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Thinking ahead for Europe

Understanding the Circular Economy in Europe, from Resource Efficiency to Sharing Platforms: The CEPS Framework

Igor Taranic, Arno Behrens and Corrado Topi

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Abstract

This paper aims to rethink the concept of the 'circular economy' through the prism of its relevance to its many stakeholders, ranging from public and private actors and mature and emerging industries to cities and regions, SMEs and multi-sectoral corporations. The paper presents a schematic framework, which breaks down the circular economy into eight fundamental building blocks and shows how they are interconnected in relation to the multiplicity of involved actors. The framework is used to develop recommendations addressed to European policy-makers on how best to support the transition towards a circular economy in the EU.

CEPS ENERGY CLIMATE HOUSE

The report is based on research conducted by CEPS and on discussions that took place during three stakeholder workshops, at which a wide range of representatives from industry, NGOs and research institutes provided input. CEPS is responsible for the content of this report.

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Contents

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1. Introduction

The concept of the circular economy

The concept of the circular economy (CE), which grew out of the movement promoting sustainable development, has recently become one of the EU's main policy priorities. The foundations of sustainable development were laid in the 1960s, pointing out the connection between the state of the environment and resource exploitation and between the economy and social well-being. Sustainable development entered mainstream thinking in the 1990s and since then has been referred to under various different labels. By the end of the first decade of the 2000s, sustainable consumption and production, green growth, the low-carbon economy and resource efficiency progressively became more integrated into the definition of the new economy model, known as the "Green Economy" (see e.g. International Institute for Sustainable Development, 2012; UNDESA, 2012). The concept of the circular economy is a fundamental component of the Green Economy.

CE started developing in the 1970s as an alternative economic model, challenging the traditional linear industrial economy. The linear economy is based on a linear process, optimised towards high throughput and low production costs relying on the abundant availability of raw materials at relatively low cost. The typical process consists of a series of steps – resource extraction, manufacturing, consuming and disposing of products at the end of their life cycle – which is also referred to as a take-make-consume-dispose model. The circular economy, on the other hand, aims at low environmental impact by minimising waste and excessive resource use by turning goods at the end of their lifespan into resources for others through re-use, re-manufacture, re-cycle, waste reduction and other practices. In other words, CE is restorative by design and intention (Stahel, 2016; EMF, 2012; Lehmann et al., 2014).

Since the early 2010s, interest in the circular economy among environmentalists and policy-makers has been growing for a number of reasons. Among the main environmental reasons are resource scarcity, particularly for strategic resources, such as rare earth elements; and negative environmental impacts of unsustainable production and consumption (UNEP, 2010a). The main economic reasons are the volatility

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of (and rising) commodity prices and the potential multi-billion euro economic benefits of new markets for the circular economy business models, popularised in the reports of the Ellen MacArthur Foundation (EMF, 2012, 2013, 2014) and the Club of Rome (Wijkman & Skånberg, 2015) inter alia.

In December 2015, the European Commission published the Circular Economy Action Plan, putting CE at the core of its new mainstream sustainable development policy. The European Commission's plan suggests rethinking the EU economy by changing the five stages of the lifecycle of products and services: 1) design, 2) production, 3) consumption, 4) waste management and 5) secondary materials treatment. The plan also defines five priority areas,[1] which face specific challenges. According to the Action Plan, these challenges will be addressed by amending relevant legislation and introducing numerous legislative initiatives between 2015 and 2019, a process that has already started with proposed directives on waste, landfill and increased usage of organic and waste-based fertilizers (European Commission, 2016a, 2016b).

The transition towards a circular economy will also be one of the main EU policies to help Europe achieve its commitments under the UN Sustainable Development Goals (SDGs). In fact, many of the 17 goals are either directly or indirectly impacted by the circular economy. The most directly impacted is Goal 12, which aims at ensuring sustainable consumption and production patterns. More indirect impacts are expected on a wide range of other goals, including Goal 7 on clean energy, Goal 11 on sustainable cities, Goal 13 on climate action, and Goals 14 and 15 on ocean and terrestrial ecosystem protection. A concrete plan to translate these goals into EU internal and external policies is currently being developed by the European Commission.

The current situation and challenges of the circular economy

The transition to the circular economy rests on three pillars: 1) environmental benefits, particularly in terms of reduced impacts and reduced resource usage; 2) cost savings from reduced natural resource needs; and 3) the creation of new markets, providing additional economic benefits of circular economy practices, e.g. in terms of jobs creation or wealth creation (Figure 1).

Figure 1. Three pillars supporting the transition to the circular economy

Source: Authors' elaboration based on Behrens, 2016; EMF, 2012, 2013, 2014; Wijkman & Skånberg, 2015.

In theory, the circular economy promises significant environmental and economic benefits and should therefore rapidly drive the replacement of the linear economy, but in practice the 'linear model' still dominates the economy. The complexity of the circular economy concept and falling commodity prices are two of the main explanations for this conundrum.

[1] Namely plastics, food waste, critical raw materials, construction and demolition and biomass and bio-based products.

