

TOWARDS A CIRCULAR ECONOMY THROUGH CHALLENGES, OPPORTUNITIES AND POLICIES

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Abstract:

The transition to a circular economy is an imperative that addresses the growing environmental challenges and irrational use of resources confronting modern society. The proposed article highlights the importance of this transition, elucidating its multifaceted impact with a close connection to the economic, social and environmental domains. Highlighting the need for sustainable and circular supply chains, the research outlines key features of the circular economy, including the use of innovative technologies such as AI and blockchain, redesigning products to be recyclable and promoting collaborative partnerships between sectors.

Drawing on information from the European Union's Circular Economy Action Plan, the article highlights the critical need for global adoption to mitigate biodiversity loss and the crucial impact on climate change. The research describes both notable progress in the European Union and the United States, as well as some gaps in awareness, fragmented regulation and inadequate incentives.

Solutions discussed in the paper include comprehensive policy frameworks, targeted investments, consumer education and stakeholder collaboration. By aligning efforts with the principles of the circular economy, developed and developing countries around the world can unlock economic growth, create new jobs and ensure environmental sustainability. Ultimately, the key elements of the circular economy offer a transformational path to a sustainable, equitable and resilient future for all stakeholders.

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The circular economy is a worldwide trend with a major long-term impact and which will influence the whole society through various aspects: economic, social, and even cultural. Next, we will describe the main characteristics of the circular economy:

- the need to organize supply chains developed on sustainable and circular principles by providing the needed materials, the effective design of waste generation and the stimulation of reuse and recycling both in the production and distribution process, a fact that would reduce transport costs, reduce the specific risks of international trade in case of pandemic, war, etc.
- the development of modern technologies such as digital platforms, AI and blockchain, which can provide effective solutions to improve the control of the resource track and to facilitate the recovery of materials.
- the design of new products through the prism of circular principles, which would primarily include the use of recyclable materials, which would ensure more efficient use of resources and reduce the harmful impact on the environment.
- developing new business models, such as offering services and not products, creating and developing sharing and remanufacturing platforms to extend product life cycles and create new values by reusing goods, reducing waste and reusing it in a better way.
- collaboration between the most important stakeholders: government, industry, NGOs and the academic institutions, which would create excellent conditions to develop

circular economy initiatives. Partnerships and alliances are needed to develop new ideas, organize joint actions, exchange best practices and promote societal change.

- the development of regulations is necessary to create favorable conditions for the promotion of the best circular economy practices. It is necessary to draw some clearly defined objectives, to approve some effective incentives, including financial ones, that would facilitate the transition to the circular economy.
- government investments in various circular economy projects, infrastructure and technologies through specific financing mechanisms, such as impact investments, green bonds and public-private partnerships.
- public pressure by increasing consumer awareness of sustainability and the green economy and thus influencing companies to develop more sustainable practices and offer ecological options for business development and to meet, in this way consumer expectations.

At the same time, we must mention that the transition to the circular economy has a set of economic advantages and can be stimulated by innovation, the development of new technologies and the formation of new jobs in industries oriented to the recovery and recycling of resources, increasing the efficiency of the use of resources and implicitly to the reduction of production costs. It can contribute to the reduction of waste and their efficient processing. Consumers, in turn, are increasingly looking for sustainable products and services, creating opportunities for businesses that prioritize circularity.

So, the circular economy advantages can be described:

- the concentration of production processes to maximize the efficiency of resources and the development of closed circle production and consuming system in which materials are used sustainably, have a high degree of reuse and are not disposed of as waste [1].
- the development of new principles of consumption and sustainable production by prioritizing the use of renewable resources, expanding the use of products and reducing the amount of waste [2].
- benefits of various organizations in terms of cost savings, greater efficiency in the use of resources and better brand reputation due to the inclusion of circular economy principles in their work [3].
- the creation of new jobs, the reduction of emissions of harmful substances and the more efficient use of natural resources by promoting a sustainable economy [4].

There are also environmental benefits, such as reduced emissions of harmful substances, better conservation of natural resources and the minimization of pollution and waste generation.

