement approximately 15% and thus reducing CO₂ emissions by 15%. SmartCrusher uses about 85% less energy for each processed ton of concrete rubble and is possible to recycle 100% of steel-fibre concrete, while remaining straight, and can be reused straight away. Finally, big economic advantages can be gained by including the SmartCrusher in BREEAM, the Dutch Green Building Council and Lansiks CO₂ performance ladder."¹

¹ SmartCrusher bv, viewed at 20/12/15, <http://www.slimbreker.nl/smartcrusher.html>

The Netherlands



02

Betonketen

Circular Economy model applied: Other

Network

Betonketen

Project

Circular cement
network

The official website presents the network as follows: *"The network is characterized by participants asking questions, seeking the connection and creating circular concrete solutions. By participating in the network, participants will invest in knowledge related to sustainability and the Circular Economy. Together with other companies and organization's from the cement sector informative meeting and sessions with knowledgeable experts will be conducted. All active organizations in the supply chain of cement in the Netherlands can join the network: suppliers (materials), advisors, concrete suppliers, construction, architects, etc. At this moment around 50 organizations have been included in the network."¹*

¹ Netwerk Betonketen, viewed at 20/12/15, <http://www.betonketen.nl/>

Appendix I; Case studies by country and sector

Circular Economy indicative practices for the Construction sector

The Netherlands



01

Philips & Turntoo

Circular Economy model applied: Product as a service

Company

Philips & Turntoo

Project

Circular lighting

As presented by the Ellen MacArthur Foundation¹: "The idea of a 'performance economy', developed by Walter Stahel since the 1970s, insists on the importance of selling services rather than products. The client (RAU architects) did not want to purchase an expensive lighting infrastructure that they would eventually need to replace and dispose of, but rather "light as a service", and just the right amount to suit the building. RAU Architects worked with Philips to develop a system that could work within this new way of thinking. Philips ended up creating a minimalist light plan that made as much use as possible of the building's natural sunlight, again to avoid providing a surplus of material of energy. Effective systems management resulted in a total energy reduction of 55% - 35% as a result of the LED installation, but also through optimisation by Philips; another 20% reduction. By moving from a one-time sale to a 'Pay per lux' model in which Philips maintain ownership of the materials, Rau Architects benefit from maintenance and service, as well as the option to adapt or upgrade the setup, with the manufacturer able to recover the materials when necessary. Following the success of this first 'Pay per Lux' project, Thomas Rau went on to set up Turntoo, an intermediary platform that treats products as resource banks, facilitating resource management between manufacturer, supplier and end-user. Having seen the potential of a performance offering, Philips are now further developing the business underpinnings for this model, and drawing up contracts that systemize the concept".

¹ Ellen MacArthur Foundation, viewed at 20/12/15, http://www.ellenmacarthurfoundation.org/case_studies/philips-and-turntoo

The Netherlands



02

BAM

Circular Economy model applied: Product life extension

Company

BAM

Project

Modular housing

According to the Ellen MacArthur Foundation and the BAM group^{1,2}: "The expansion of the town hall of Brummen, is an example of a building designed with end-of-life in mind, using the circular-model, where users no longer take ownership of a product but only pay for its performance. The municipalities tender required a semi-permanent facility that would last at least twenty years. Neither the architect nor BAM wanted to compromise on the quality of the building or its professional environment, and the Circular Economy model provided the solution. The careful choice of materials and design means the Town Hall's components can be disassembled and reused or returned to the proper owner, back to the supply chain or sold on to a new end user, at the end of its lifespan. The loadbearing structure of the building, façade, and floors are made of timber and were prefabricated when possible. This model requires a new kind of housing: modular, reconstructable, with new financial models and without the loss of a high-end user experience."