Firstly, the circular economy is an immensely complex concept, with potential impacts throughout the economy. Although a variety of definitions exist (see e.g. EMF, 2013; European Commission, 2015a), CE has different meanings and impacts for different industry sectors and other economic actors. For example, what does CE mean for the construction industry and how is it different from CE for car producers? What is the difference between CE for a city and CE for a multi-sectoral corporation or a start-up? Decision-makers in private enterprises and policy-makers at radically different scales, ranging from the city to the national level and macro-regional scale, need more clarity on how CE is relevant for each type of economic actor and sector of economic activities.

Secondly, the circular economy became an EU policy priority (partly) as a response to high commodity prices and resource scarcity. Today's commodity prices, particularly in relation to energy, food and metals, are about half those of the average commodity prices in 2010-14, and about 20% lower than in 2005 (IMF, 2016). Low commodity prices significantly weaken one of the three foundations of the circular economy by reducing potential cost savings associated with reduced resource use.

Aims and structure of the paper

The first aim of the paper is to address the complexity challenge by clarifying and bringing a structured approach to the concept of the circular economy in EU policy-making. The paper introduces a framework to support decision makers in private enterprises and policy-makers at various levels in their efforts to develop, deploy and implement circular economy business models. Called the "Circular Economy Progress for Stakeholders", shortened to CEPS framework, the framework breaks down the overall theoretical concept of the circular economy into a collection of eight building blocks and the relationship between the blocks. This simple structure allows stakeholders to combine these blocks in different patterns or formations to develop circular economy business models to deploy in the real world.

The second aim of the paper is to formulate policy recommendations and measures conducive to creating a supportive environment for the transition towards the circular economy.

Section 2 introduces and analyses eight basic building blocks of the circular economy based on the CEPS framework and their inter-relationships. Section 3 discusses the different types of stakeholders in the circular economy and their relationship with the building blocks in the CEPS framework. Section 4 examines the available regulatory instruments and presents policy recommendations aimed at speeding up the transition towards the circular economy in Europe. The final section 5 offers conclusions.

2. Building blocks of the circular economy

This chapter describes the eight building blocks of the circular economy and their relationships.[2] These consist of: 1) industrial symbiosis, 2) material resource efficiency, 3) product life-cycle extension, 4)

[2] The analysis of the circular economy building blocks is based on a thorough review of the academic literature (EMF, 2012; Rizos et al., 2015; Webster, 2016; Accenture, 2015 and Planing, 2015) and on an analysis of business sources and intensive stakeholder interaction, inter alia in the context of two projects funded by the European Commission (FP7), called NETGREEN and GreenEcoNet.

biological products, 5) energy efficiency and renewable energy, 6) the performance economy, 7) the sharing economy and 8) the platform economy.

The building blocks consist of both well-established EU policies, such as resource and energy efficiency, and emerging economic concepts, such as the sharing and platform economy. The building blocks are interconnected and all have a direct or indirect impact on resource use. However, this is not an exclusive list of the circular economy's basic building blocks and it can be modified as the CE concept continues to develop.

The examples presented in the description of each of the eight building blocks illustrate how these blocks can have different meanings for different industry sectors, and how they may be more relevant to some sectors than to others.

Industrial symbiosis

There are two concepts of industrial symbiosis: a classic concept of material resource flows and a digital-age concept based on knowledge flows across networks. The classic concept of industrial symbiosis, defined by Chertow (2007) involves *"*physical exchanges of materials, energy, water, and by-products*"* between different co-located industrial facilities, e.g. in situations where the waste of one facility is used as a resource by another. Businesses undertake such exchanges for various reasons: the sharing of resources can: i) increase revenues or reduce costs, ii) help achieve long-term resource security and iii) meet regulatory requirements of resource or energy efficiency (Chertow, 2007). The best-known example of the 'classic' industrial symbiosis is the Kalundborg Symbiosis,[3] a cooperation among eight public and private enterprises from different industry sectors in Kalundborg, Denmark. The cooperation, established over 40 years ago, includes the exchange and sharing of water, energy and other resources.

The digital-age interpretation of industrial symbiosis conceptualises it as the exchange of knowledge to foster eco-innovation through networks of actors (Lombardi & Laybourn, 2012). Two examples of such networks are SPIRE[4] – the European public-private partnership for better resource efficiency in eight industry sectors (including chemicals, engineering, minerals inter alia) – and GreenEcoNet[5] – a global web platform to support the transition to a green economy in SMEs, through the exchange of knowledge and best practices between SMEs, policy-makers and research institutions.

Material resource efficiency

Material resource efficiency is the process of reducing the amount of material resources, e.g. raw materials or intermediate products, needed to produce one unit of a product or service, or simply put as *"*doing more with less*"* (EEA, 2015) and reducing the environmental impact of products and services along their life cycle (UNEP, 2010b).

High levels of material consumption result in resource degradation and large ecological footprints (Global Footprint Network, 2016). These two trends of ongoing urbanisation (e.g. in China and India), and a growing global middle class that is likely to reach 3 billion people by 2030 (UNEP, 2015) are likely to further

[3] For more information on the Kalundborg symbiosis, see http://www.symbiosis.dk/en
[4] SPIRE – Sustainable Process Industry through Resource and Energy Efficiency– (http://www.spire2030.eu/).
[5] For more information, see http://www.greeneconet.eu/

increase global material consumption. The average annual domestic material consumption per capita in the EU28 has decreased from about 16.5 tonnes in 2007 to around 13 tonnes in 2014 (Eurostat, 2016a). This trend could be explained by reduced resource demand following the 2008 economic crisis and the subsequent recession (EEA, 2016). However, taking into account also the imported goods, total material consumption in OECD Europe was 26 tonnes per capita in 2010 (OECD, 2016). Therefore, much more needs to be done to reduce the material consumption in the EU. This will require rethinking both consumption and production patterns in Europe. The circular economy can address this challenge.