Now human civilisation has only one planet to live on, but by 2050 humans will be consuming resources as if they had three planets. The EU's Circular Economy Action Plan describes the opportunities of the circular economy and its potential to reduce pressure on nature by achieving sustainable development, creating jobs. All this will enable EU countries to achieve climate neutrality by 2050, which will lead to a reduction of biodiversity loss in nature [5].

Keeping resource consumption within the planet's means can only be achieved by abandoning the use of the linear "take-make-use-throw-away" model for good and moving to a model that includes regeneration/reuse of resources. In a circular economy, the life of materials and resources is much longer than in a linear economy, and waste generation is much lower.

Moving to a global circular economy would significantly reduce the negative impact of human activity on the planet's flora and fauna and on the climate in general. The linear economy is based solely on consumption and irrational use of the planet's goods.

In March 2020, the European Commission adopted a new plan to develop the circular economy in EU countries, which would allow a faster shift to this model.

Thus we can state that the EU is the world leader regarding the transition to the circular economy, a fact confirmed that in the last 2 decades the use of resources has decreased by 9.4%, and the share of resources from recyclable resources has increased to 50%. Also, due to the

approved policies regarding the circular economy, it could lead to a further reduction in the consumption of materials in the next 10 years by about another 11% [6].

We must state that the United States of America does not have a comprehensive federal law, specific to the promotion of a circular and sustainable economy. However, there are several laws and regulations at both the federal and state levels that address various aspects of the sustainable economy, efficient use of resources, and environmental protection. Key US legislation and initiatives related to promoting a sustainable and green economy include the following:

1. Resource Conservation and Recovery Act (RCRA):

- The RCRA is a federal law that regulates the management of hazardous and non-hazardous waste, including requirements for waste reduction, reuse, and recycling [7].

2. Energy Policy and Conservation Act (EPCA):

- The EPCA is a federal law that promotes energy efficiency and conservation in the US, including measures to reduce energy consumption and greenhouse gas emissions [8].

3. The federal government and agencies such as the Environmental Protection Agency (EPA) and the Department of Energy (DOE) have initiated programs and partnerships to support research, innovation, and collaboration to define circular economy solutions. The EPA's Sustainable Materials Management program, for example, aims to reduce waste generation, conserve resources, and support sustainable materials use [9].

4. State level initiatives:

- At the same time, it should be underlined that there are many initiatives at the level of different states in the USA, various regulations and programs being implemented to promote the sustainable economy, renewable energy and the efficient and effective use of resources. For example, we can highlight the state of California, which has adopted various legislative acts such as the California Global Warming Solutions Act (AB 32) and the California Circular Economy and Plastic Pollution Reduction Act (SB 54), which aims to influence climate change and stimulate environmental initiatives, recycling and resource recovery [10].

As a result, some innovative policies have been implemented in the state of California to promote sustainable business, the efficient use of resources and, in particular, the reduction of plastic waste, thus increasing the level of collection and the rate of their recycling.

5. Corporate sustainability initiatives:

- It should be noted that many US businesses are socially responsible and voluntarily adopt new sustainable economy practices through initiatives such as the Ellen MacArthur Foundation's Circular Economy 100 program or the Sustainable Packaging Coalition's How2Recycle labeling program [11].

There are several important companies in the US, such as Apple, Google, Nike etc. who promote transition to the circular economy, leaders in the adoption of new business models focused on sustainability and circularity in various fields, such as product design, supply chain, production and development of new technologies.

6. Non-profit organizations and research institutions:

- US non-profit organizations and research institutions are important stakeholders in the circular economy through various activities such as research, education and advocacy. Organizations such as the Ellen MacArthur Foundation and the Sustainable Packaging Coalition collaborate with businesses, public institutions and communities to facilitate the transition to a circular economy [12].

Thus, we must emphasize that the regulations in the US are less developed and comprehensive than those specific to the EU economy, and the implementation of a circular economy in the US is overall at an early stage and includes various ongoing efforts and initiatives at the federal, state and corporate level. According to the Environmental Protection Agency (EPA), the share of recycled waste constitutes about 35% of the total waste, and in some areas superior results are attested such as: aluminum 50% and paper 63%.