¹ Royal BAM Group, viewed at 20/12/15, <http://sustainability.bam.co.uk/insights/2014-01-22-starting-with-the-end/>

² Ellen MacArthur Foundation, viewed at 20/12/15, <https://www.ellenmacarthurfoundation.org/ce100/directory/royal-bam-group>

Appendix I; Case studies by country and sector

Circular Economy indicative practices for the Electricity sector

The Netherlands



01

Landis+Gyr, Flonidan and Iskraemeco

Circular Economy model applied: Other

Company

Landis+Gyr, Flonidan and Iskraemeco

Project

Smart meters/Fair meter initiative

According to the Waag society¹: "A Fair Meter is a smart energy meter made of circular materials and materials derived from socially responsible sources in a socially responsible production process. Goal is to maximize the transparency in the complete supply chain: from mining, production and logistics, all the way up to installation, use, second-life solutions and data and software management. Important aspects in the development of this meter are a resources label, tracking all materials throughout the supply chain and circularity of the product and process. The notion of circularity focuses on life cycle design, maximizing use of secondary raw materials in production, minimizing residual waste and maximizing second life applications. According to the initiative's website²: "Since smart meters are an important link to sustainable energy grids, energy efficiency and customer relationship, the smart energy meter itself should also be demonstrably sustainable and socially responsible. The Dutch grid operators have worked together and they have installed smart meters at more than 500.000 households in the Netherlands. The four grid operators expect to make significant savings on the cost price per meter."

¹ Waag Society, viewed at 28/03/16, <https://waag.org/en/project/fair-meter>

² http://fairmeter.org/?page_id=2

Germany



02

Daimler

Circular Economy model applied: Product life extension

Company

Daimler

Project

Used car batteries

According to an article by Computerworld: "Daimler realized that its batteries from electronic vehicles are after 10 years still useable and of value for generating energy. The batteries will not be able to deliver the same capacity, however by using the batteries in a large energy storage system, Daimler is able to provide the batteries with a second life. Daimler installs a large energy storage system in Germany using reused batteries of electronic vehicles. Taking into account a small decrease in the capacity of the batteries, about 1000 batteries are needed to generate a storage capacity of 13 million watt hour (MWh). The reused batteries for example support in the city of Lünen the electricity network by capturing surplus from generated wind power. The reuse of the batteries will not only keep them out of landfills, but will help reduce costs in the EV marketplace by adding an additional revenue stream."¹

¹ Computerworld, viewed at 20/12/15, <http://www.computerworld.com/article/3005757/sustainable-it/daimler-to-recycle-electric-car-batteries-for-massive-energy-storage-systems.html>

Appendix I; Case studies by country and sector

Circular Economy indicative practices for the Food & Beverage sector

U.S.A.



01

Ecovative

Circular Economy model applied: Resource recovery/Circular supplies

Company

Ecovative

Project

From food waste to packaging

As presented by the Ellen MacArthur Foundation¹: "Ecovative's products are fully compostable alternatives to synthetic materials such as petroleum-based expanded plastics. They are made of mycelium grown in and around agriculture by-products, acting thereby as a glue, and can take any shape needed."

The company adds to this²: "Ecovative's Mushroom® Packaging is replacing many thousands of plastic foam packaging parts that are made from finite petrochemicals, often cause pollution, and are economically impractical to recycle in most locations. The raw materials for Mushroom® Packaging are sourced from local farmers, who derive an additional revenue stream by selling their plant stalks and other byproducts. Once Mushroom® Packaging has finished protecting a product, it can be composted, adding nutrients to the soil."

The Ellen MacArthur Foundation points out that¹: "Since its conception, Ecovative has supplied their protective packaging to a growing number of other Fortune 500 companies. Ecovative is also investigating further applications, such as consumer products and new bio-material."

Again the company reports that²: "Ecovative soon will be launching Mushroom® Insulation, a replacement for rigid board foams for buildings and the Ecovative Myco Board™ material, a replacement for wood materials like MDF with a tree-free and formaldehyde adhesive-free alternative." Finally, an article by the New York State Conservationist³ reports that: "The environmental benefits of Ecovative's products include replacing 196,000 cubic feet of plastic foam packaging parts and diverting that material from landfills post use, saving 77 thousand gallons of petroleum annually and diverting 686 tons of agricultural waste from landfills or incinerators on an annual basis"