An example of how to reduce the consumption of raw-materials comes from the car industry: During the economic crisis beginning in 2008, several EU member states supported their car industry (and related jobs) with programmes aimed at renewing the car fleet. Apart from increasing consumer spending, these programmes also had the environmental objective of encouraging the replacement of old cars with new ones equipped with lower emissions levels (hence the expression "Cash for Clunkers") (Eurostat, 2015; Stahel, 2012). An alternative to replacing old cars with new ones has been proposed by Stahel (2011), which entails remanufacturing, upgrading or replacing the engines, instead of replacing the whole car.[6] Although this would result in similar CO_2 emissions,[7] it would avoid the usage of raw materials to produce new cars. It would also support the job market – modern manufacturing industry is usually capital-intensive, while maintenance services are usually labour-intensive, possibly creating more jobs than manufacturing (Stahel, 2012).

Renewable energy and energy efficiency

Renewable energy and energy efficiency policies support the transition to the circular economy by reducing the consumption of fossil fuels and curbing GHG emissions. In the EU, the building sector alone was responsible for almost 41% of final energy consumption in 2013 (European Commission, 2015d). The application of energy-efficiency measures to buildings through retrofitting could save up to 75% of energy consumption (see EU-funded project SPECIAL, 2016).

An example of the combination of renewable energy and energy efficiency in buildings is the new Deloitte office building in Amsterdam, called the "Edge".[8] Due to its specially designed LED lighting, heating and cooling systems, the "Edge" uses 40.7 kWhe/m3/year, which is 70% less electricity than is consumed by the typical EU office building. Solar panels on the roof and the southern wall generate more electricity than the building uses, resulting in negative final energy consumption of (-0.3) kWhe/m3/year (Bloomberg, 2015), already surpassing EU requirements mandating nearly zero energy buildings for public buildings by 2018 and by 2020 for all new buildings (European Parliament and the Council, 2010).

[6] This is an illustrative example, not taking into account the stricter safety requirements of new cars and other possible aspects.
[7] The CO_2 emissions of the production process of a standard gasoline vehicle are estimated at 5.6 tonnes of CO_2e (RICARDO, 2011).
[8] The example of the Deloitte building in Amsterdam illustrates the impact of renewable energy and energy efficiency on the circular economy.

Biological products

Modern agriculture, which is mostly dependent on pesticides and synthetic fertilizers, was able to keep pace with global population growth and modern dietary demands, but it came at a price to the environment and to the quality of agricultural products. Dependence on pesticides and synthetic fertilizers is causing deterioration of soil productivity (FAO, 2016), making it both an environmental and economic problem (Stuchtey & Rossé, 2016). Moreover, food waste materialises further up the food supply chain. Annual consumer food waste in the EU reached 47 million tonnes in 2015 (European Commission, 2015b), most of which could be avoided (e.g. by better planning of menus and food shopping, and paying attention to storage instructions of food products).[9]

The problems associated with both synthetic fertilizers and food waste can provide economic opportunities for business. "Just Egg", a British hard-boiled egg supplier based in Leicester, was paying about €36,000 (£30,000)[10] a year to bury its by-product – 480 tonnes of eggshells – in landfill. Together with Leicester University, it developed a technology to transform eggshells into a powder that can be used in the production of plastics (University of Leicester, 2012; and interview by the principal author with Andrew P. Abbott, Professor of Physical Chemistry, University of Leicester, June 2016), i.e. making biological waste a resource for the plastics sector. In a similar vein, HomeBiogas, an Israeli start-up, has developed a small domestic system that converts food waste and animal manure into cooking gas and liquid fertilizers (HomeBiogas.com, 2016).

The success of these and many other solutions depends on their potential to be used on a larger scale (i.e. scaling-up) and on making them market-ready for large-scale application.

Product life-cycle extension

The linear industrial economy model, which is currently the mainstream, relies on the economically optimised manufacturing of high-volume standardised products, the constant release of new products and increasing consumption patterns that support it. Product life-cycle extension aims at designing products with prolonged life spans.

Many of the product life-cycle extension strategies have been tried and tested in real-world market conditions. For example, products can be designed to serve longer, so that they can be easily repaired or upgraded, and finally re-used and recycled at later stages of the life cycle. Some of these products, from umbrellas to power tools, have been available on the market for several decades.[11] Other newly developed products are progressively following even stricter design constraints. Two examples of the latter come from the consumer electronics sector, and more specifically from mobile phones manufacturing: Fairphone 2.0 and Google's Project Ara.

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[9] "What can I do in my daily life to limit food waste?" (http://ec.europa.eu/food/safety/food_waste/library/docs/tips_stop_food_waste_en.pdf).

[10] According to the exchange rate of the European Central Bank on 4 April 2012 (https://www.ecb.europa.eu/stats/exchange/eurofxref/html/eurofxref-graph-gbp.en.html).

[11] For an example of lifetime warranty brands, see *"32 brands with lifetime warranties"* (http://www.gobankingrates.com/personal-finance/32-brands-lifetime-warranties/).

