CHAIN REACTIONS

THEMATIC BRIEF ENERGY & ENVIRONMENT

New value creation through the Circular Economy model

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Definition Circular Economy

The concept of circular economy can be best explained by opposing it to the linear model which is based on a take-make-consume-throw away pattern. In the linear model raw materials are collected, transformed into products that are used until they are finally discarded as waste. Value creation happens only via producing and selling as many products as possible.[1]

The circular economy on the contrary is a model where production and consumption involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. The goal is to extend the life cycle of products as much as possible. This implies reducing waste to a minimum by keeping materials of a product that has reached its end within the economy wherever possible. By using again these materials further value is created.[2]

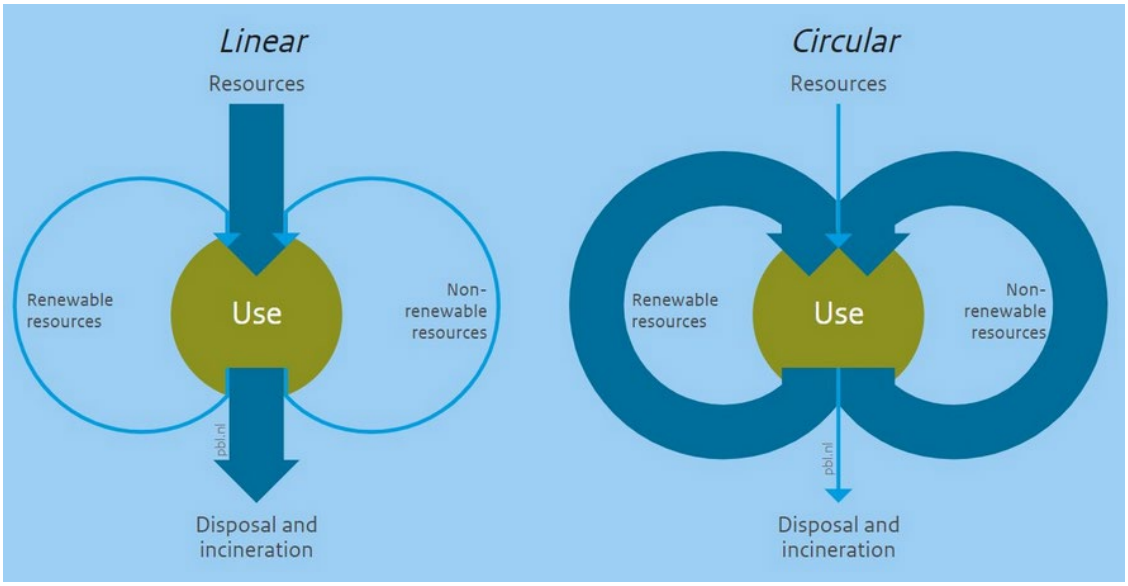

Figure 1: Comparison Linear and Circular Economy
Source: Het Groene Brein

On a European level, the concept of Circular Economy is part of the European Green Deal which is Europe's *"growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy* ***where there are*** *no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use."*[3]

[1] https://kenniskaarten.hetgroenebrein.nl/en/knowledge-map-circular-economy/how-is-a-circular-economy-different-from-a-linear-economy/

[2] https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits

[3] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS The European Green Deal,
Brussels, 11.12.2019 COM(2019) 640 final

Figure 2: Circular Economy as Part of the European Green Deal
Source: European Commission

Challenges in key product value chains

The Green Deal acknowledges that achieving a climate neutral and circular economy requires the full mobilization of industry. It estimates that transforming an industrial sector and all the value chains takes 25 years which means that to achieve the goals of the Green Deal by 2050, action need to be taken within the next five years (acknowledging that the Green Deal document dates from December 2019).

Looking at the annual global extraction of materials, these have tripled from 1970 to 2017 and it continues to grow which presents a major global risk.[4] Further to that, half of total greenhouse gas emissions and more than 90% of biodiversity loss and water stress is coming from resource extraction and procession of materials, fuels and food. Even if the EU's industry has started to shift, it still accounts for 20% of the EU's greenhouse gas emissions. These numbers demonstrate that European economy is still too linear with only 12% of the materials it uses coming from recycling.[5]

The new Circular Economy Action Plan of the European Commission focuses on the sectors that use most resources and where the potential for circularity is high. These sectors and their specific challenges are outlined below:

Electronics and ICT

Electrical and electronic equipment represent one of the fastest growing waste streams in Europe with a current annual growth rate of 2%. Only less than 40% are estimated to be recycled in the

EU20.[6] Even if two out of three Europeans would like to keep using their current digital devices for longer[7], value is lost once fully or partially functional products are discarded because they are not reparable, the battery cannot be replaced, software is no longer supported or materials that are

[4] Global Resources Outlook 2019: Natural Resources for the Future We Want: The International Resource Panel.
[5] https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=cei_srm030&plugin=1
[6] https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_rt130&plugin=1
[7] Special Eurobarometer 503, January 2020.

incorporated in devices are not recovered.