¹ Ellen MacArthur Foundation, viewed at 20/12/15, http://www.ellenmacarthurfoundation.org/case_studies/ecovative

² Ecovative, viewed at 20/12/15, <http://www.ecovativedesign.com/how-it-works>

³ New York State Conservationist, October 2015, The Future of Fungi, available at: http://www.dec.ny.gov/docs/administration_pdf/1015futureoffungi.pdf

The Netherlands



02

GRO

Circular Economy model applied: Resource recovery

Company

Green Recycled Organics

Project

Coffee residue re-use

According to a study by ING¹: "Green Recycled Organics Holland (GRO-Holland in short) uses coffee residue as a growth substrate for oyster mushrooms. About 2,500 kilograms of coffee residue is collected weekly from around 100 La Place restaurants in the Netherlands. On this substance mushrooms are grown. Collaboration in the supply chain is strengthened further by selling the mushrooms to the La Place restaurants where they are used as ingredients. The project's system thinking approach exhibits strong symbiotic relationships. Gro-Holland implanted itself within La Place existing distribution network, in which coffee residue was already being separated. The distribution trucks are full in both directions, dropping off coffee grounds and picking up mushrooms."

¹ING, 2015, Rethinking finance in a circular economy - Financial implications of circular business models

Appendix I; Case studies by country and sector

Circular Economy indicative practices for the ICT sector

United Kingdom



01

Re-tek

Circular Economy model applied: Product life extension

Company

Re-Tek

According to The Ellen MacArthur Foundation¹: "For nearly 20 years, Re-Tek has concentrated on making the disposal of IT products and electronics easy, by successfully repairing those which are functional, and selling them on. Set up initially to work with large original equipment manufacturers, the company now processes 7.000 ICT items per month, in a custom built 22.000 ft facility, which, as a result of an extensive investment programme, is now powered by 70% renewable energy. Ensuring their clients' data security, and offering reuse as a viable method of asset retirement, Re-Tek is able to share the revenue gained with the equipment's previous owners".

Project

IT products repair

The company, via its website, describes further²: "Donating old IT equipment for reuse offers the potential energy savings of between 5 and 20 times of those gained by recycling, and obviously extending the life of electrical items is by far the best way to maximise a product's economic value. This Circular Economy business model adopted by Re-Tek has been recognised by the Institute for Environment and Sustainability of the European Commission Joint Research Centre (JRC) who recently conducted a site visit to Re-Tek's premises and identified the processes and systems as being best practice. The company is now involved in a number of collaborative (funded) trial projects aimed at applying repair and refurbishment expertise and developing new, innovative models for collecting and processing IT items from the consumer market. In Re-Tek they believe that these projects will deliver commercially viable methods that have the potential to divert significant volumes of household IT EEE that is no longer required, from recycling (and potentially landfill) to the re-use approach."

¹ Ellen MacArthur Foundation, viewed at 20/12/15, http://www.ellenmacarthurfoundation.org/case_studies/re-tek

² Re-Tek, viewed at 20/12/15, <http://re-tek.co.uk>

The Netherlands



02

Fairphone

Circular Economy model applied: Product life extension

Company

Fairphone

According to the Circle Economy website¹: "In recent years, as everything becomes more technically advanced, repairs are no longer a viable or affordable option, meaning that many products (especially electronics) are discarded when something goes wrong. With Fairphone the company wanted to reverse that trend and design a smartphone with a longer-than-average life. They started, by making the Fairphone easy to open and understand, with components like removable (and replaceable) batteries. They sell a selection of spare parts in their online shop to allow users to repair their phone or replace the parts that most frequently break due to regular wear and tear". As reported on the company's website² they've also partnered with iFixit to create open source repair guides specifically for the Fairphone. On the same website², it is reported that: "In addition, to create the Fairphone and contribute to a fairer economy based on social and environmental values, they're opening up supply chains, changing production processes and improving worker welfare. They are focusing on activities and interventions within five core action areas: Mining, Design, Manufacturing, Lifecycle and Social Entrepreneurship and together with their partners from research groups, NGOs, civil society, media, and business, they're working to create positive, tangible impact".