Developed by the homonymous Dutch company Fairphone, a start-up and a social enterprise, Fairphone 2.0 is the first modular smart phone inspired by the circular economy, designed for upgrade, reparability and easy reuse and recycling at the end of the phone's (extended) lifespan (Fairphone, 2016).

Based on a similar approach, Google is developing its first modular phone "Ara" with replaceable modules, enabling consumers to enjoy the latest smart phone technology without needing to replace their entire device each year.

Performance economy

The 'performance economy' is defined as *"*selling goods as services through rent, lease and share business models*",* or, in other words, providing products as services (Stahel, 2016). According to the concept of the performance economy,[12] the number of manufactured units of products will decrease, but the revenue for each unit produced will increase.

In many industries, 'products as services' are already in use, in particular in Business to Business (B2B) practices. In the railway sector, for example, Ascendos Rail Leasing provides full-service rail fleet leasing – from locomotives to freight and passenger wagons (Ascendos Rail Leasing, 2016). In the construction industry, a large part of the equipment and machinery is being leased by the construction companies from specialised equipment enterprises (Ramirent, 2016). This leads to optimised utilisation of the railway fleet and construction equipment, keeping resources in use as long as possible.

Similar economic patterns also need to be adopted in Business to Consumer (B2C) models, where washing machines, mobile phones, lightning and other products could be offered by producers (or operators) as services. It might require labour intensive services, such as repair and maintenance, potentially creating more jobs than capital intensive manufacturing.

The sharing economy

The sharing economy entails the *"peer-to-peer-based activity of obtaining, giving, or sharing the access to goods and services".* It can be coordinated within a local community or network, or function on a larger-scale *"coordinated through community-based online services"* (Hamari et al., 2015). It mostly covers consumer to consumer (C2C) business relationships.

The concept is not novel per se: people have shared and exchanged products for thousands of years. The novelty of the current sharing economy concept is that today's exchange can take place via the internet on a far larger scale larger than ever before possible, extending the geographical constraints of a peer to peer (P2P) community. This model gained its popularity during the global economic crisis at the end of the 2000s, when consumers wanted cheaper products and services options, starting with hotels, car rentals and others (Gross, 2015).

Although environmental protection is usually not the main purpose of sharing platforms, in some cases sharing economy models help achieve CE aims. For example, one Zipcar (an American car-sharing

[12] The concept of the performance economy is similar to that of the 'functional economy', which is defined as "the sale of use rather than ownership" (EESC, 2016).

company) takes 5-20 privately-owned vehicles off the road (University of Pennsylvania, 2015), potentially reducing both material consumption and CO_2 emissions.

The platform economy

Platforms facilitate information exchange and immediate direct interactions between buyers and sellers on a global scale. The platform economy does not impact the circular economy per se, but enables other circular economy building blocks (e.g. performance and sharing economies) and offers a bottom-up market driven approach of B2B, B2C (business to consumer) and C2C (consumer to consumer) to trade and exchange products and services.

In many cases, today's eBay buyers are tomorrow's sellers and today's Uber customers can be tomorrow's drivers (Van Alstyne, 2016). These dynamically changing roles and online interactions of B2B, B2C and C2C in real time create network effects on a scale larger than ever before. The platform economy is growing at an unprecedented speed, reaching a value of about €4 trillion ($4.3 trillion)[13] (Center for Global Enterprise, 2016). Thus, the platform economy can help performance and sharing economies to scale up rapidly, with potentially positive effects on the circular economy.

2. Circular Economy Progress for Stakeholders (CEPS Framework)

Based on our understanding of the building blocks, this section presents the "**C**ircular **E**conomy **P**rogress for **S**takeholders, or **CEPS,** Framework**,** from the perspective of its relevance to the different types of stakeholders in the circular economy – classic (mature) industries, emerging industries, SMEs, multi-sectoral corporations, cities and regions. This goes beyond the existing work on the circular economy and fills the gap in the literature of linking the CE building blocks and stakeholders in one comprehensive model. By doing so, the paper aims to provide more clarity to the CE policy process.

The framework differentiates between classic industries, emerging industries and multi-sectoral approaches. In practice, in many cases several building blocks work together in an interrelated way to produce a circular economy framework that is specific to a sector or to a value chain. The differentiation between classic industries, emerging industries and multi-sectoral approaches is made to theoretically simplify the complexity and further clarify the concept of the circular economy.

Classic (or mature) industries

Classic industries consist of typical sectors of the industrial economy, such as chemicals, machinery, transportation and household durables (Global Reporting, 2013). They are likely to impact mostly the first five CE building blocks of the CEPS framework – industrial symbiosis, material resource efficiency, renewable energy sources and energy efficiency, biological products and product life cycle extension.[14]

[13] According to the exchange rate of the European Central Bank for 7 January 2016 https://www.ecb.europa.eu/stats/exchange/eurofxref/html/eurofxref-graph-usd.en.html

[14] Classic industries may also impact other building blocks of the CE and are active players in the new markets of CE, such as sharing platforms. As mentioned, the aim of differentiating the actors is to theoretically simplify the interaction between the CE building blocks and its stakeholders

Emerging industries

Emerging industries represent the new markets of the circular economy, such as sharing platforms, refurbishment schemes and other new business models. They are likely to impact the four building blocks of product life cycle extension, performance economy, sharing economy and platform economy.[15]

Multi-sectoral approach

The approach relates to the deployment of circular-economy models by specific types of actors that have multi-sectoral activities. This paper differentiates between three types of actors:

1) Regions and cities and/or any other type of geographical organisation. Cities can potentially have an immense impact on all components of the circular economy. Different cities might need different circular economy strategies. The CEPS framework provides several ideas – cities with industrial sites could provide incentives and facilitate industrial symbiosis schemes, like in the Kalundborg example. Service economy-oriented cities could facilitate sharing services and platforms (Uber, for example).