Batteries and vehicles

Sustainable batteries and vehicles underpin the mobility of the future. In order to master the transformation to future mobility, progress is also needed in terms of enhancing the sustainability of the emerging battery value chain for electro-mobility and boosting the circular potential of all batteries. The lithium-ion battery value chain can be divided into six steps, starting with the mining and processing of raw materials, recycling of the end product, with cell component, cell manufacturing, battery pack manufacturing and electric vehicle manufacturing between. Concerning the recycling of EV batteries, although the EU is in a strong position due to legislative requirements, it is not yet prepared to manage a large number of end-of-life batteries.[8]

Packaging

The amount of materials used for packaging is growing continuously. In 2017 packaging waste reached the highest level ever in Europe with 173 kg per inhabitant.[9]

Plastics

In a report from 2016, it has been shown that most plastic packaging is used only once with only 14% being collected for recycling. In economic figures, 95% of the value of plastic packaging material, worth USD 80-120 billion annually, is lost every year.[10] Further to that, according to the Circular Economy Action Plan of the European Commission, consumption of plastics is expected to double in the coming 20 years.[11]

Textiles

For the use of primary raw materials and water, textiles represent the fourth highest-pressure category after food, housing and transport, and fifth for greenhouse gas emissions.[12] Less than 1% of all textiles worldwide are recycled into new textiles.[13] Looking at the EU textile sector, it is predominantly composed of SMEs and has started to recover after a long period of restructuring, while 60% by value of clothing in the EU is produced elsewhere.[14]

Construction and buildings

The construction sector requires vast amounts of resources. It accounts for about 50% of all extracted material and is responsible for over 35% of the EU's total waste generation.[15] Greenhouse gas emissions from material extraction, manufacturing of construction products, construction and renovation of buildings are estimated at 5-12% of total national greenhouse gas emissions.[16] If the construction sector payed attention to greater material efficiency, 80% of those emissions could be saved. Greater material efficiency could save 80% of those emissions.[17]

[8] Eleanor Drabik and Vasileios Rizos: "Prospects for electric vehicle batteries in a circular economy", No 2018/05, July 2018, available at https://circulareconomy.europa.eu/platform/sites/default/files/circular_economy_impacts_batteries_for_evs.pdf

[9] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A new Circular Economy Action Plan For a cleaner and more competitive Europe, Brussels, 11.3.2020 COM(2020) 98 final

[10] Plastics and circular economy, available at https://www.ellenmacarthurfoundation.org/explore/plastics-and-the-circular-economy

[11] COM(2020) 98 final

[12] EEA Briefing report Nov 2019

[13] Ellen McArthur Foundation (2017), *A new Textiles Economy*

[14] COM(2020) 98 final

[15] Eurostat data for 2016.

[16] https://www.boverket.se/sv/byggande/hallbart-byggande-och-forvaltning/miljoindikatorer---aktuell-status/vaxthusgaser/

[17] Hertwich, E., Lifset, R., Pauliuk, S., Heeren, N., IRP, (2020), Resource Efficiency and Climate Change: Material

Food, water and nutrients

While the food value chain is responsible for significant resource and environmental pressures, an estimated 20% of the total food produced is lost or wasted in the EU.[18] On a global level, the UN estimates that 1.3 billion metric tons of food — about one-third of all the food produced for human consumption — is lost or wasted globally each year.[19]

For all key sectors implementation actions are suggested in the Circular Economy Action Plan such as the "Legislative and non-legislative measures establishing a new 'right to repair' by 2021, the "Circular Electronics Initiative, common charger solution, and reward systems to return old devices" by 2021 or the "Initiative to substitute single-use packaging, tableware and cutlery by reusable products in food services" by 2021. In sum 35 actions are planned with a timetable that can be accessed online via the Implementation tracking table.[20]

Potential of value creation through the circular economy model

A recent study estimates that applying circular economy principles across the EU economy has the potential to increase EU GDP by an additional 0.5% by 2030 which would create around 700 000 new jobs through additional labor demand from recycling plants, repair services and rebounds in consumer demand from savings generated through collaborative actions. These numbers confirm that resource efficiency and increase in employment are possible at the same time as illustrated in the graph below [21].