¹ Circle Economy, viewed at 28/03/16, <http://www.circle-economy.com/case/nog-een-test/>

² FairPhone, viewed at 20/12/15, <https://www.fairphone.com/projects/spare-parts-and-self-repair>

Appendix I; Case studies by country and sector

Circular Economy indicative practices for the Refining sector

Finland



01

Neste

Circular Economy model applied: Circular supplies/resource recovery

Company

Neste

Project

Bio LPG

As reported on the Duurzaam website¹: "On the Maasvlakte, Netherlands, Neste is expanding its activities with an installation for the production of renewable LPG. The Dutch company SHV Energy will sell the biofuel. Neste's Rotterdam refinery primarily produces premium-quality NEXBTL renewable diesel from various waste, residues and vegetable oils. The EUR 60 million investment to produce and store Bio LPG in Rotterdam was announced in fall 2014." According to Neste²: "Production is expected to start by the end of 2016, with an agreement to supply 160,000 tonnes to SHV Energy over a four-year period. The new unit will purify and separate Bio LPG from the side stream gases produced by the refinery". Adding to this, the company states that²: "In use, renewable propane is identical to conventional propane and therefore has the benefit of being able to be blended and used by all existing appliances suitable for use with propane".

¹ Duurzaambedrijfsleven, viewed at 20/12/15, <http://www.duurzaambedrijfsleven.nl/chemie/8649/rotterdam-krijgt-s-werelds-eerste-raffinaderij-voor-bio-lpg>

² Neste, viewed at 20/12/15, <https://www.neste.com/en/neste-breaks-ground-worlds-first-bio-lpg-facility-rotterdam>

Finland



02

Ekokem

Circular Economy model applied: Resource recovery

Company

Ekokem

Project

Circular economy village

"Ekokem is building a Circular Economy Village in Riihimäki. Materials included in municipal waste will be processed further through the Eco Refinery, Finland's first Plastic Refinery and the Bio Refinery. The Circular Economy Village is a unique concept, in which the best possible form of recycling has been developed for every waste stream together with Biotehdas Oy. The Eco Refinery will take municipal waste and separate about 37% of bio-waste, 10% of plastic and 3% of metal from it. In the Circular Economy Village, the recycling rate of municipal waste will rise to 50% and the utilisation rate to 98%. 100,000 tonnes of municipal waste will be treated at the plants each year. The Bio Refinery will use bio-waste to produce biogas for transport purposes. It can also recover nutrients, such as nitrogen. An estimated 400,000 tonnes of bio-waste has previously remained unexploited from municipal waste every year.

To be completed in 2016, the Ekokem Circular Economy Village located in Riihimäki, Finland is a big step towards the realization of the Circular Economy. During the construction phase the Circular Economy Village provides around 100-160 full-time equivalents of employment and, once completed, will have 20-30 employees."¹

¹ Ekokem, viewed at 20/12/15. <http://www.ekokem.com/en/circular-economy/strategy-2017-towards-the-circular-economy/>

Appendix I; Case studies by country and sector

Circular Economy indicative practices for the Steel sector

The Netherlands



01

Nedstaal

Circular Economy model applied: Resource recovery

Company

Nedstaal

Project

Raw material only from scrap

The company presents its performance as follows: "Nedstaal only uses scrap metal, no virgin material. Countless analyses are carried out for ultra high-grade steel because of the 100% scrap mix used in our production processes. They increase their efficiency by selecting scrap returned by their customers that already has the required quality levels. The right alloying elements are already present in this scrap and do not therefore have to be re-added. Approximately thirty-five tons of scrap is melted for each charge in an electric arc furnace. Alloys are added in a ladle furnace using a dosing system that ensures the chemical composition remains within the required tolerances. If required, argon is injected to create an inert atmosphere that keeps the steel as pure as possible in compliance with the highest quality standards. In Nedstaal, they also make steel with low oxygen, nitrogen and hydrogen content levels, suitable for applications where the highest quality is required".¹

¹ Nedstaal, viewed at 20/12/15, <http://www.nedstaal.nl/en>

U.S.A.