2) Small- and medium-sized enterprises. Accounting for 99.8% of all European firms, SMEs generate the majority of employment and gross value-added (Eurostat, 2016b) and impact all circular economy building blocks. SMEs are part of the value chain in all the classic industries. And almost all the enterprises in the emerging industries are SMEs or started as SMEs. For instance, multi-billion valuated Airbnb was set up in 2008, as a start-up by three young entrepreneurs (Winkler & MacMillan, 2015).

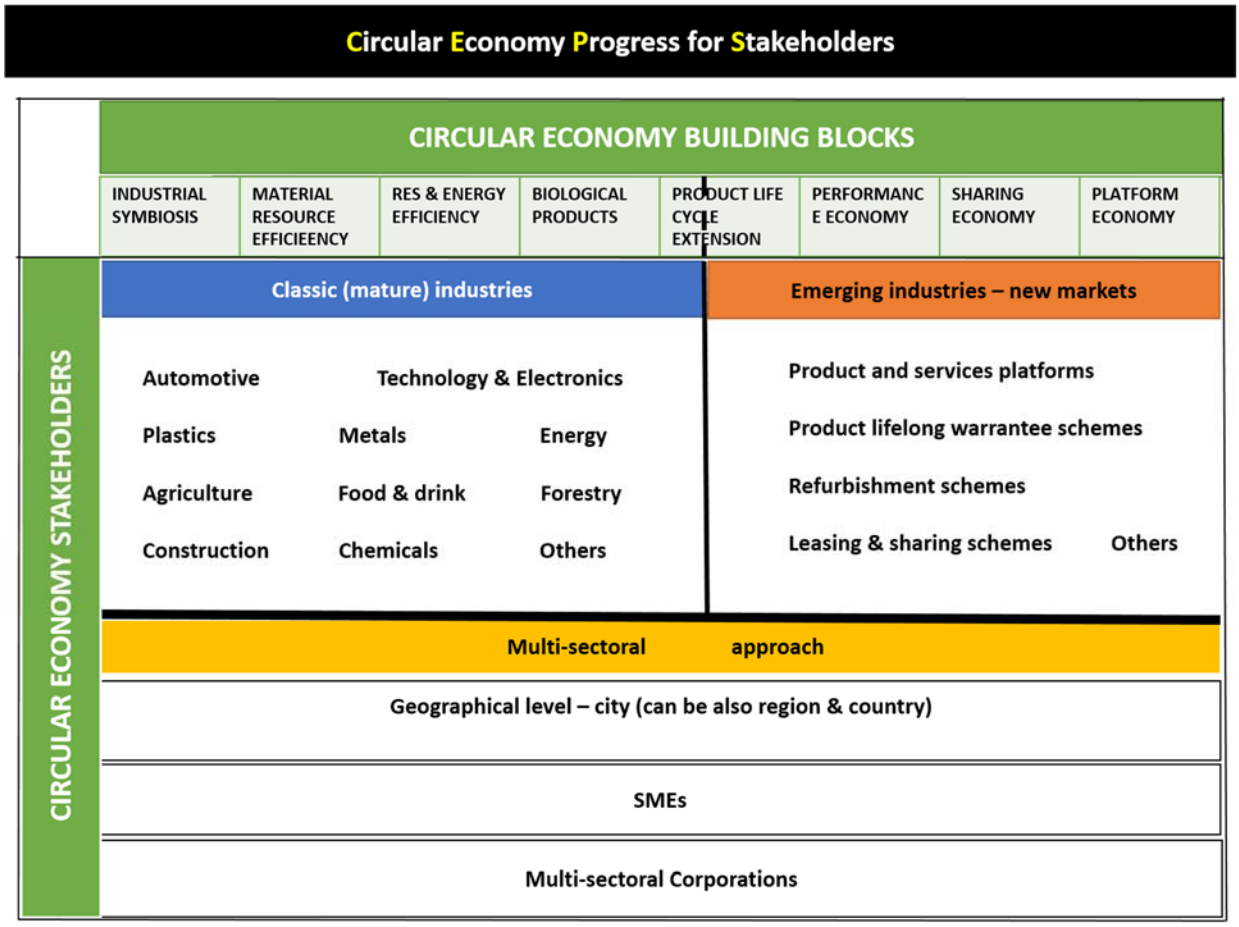
3) Multi-sectoral corporations. This category of CE actor functions in different industry sectors, as exemplified by Siemens or Philips, which are active in energy, healthcare equipment, mobility and other sectors.

The CEPS Framework (Circular Economy Progress for Stakeholders)

Figure 2 presents a visualisation of the CEPS framework, showing various interconnections of the eight CE building blocks described in section 2, with different types of stakeholders as described in section 3. The schematic presentation provides a simplification and clarification of the circular economy and its relevance to the stakeholders.