However, some states, such as California, demonstrate notable results. At the same time, modest results are attested in several states, for example, although Texas has a robust recycling infrastructure, various efficient waste management projects are being carried out, there are still many opportunities for the development of circular businesses, especially in the field of oil processing. Collaboration between government, business, academia, and civil society will be crucial to ensuring the transition to a circular and more sustainable economy in the US.

Analyzing [13] the European Commission's objectives in the field of the circular economy we can highlight the following moments:

1. The circular economy will allow us to have a healthier planet and a significant reduction of waste polluting the environment.
2. The circular economy will allow a reduction in the use of natural resources and the irrational use of water and land.
3. The circular economy will allow a significant reduction in greenhouse gas emissions, which will put the EU among the most climate neutral continents.
4. The circular economy will enable more prosperous business development in the region and increase the quality of new jobs created.
5. The circular economy will enable the formation of a stable chain of product value creation.

The implementation of the circular economy in the USA faces a lot of specific challenges, so the main problem is the lack of awareness and understanding of the need for the development of the circular economy characteristic for the entire society: businesses, decision-makers but also at the community. Consequently, there is not enough pressure to develop specific policies, regulations and business development. The absence of comprehensive federal legislation, the variety of often inconsistent regulations at the local level to support the circular economy and the lack of financial incentives are most important factors that constitute obstacles to the transition to a sustainable and green economy in USA.

Indeed, we find that the transition from a linear to a circular economy is very complex, requiring a lot of investment and business remodeling, which presented a financial burden for many companies. Additional investments and uncertainties related to the financial return associated with projects specific to the circular economy and if not providing institutional incentives, may discourage many companies from developing their businesses by using the concept of the sustainable economy. Also, in the case of an underdeveloped infrastructure for recycling and remanufacturing, as well as deficiencies in the collection and sorting of waste, substantially reduce the scalability and efficiency of businesses based on the principles of the green economy. So, it is important to establish clear regulations and legislation, to create special federal and local funds that stimulate the implementation of various circular and sustainable projects and businesses. Investments must be stimulated to be directed towards new best technologies and infrastructure development for the collection, recycling and remanufacturing of materials and waste.

The US has great potential to make significant progress in moving towards a circular economy. There are considerable intellectual, organizational and financial resources for this purpose. For this, it is necessary to combine collaborative efforts between government, business, academia and civil society for the approval of regulations and the application of circular economy practices, to stimulate collaboration between different economic sectors to overcome barriers and lead the transition to an economy more environmentally friendly and sustainable. Collaboration, innovation and sustainability-oriented policy regulation will be key factors for the implementation of the circular economy.

It should be noted that there are some examples of successful circular economy initiatives in the US:

Loop Industries is an innovative plastics recycling company that has developed advanced technology to transform plastic waste into high quality plastic. This closed loop recycling

technology allows Loop Industries to transform plastic waste into plastics that can be used in packaging including food and beverages, textiles and other [14].

The Closed Loop Fund is an investment fund that has not just economical but also a social impact due to investments in recycling infrastructure projects, thus promoting the green and sustainable economy. The fund offers not only financing but also technical assistance to companies, different local institutions to use recycling technologies, ensure efficient recovery of materials and reduce waste [15].

Adopting the circular economy in the US must include different solutions, as follows:

- establishing policy, regulations and incentives, at the federal, state and community levels, that provide guidance, create clear conditions, establish extended producer responsibility, eco design requirements and ensure efficient use of resources, create an environment favorable for investments in green and sustainable projects.
- government investment in research, innovation and infrastructure development favorable for the development of environmentally friendly businesses.
- government support for businesses that promote sustainability, are guided by the principles of circularity and develop ecological design for products.
- ensure green awareness, educate consumers and promote responsible consumption habits that are in line with circular economy concepts, such as recycling, reuse, repair and waste reduction.
- engaging various stakeholders, including government, businesses, NGOs, academia and the community through effective collaboration to direct efforts towards circular economy goals.
- the formation of partnerships and alliances between stakeholders from different sectors that can facilitate the pooling of resources and the development of solutions to face the complex challenges of the transition to a green and sustainable economy.
- designing products to include recyclable materials, incorporating a modular design that allows for easy disassembly and repair, ensuring extended product life cycles.
- embracing innovative technologies such as advanced recycling, material recovery and digital platforms that can ensure efficient use of resources and create new opportunities for green business development.
- adopting and promoting the scalability of circular business models, such as product-as-a-service, sharing platforms, remanufacturing which can create added value from the reuse, repair and reconditioning of products and materials.
- the effective implementation of waste management is ensured by establishing of clear institutional objectives and specific incentives to support the sustainable use of resources and ecologically responsible consumption. It is necessary to ensure efficient collection systems, waste sorting and the development of a necessary infrastructure for recycling, ensuring advanced material recovery processes and thus reducing the creation of waste. To recover materials and thus promote circularity, large investments in advanced recycling technologies such as chemical recycling, composting and anaerobic digestion will be required. A good prospect exists for designing products or services by allocating funds to green projects such as renewable energy systems, transportation, electric vehicles, water recycling systems, etc.