02

Steel Recycling Institute

Circular Economy model applied: Other

Industry association

Steel Recycling Institute (SRI)

Project

Steel recycling promotion

According to the official website: "The Steel Recycling Institute (SRI) is an industry association that promotes and sustains the recycling of all steel products. The SRI educates the solid waste industry, government, business and ultimately the consumer about the benefits of steel's infinite recycling cycle. SRI works with recycling coordinators, scrap processors and steel companies to cultivate an infrastructure for recycling steel cans, cars, appliances and construction materials as well as emerging sources of steel scrap such as steel aerosol cans, used oil filters and other previously untapped sources of steel scrap. There is also a Steel Recycling Database available that allows you to find recycling locations in your area. and SRI provides "a Full-Circle educational Program".¹

¹ Steel Recycling Institute, viewed at 20/12/15, <http://www.recycle-steel.org/>

Appendix II; Acknowledgements

Associations & companies engaged

SECTOR	ASSOCIATION / COMPANY
Aluminium	▶ Aluminium Association of Greece (Ελληνική Ένωση Αλουμινίου)
Cement	▶ Hellenic Cement Industry Association (Ένωση Τσιμεντοβιομηχανιών Ελλάδος)
Construction	<ul style="list-style-type: none"> ▶ Business Association for Construction Quality and Development (Σύνδεσμος Επιχειρήσεων για Ποιότητα και Ανάπτυξη των Κατασκευών) ▶ Association of Greek Contracting Companies (Πανελλήνιος Σύνδεσμος Τεχνικών Εταιριών) ▶ South Greece Inert Materials Recycling (Ανακύκλωση Αδρανών Νοτίου Ελλάδας)
Electricity	<ul style="list-style-type: none"> ▶ Hellenic Association of Independent Power Producers (Ελληνικός Σύνδεσμος Ανεξαρτήτων Εταιρειών Ηλεκτρικής Ενέργειας) ▶ Greek Electricity Producers from Renewable Energy Sources Association (Ελληνικός Σύνδεσμος Ηλεκτροπαραγωγών από Ανανεώσιμες Πηγές Ενέργειας) ▶ Greek Scientific Association of Wind Power (Ελληνική Επιστημονική Ένωση Αιολικής Ενέργειας)
Food and Beverage	<ul style="list-style-type: none"> ▶ Federation of Hellenic Food Industries (Σύνδεσμος Ελληνικών Βιομηχανιών Τροφίμων) ▶ Federation of Greek Maricultures (Σύνδεσμος Ελληνικών Θαλασσοκαλλιεργειών)
ICT	▶ Greek Mobile Operators Association (Ένωση Εταιριών Κινητής Τηλεφωνίας)
Refining	<ul style="list-style-type: none"> ▶ Hellenic Petroleum S.A. (Ελληνικά Πετρέλαια Α.Ε.) ▶ Motor Oil S.A. (Μοτορ Όιλ (ΕΛΛΑΣ) Διυλιστήρια Κορίνθου Α.Ε.)
Steel	▶ Hellenic Steelmakers Union (Ένωση Χαλυβουργιών Ελλάδος)
Across sectors	<ul style="list-style-type: none"> ▶ Hellenic Bank Association (Ελληνική Ένωση Τραπεζών) ▶ Federation of Recycling and Energy Recovery Industries and Enterprises (Σύνδεσμος Βιομηχανιών και Επιχειρήσεων Ανακύκλωσης και Ενεργειακής Αξιοποίησης Αποβλήτων) ▶ Greek Federation of Environmental Protection Enterprises (Πανελλήνιος Σύνδεσμος Επιχειρήσεων Προστασίας Περιβάλλοντος) ▶ Hellenic Solid Waste Management Association (Ελληνική Εταιρία Διαχείρισης Στερεών Αποβλήτων) ▶ Greek Logistics Company (Ελληνική Εταιρία Logistics) ▶ Business Association of Passenger Ships (Σύνδεσμος Επιχειρήσεων Επιβατηγού Ναυτιλίας) ▶ Polyeco S.A.

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