[15] Emerging industries may also impact additional building blocks, such as material resource efficiency. And as mentioned, the aim of differentiation is to theoretically simplify the interaction between the CE building blocks and its stakeholders

*Figure 2. The CEPS Framework (**C**ircular **E**conomy **P**rogress for **S**takeholders)*



4. Regulatory instruments and policy recommendations

As mentioned in section 2, the circular economy rests on three pillars: 1) reducing environmental impacts and increasing environmental benefits, 2) cost savings from reduced resource use and 3) creating new markets.

The role of regulators is to develop an enabling environment to promote, facilitate and support the deployment of the circular economy, and to strengthen all three pillars, both collectively and separately. Geographically smaller loops (re-use, repair, upgrading of goods) are generally more profitable and resource efficient (due to lower transportation and other transaction costs) (Stahel, 2012). This observation warrants a focus both on national and EU-wide CE strategies. Yet, according to a recent report published by the European Environment Agency, within the EU28 only Belgium, Germany and the Netherlands have national CE strategies in place and most of the existing CE initiatives adopt a very narrow approach that focuses mostly on waste management and secondary materials (EEA, 2016).

This section suggests different policy options for strengthening the circular economy via various types of regulatory interventions at the EU and national levels, thereby overcoming the challenge that diverse practices impact various stakeholders in different ways.

4.1 Regulatory instruments

Streamlining existing and forthcoming EU policies and legislative proposals through the prism of the circular economy

Conceptually, all eight circular economy building blocks exist separately, but they can be used to build consistent and integrated economies that are interlinked and interrelated and to assemble consistent and integrated business and economic development models. The role of policies should be to create synergies between the circular economy building blocks within the CEPS framework, which in turn requires a high degree of integration of regulation.

Several major EU policies are directed at the circular economy, including the Circular Economy Action Plan, other environment policies, energy and climate policies, the Digital Single Market and the Collaborative Economy. Although the main objectives of these policy areas vary, all of them make explicit reference to one or more building blocks of the circular economy and some degree of streamlining might create synergies between the building blocks to increase the benefits for the EU and its ability to exploit the opportunities offered by the circular economy.

The CEPS framework presented in this paper offers a bottom-up, stakeholder-centred and inclusive approach to conceptualising and thinking about the circular economy. The inclusion of this framework in future directives and communications may provide the key to unlock the potential of the circular economy in the service of invigorating the EU economy. We identify below four steps which, together with the recommendations presented in the next two sections, may help unlock the advantages offered by the CE to Europe's economy:

1) The first step entails the inclusion of the CEPS framework in the forthcoming Directive for the treatment of plastics in the circular economy, which is the next major deliverable called for in the Circular Economy Action Plan (European Commission, 2015c).
2) The second step consists of aligning the policy frameworks for the collaborative economy with that for the circular economy.[16] This could be achieved via the CEPS framework.
3) The third step would be the insertion of references to the CEPS framework in the Research and Innovation Strategy for the Energy Union, expected in November 2016 (European Commission, 2016d) and the waste to energy framework of the Energy Union.[17]
4) Fourth step would be including the CEPS framework in the CE policy initiatives beyond 2016, according to Commission's CE Action Plan (European Commission 2015).

Financing the transition to the circular economy

The importance of the circular economy as a policy is a relatively new concept, the uptake of which is made politically urgent by the rapidly deteriorating environmental conditions at global and local scale. To

[16] As called for in the Commission's Communication on Collaborative Economy (European Commission, 2016f) and as shown in this paper, mainly on sharing platforms.

[17] An initiative on waste to energy in the framework of the Energy Union is mentioned in the Annex to the Circular Economy Action Plan (European Commission, 2015c).

accelerate and scale up the uptake of the CE beyond its present pace and ensure its adoption by the market, price-based mechanisms need to be put in place.

As mentioned, the circular economy should also be coherently aligned with other EU policies. Although many policy tools to support the transition to the circular economy remain in the hands of the member states (e.g. taxation), the European Union can play an indirect role by promoting more integration between a number of policy tools. The European Commission has already acknowledged the importance of public financing for the circular economy and this sub-section offers additional recommendations.[18]

Research and Development

In the area of R&D, the EU channels funding through Horizon 2020 to circular economy programmes. The European Fund for Strategic Investments (EFSI) contains elements of the circular economy for deployment in private enterprises (European Commission, 2016e). Other sources of funding may be made available through incentives and the redirection of direct and indirect subsidies, e.g. from 1st generation biofuels or aviation fuels.

Structural Funds

These ad-hoc and disparate elements, however, require further alignment, as the circular economy (similar to the energy transition) will necessitate a fundamental change in the way economic actors behave vis-á-vis the use of resources. One powerful tool at the EU's disposal to motivate resource efficiency and design and the implementation of a coherent circular economy strategy at the national level is to introduce CE elements in the strategic requirements for the structural funds. Like it has done with the smart specialisation strategies and climate earmarking, the EU can gradually introduce a coherency requirement in line with the circular economy. It is important that this is done in a flexible manner, seeking to maximise economically sustainable solutions and to enlist the active involvement of the private sector.