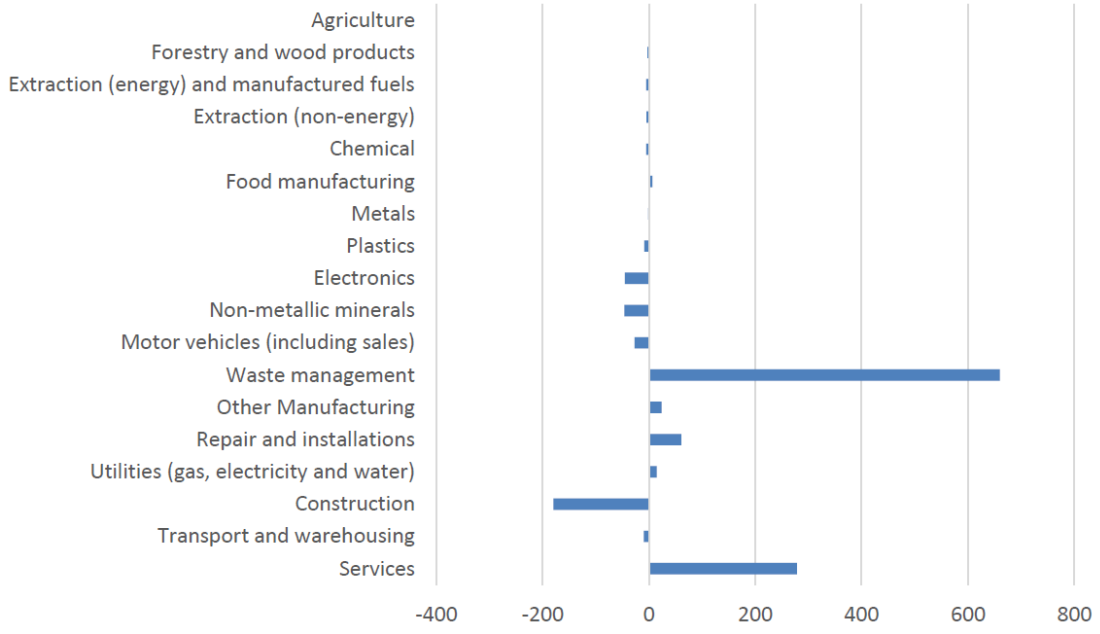

Figure 3: Circular economy job impacts across the EU28 sectors in 2030 (thousands) Source: E3ME, Cambridge Econometrics.

Efficiency Strategies for a Low-Carbon Future.

[18] COM(2020) 98 final

[19] "3 ways to accelerate a circular food system, even in the middle of a pandemic", available at https://www.greenbiz.com/article/3-ways-accelerate-circular-food-system-even-middle-pandemic

[20] https://ec.europa.eu/environment/circular-economy/pdf/implementation_tracking_table.pdf

[21] Cambridge Econometrics, Trinomics, and ICF (2018), Impacts of circular economy policies on the labour market.

On a micro economic level, there is also a clear business case: individual companies, in particular manufacturing firms that spend on average about 40% on materials, can increase their profitability through closed loop models while sheltering them from resource price fluctuations.[22]

Looking at business creation and entrepreneurship in Europe, the circular economy can have a positive effect on the latter whilst building on the single market and the potential of digital technologies. Circular economy paves the way towards new innovative models that are based on a closer relationship with customers, mass customization, sharing and collaborative economy, powered by technologies, such as the internet of things, big data, blockchain and artificial intelligence. Such new models will not only accelerate circularity but also the dematerialization of our economy and make Europe less dependent on primary materials.[23]

Looking at value creation for citizens, the circular economy will provide more high-quality, functional and safe products, which are efficient and affordable, last longer and are designed for reuse, repair, and high-quality recycling. To sum up, circular economy has the potential to contribute to the development of a whole new range of sustainable services, product-as-service models and digital solutions bringing about a better quality of life, innovative jobs and upgraded knowledge and skills.[24]

Current scale of circular business models

Even if the potential for value creation of the Circular Economy model is estimated high, its current sccope remains limited. The OECD report "Business Models for the Circular Economy Opportunities" distinguishes between five types of Circular Economy Business Models:

- **Circular supply models** replacing traditional material inputs derived from virgin resources with bio-based, renewable, or recovered materials, reduce demand for virgin resource extraction in the long run
- **Resource recovery models** recycling waste into secondary raw materials, thereby diverting waste from final disposal while also displacing the extraction and processing of virgin natural resources
- **Product life extension models** extending the use period of existing products, slowing the flow of constituent materials through the economy, and reducing the rate of resource extraction and waste generation.
- **Sharing models** facilitating the sharing of under-utilized products, and therefore reducing demand for new products and their embedded raw materials
- **Product service system models**, where services rather than products are marketed, improving incentives for green product design and more efficient product use, thereby promoting a more sparing use of natural resources.[25]