Private financing

A key step in the process is to create incentives for private financing to follow public financing. This would require devising a specific set of policy measures to develop an enabling environment conducive to the deployment of private to private finance mechanisms. In particular, in the initial stages, publicly leveraged private financing mechanisms and targets to finance institutions may be needed (see e.g. Topi & Marini Govigli, 2016a, 2016b).

Financing SMEs and large companies

Particular care should be taken to ensure the full participation of SMEs in the opportunities offered by the circular economy. Given the importance of SMEs in the EU economy, they should be given high priority. It

[18] The financing of the circular economy by the European Fund for Strategic Investments (EFSI) and Cohesion funds and involvement of the EIB are also mentioned in the Annex to Circular Economy Action Plan (European Commission, 2015c).

is also important, however, that large companies and the public sector are closely involved, as many SMEs are suppliers of components to larger companies or tender for public calls. There is a need to drive larger companies and the public sector to demand resource-efficient inputs. European SMEs require a focused policy, as they face a series of barriers in trying to adopt green economy and circular economy practices, particularly in obtaining access to finance and to skills, capacity and knowledge (Rizos et al., 2015). Such barriers would need to be addressed with SME-specific policy measures. SMEs should be at the core of the EU economic development policy framework (see Topi & Govigli, 2016a, 2016b).

Strengthening the three pillars that support the transition to the circular economy

Section 2 presented the three main pillars that serve as the foundation of the circular economy: environmental benefits, cost savings and new markets (as diagrammed in Figure 1 above). This sub-section presents in more detail the policy instruments that can strengthen these three pillars.

Creating more environmental benefits from the circular economy

Mandatory and voluntary resource use targets. Mandatory targets proved to be an effective tool in promoting energy efficiency in the EU. The same approach could also be applied to other aspects of environmental policy, such as material resource use.[19] Alternatively, the EU could take the approach of voluntary agreements with industry and other stakeholders on voluntary targets or other sorts of mechanisms (standards, for example) to reduce resource use (Behrens, 2016).

Labelling. Environmental labelling has been found to exert a positive effect on sustainable consumption (IEA, 2015). There are dozens of eco-labels in Europe and many more globally.[20] The Green Dot symbol (*Der Grüne Punkt*)[21] is one of the best-known industry-funded labels to designate the recyclability of packaging waste. Furthermore, circular economy labelling initiatives need to go beyond packaging recycling; re-usability, re-manufacturability and recyclability of products could encourage sustainable production and consumption.

Circularity indicators. Measuring progress towards the circular economy will help manage the transition. The EU Resource Efficiency Scoreboard aims to illustrate the progress towards increased resource efficiency on the EU and national levels. But the measurement of the circular economy should be expanded to the individual enterprise level, where circular economy indicators could be harmonised (similar to the standard accounting procedures) (CEPS 2015; Behrens et al., 2015). The Ellen MacArthur Foundation and Granta Design have developed a set of Material Circularity Indicators,[22] to be applied at the company level, providing tools to measure input into the production process (see Table 1; EMF & Granta Design 2015).

[19] Some resource productivity targets are already in place in nine EU countries, but they are not directly related to the reduction of resource extraction and consumption (EEA, 2016, p. 83).
[20] For a non-exhaustive list of existing EU and international eco-labels, see http://ec.europa.eu/environment/gpp/pdf/ecolabels.pdf.
[21] For more information, see the Green Dot website (http://www.gruener-punkt.de/en.html).
[22] The project that resulted in the indicator system was co-founded by the European Union's financial instrument LIFE.

These and similar kinds of indicators should be incorporated into standard accounting practices of individual enterprises (Behrens et al., 2015).

Table 1. Material circularity indicators for a product

INDICATOR	EXPLANATION
Input into the production process	How much input is coming from virgin and recycled materials and reused components?
Utility during use phase	How long and intensively is the product used compared to an industry average product of similar type?
Destination after use	How much material goes into landfill (or energy recovery), how much is collected for recycling and which components are collected for reuse?
Efficiency of recycling	How efficient are the recycling processes used to produce recycled input and to recycle material after use?

Source: Akerman (2016).

Enhancing cost savings with the circular economy

Taxation shift from labour to natural resources. Together with sustainable growth, job creation and economic resilience are two of the main policy objectives of European policy-makers: shifting from labour taxation to resources taxation may offer a solution to tackle both challenges at once. This approach to optimising the usage of natural resources, i.e. ecosystem services, ecosystem goods and other natural capital, through tax reform is known as the "double-dividend" approach, in which dividends are determined at societal level. The first dividend is environmental in nature: by applying or increasing taxation on environmental impacts and on the extraction of natural resources and their use, whether they are services or goods, a reduction is obtained in environmental impact and in resource usage. The second dividend is of an economic nature: the additional revenues can be used to reduce the pressure on labour costs, income or capital flows either through tax credits targeting specific activities or by correspondingly reducing taxation in general, based on of the outcome of economic models, improving the performance of the local economy.[23] The double-dividend approach has been widely investigated over the last 20 years, particularly in the context of carbon taxes and environmental impacts (Bovenberg, 1999; Chen & He, 2015; Goulder, 1995). In this paper, we propose that such an approach may also be used for natural resources, as defined broadly, in order to promote the adoption of the circular economy. This proposition may be made even stronger by linking the revenues from taxation (dividend one) to tax relief specifically targeting labour and capital flows (dividend two) that are derived from the circular economy.

It is important to note, however, that tax measures must be adopted unanimously by member states. This makes it difficult to achieve the above-mentioned tax shifts on an EU-wide level. Instead, it is more realistic to implement these measures on the national level in those member states that want to lead the transition to the circular economy.

[23] In classic economic theory, the removal of taxation on labour and capital is perceived as the removal of distortion to market dynamics, rather than as a proactive form of intervention.

Opening new markets through the circular economy

Creating partnerships[24] *or networks with different types of stakeholders*. A first example of such networks could consist of businesses from different sectors to exploit sustainable commercial opportunities, improve resource efficiency and share knowledge (NISP, 2016; Chertow, 2007). The UK's National Industrial Symbiosis Programme, which engaged 15, 000 UK companies in the period 2005-13, serves as an effective model.

A second, model could involve the creation of public-private partnerships (PPPs), such as the Spanish Group for Green Growth, which is composed of Spanish companies working with the government to achieve sustainable economic growth (EUASE, 2015).

A third model could take the form of multi-stakeholder networks of businesses, public authorities, research institutes and universities, civil society and others. GreenEcoNet,[25] a global platform that supports SMEs in their transition towards the green and circular economy, can be cited as a good example of this model.

Public procurement[26] contracts represent 16% of the EU's GDP (European Commission, 2016c). The circular economy could be stimulated by including circular economy-related constraints in public procurement contracts, using the CEPS framework as a starting point and taking into account the whole life cycle of products and services, including their re-usability, re-manufacturability and recyclability (assuming that data on the product level are available) and not only the purchase price.

Price-based mechanisms targeting consumers

Beyond the proposals discussed in the previous sections, other price based mechanisms are available to foster the adoption of CE practice along the value chain of services and products, including on the consumer side. For example, time-limited reduction of value-added tax (VAT) for products certified as being manufactured under CE compliant practices, subsidies to consumers for the purchase of costly items, e.g. appliances, manufactured under strict CE compliance, and tax relief on the purchase of such items could be offered. Careful consideration should be taken at the local level to appropriately balance the entire portfolio of options, considering the trade-offs in terms of the effects on the economy as a whole.

[24] Support of PPPs (public-private partnerships) and other types of cooperative platforms is also mentioned in the Annex to the Circular Economy Action Plan (European Commission, 2015c).
[25] For information about GreenEcoNet, see http://www.greeneconet.eu/about-us.
[26] Action on Green Public Procurement is cited in the Annex to Circular Economy Action Plan (European Commission, 2015c).

4.2 Policy Recommendations

<table>
<tr><th colspan="3">General Policy Recommendations</th></tr>
<tr><td colspan="3">Streamlining the links between the circular economy and the collaborative economy (the CEPS framework provides an overview of these links and guidelines for addressing them with policies)</td></tr>
<tr><td colspan="3">Incorporation of the CEPS framework in forthcoming circular economy legislative initiatives, as called for in the European Commission's Circular Economy Action Plan:
• Plastics Directive
• Energy Union Initiatives on Research and Innovation Strategy and waste to energy framework
• Numerous legislative initiatives on the circular economy beyond 2016</td></tr>
<tr><td colspan="3">Price-based mechanisms targeting consumers – reduction of VAT for circular economy-certified products and services</td></tr>
<tr><th colspan="3">Financing the circular economy</th></tr>
<tr><td colspan="3">• Providing better access to public financing
• Incorporating circular economy aspects into cohesion funds requirements
• Adopting SME-specific policy measures</td></tr>
<tr><th colspan="3">Strengthening the three pillars of the circular economy</th></tr>
<tr><th>ENVIRONMENT</th><th>COST SAVINGS</th><th>NEW MARKETS</th></tr>
<tr><td>Introducing mandatory or voluntary resource-use targets</td><td rowspan="3">Shifting taxation from labour to natural resources</td><td>Creating partnerships between different types of stakeholders</td></tr>
<tr><td>Introducing circularity indicators</td><td rowspan="2">Taking into account the whole life cycle of products and services for public procurement</td></tr>
<tr><td>Introducing circular economy labelling – recyclability, re-manufacturability and re-usability of products</td></tr>
</table>

5. Conclusions

Although the transition to a circular economy is currently high on the policy agenda in Europe, the linear model of producing and consuming goods and services in Europe continues to prevail. One of the reasons is the complexity of the circular-economy concept, which eventually will affect all sectors of the economy. Policy-making based on political, thematic or sectoral 'silos' will not be effective for fostering this transition.

With the introduction of the CEPS Framework (Rethinking the Circular Economy for the Stakeholders Framework), this paper aims to provide a tool for policy-makers and business to identify sectors and stakeholders affected by the transition to a circular economy. By identifying eight building blocks of the circular economy and various stakeholders engaged in these blocks, the CEPS Framework allows for a standardised approach to policy-making for the circular economy and for creating synergies between

various building blocks and stakeholders. The incorporation of the CEPS Framework into EU policy would thus allow Europe to better exploit the opportunities offered by the circular economy.

On the basis of the CEPS framework, the paper also proposes to strengthen the three 'pillars' of the circular economy: 1) environmental benefits, 2) cost savings from reduced natural resource needs and 3) additional economic benefits reaped from the creation of new markets.

The paper suggests that the implementation of the CEPS framework and the policy recommendations associated with the three pillars will help to fully integrate the principles of the circular economy principles the European economy.

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