So far, market shares of circular business models are limited. Where circular business models have reached a significant market share, it is mostly a niche market. Examples are product service systems in automative coatings and resource recovery in the steel sector. Reuse and remanufacturing, the sharing of under-utilized capacity, and the provision of services rather than

[22] COM(2020) 98 final
[23] COM(2020) 98 final
[24] COM(2020) 98 final
[25] "Business models for the circular economy", OECD, October 2018, available at: https://www.oecd.org/environment/waste/policy-highlights-business-models-for-the-circular-economy.pdf

products accounts for only a small fraction of output in most sectors (generally no more than 5 to 10% in economic terms) as illustrated in the graph below. As such, there remains considerable potential for the scale up of circular economy business models in many sectors.[26]

Business model	Sector	Market penetration
PSS: result-oriented (chemicals)	Automotive	50 - 80%
PSS: result oriented (digital content)	Music	50%
Waste as value: recycling	Pulp and paper	38%
PSS: result oriented (digital content)	Books	25 - 35%
Waste as value: recycling	Steel	25%
PSS: result-oriented (chemicals)	Aerospace	5 - 15%
Waste as value: recycling	Plastics	13%
Product life extension: refurbishment	Smartphones	4 - 8%
PSS: result-oriented (lighting & heating)	Various	4 - 8%
Product life extension: remanufacturing	Machinery	3 - 4%
Product life extension: refurbishment	Various	2 - 3%
Product life extension: remanufacturing	Aerospace	2 - 12%
Idle Capacity: co-access	Lodging	1% - 6%
Product life extension: remanufacturing	Automotive	1%
Product life extension: remanufacturing	Consumer and electrical and electronic equipment (EEE)	0 - 1%
Was as value: recycling	Rare earth element (REE) metals	<1%
PSS: user-oriented (car sharing)	Transport	<1%

Figure 4: Market share of circular business models in selected sectors
Source: OECD

To conclude, despite the extensive potential described for example in the Circular Economy Action Plan of the European Commission, a transition to a CE faces numerous obstacles. This can be observed on various levels such as cognitive, cultural, regulatory, financial or operational. In addition, the profusion of different definitions of a circular economy is hindering setting clear implementation goals and setting indicators for measuring the effectiveness of the measures.27 In order to exploit the above outlined potential for value creation, the Actions foreseen in the Circular Economy Plan - many of them foreseen to be addressed in 2021 – need to be implemented vehemently in all EU member states.

[26] "Business models for the circular economy", OECD, October 2018, available at: https://www.oecd.org/environment/waste/policy-highlights-business-models-for-the-circular-economy.pdf
[27] Weber, T./ Stuchtey, M. (Ed.): Pathways towards a German Circular Economy – Lessons from European Strategies (Preliminary study), Munich 2019.

Literature

https://kenniskaarten.hetgroenebrein.nl/en/knowledge-map-circular-economy/how-is-a-circular-economy-different-from-a-linear-economy/

https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS The European Green Deal, Brussels, 11.12.2019 COM(2019) 640 final

Global Resources Outlook 2019: Natural Resources for the Future We Want: The International Resource Panel.

https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=cei_srm030&plugin=1

https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_rt130&plugin=1

Eleanor Drabik and Vasileios Rizos: "Prospects for electric vehicle batteries in a circular economy", No 2018/05, July 2018, available at https://circulareconomy.europa.eu/platform/sites/default/files/circular_economy_impacts_batteries_for_evs.pdf

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Plastics and circular economy, available at https://www.ellenmacarthurfoundation.org/explore/plastics-and-the-circular-economy

Ellen McArthur Foundation (2017), A new Textiles Economy

https://www.boverket.se/sv/byggande/hallbart-byggande-och forvaltning/miljoindikatorer---aktuell-status/vaxthusgaser/

Hertwich, E., Lifset, R., Pauliuk, S., Heeren, N., IRP, (2020), Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future.

"3 ways to accelerate a circular food system, even in the middle of a pandemic", available at https://www.greenbiz.com/article/3-ways-accelerate-circular-food-system-even-middle-pandemic

Cambridge Econometrics, Trinomics, and ICF (2018), Impacts of circular economy policies on the labour market.

"Business models for the circular economy", OECD, October 2018, available at: https://www.oecd.org/environment/waste/policy-highlights-business-models-for-the-circular-economy.pdf

Weber, T./ Stuchtey, M. (Ed.): Pathways towards a German Circular Economy – Lessons from European Strategies (Preliminary study), Munich 2019.