By implementing these recommendations to all stakeholders: policymakers, businesses, investors, consumers, academia, and civil society, circular economy best practices could be developed and advanced in the US that would contribute to sustainable, more efficient in terms of the use of resources and more resilient, more favorable long-term sustainable development.

Analysing concrete EU policies in the field of implementing circular economy objectives and strategies, we can highlight the following:

- The EU policy on "plastics" is primarily geared towards protecting the environment as well as human health through the reduction of waste entering the seas and oceans, greenhouse gas emissions and over-dependence on imported oil products [16].

- The EU's policy on "goods repair" is geared towards consumers' rights to simple, cheap and convenient repair. This means prioritizing repairing goods whenever necessary, versus throwing them away and buying a new product [17].
- The EU's "raw materials" policy is geared towards protecting the EU's interests in the supply of strategic materials of major importance for the EU's economic development and growth. Thus, strategies have been developed and approved in the area of supplying the most critical materials for the Community [18].
- The EU policy on "waste and recycling" is geared towards promoting a circular economy based on the maximum extraction of rare, critical materials from waste. This policy implies a shift towards a modern, competitive and resource-efficient economy [19].
- The EU policy on "production and use of textile products" is geared towards ensuring a more environmentally friendly and economically competitive sector that is better adapted to global change [20].
- The EU policy on "industrial emissions and safety" is geared towards the prevention and strict control of industrial emissions and industrial accidents that may have a negative impact on the environment. Industry consumes huge amounts of electricity and creates a vast amount of waste, which subsequently affects ecosystems and human health, which makes EU policies in this area so important [21].
- The EU policy on "green claims" is aimed at reducing misleading claims by manufacturing companies about the environmental claims of products manufactured or services provided. This policy is designed to reassure consumers that the information on environmental labels and claims is credible and trustworthy, allowing them to make a more informed purchasing decision. It will also enhance the competitiveness of companies that focus on environmentally sustainable development of both their products and their manufacturing processes [22].
- EU policy on the "global circular economy" is geared towards bilateral policy dialogues with countries around the world, multilateral environmental fora and agreements, pre-accession and neighbourhood assistance, development programmes and international cooperation [23].
- The EU policy on "sustainable products" is geared towards the need to produce more sustainable products, which would enable a more resource-efficient circular economy with a neutral impact on the environment and zero pollution [24].

To achieve these policies, the European Union uses various instruments and levers that deliver the desired results within the set terms.

CONCLUSIONS

The transition to a circular economy is a fundamental change with profound economic, social and environmental implications. As discussed above, the adoption of circular principles requires a holistic approach, encompassing supply chain re-engineering, technological innovation, regulatory frameworks and collaborative efforts between various stakeholders.

At the core of the circular economy paradigm is the imperative to maximize resource efficiency and minimize waste generation. Through initiatives such as sustainable supply chains, eco-design and extended producer responsibility, the circular economy promotes a regenerative approach to resource use, fundamentally changing traditional patterns of production and consumption. In addition, the adoption of modern technologies such as AI and blockchain facilitates material traceability and improves resource recovery processes.

The benefits of the transition to a circular economy are multiple, including economic growth, job creation and environmental conservation. By promoting closed-loop systems and sustainable consumption practices, the circular economy not only reduces greenhouse gas emissions and conserves natural resources, but also creates sustainable businesses and communities.

While the European Union has made significant strides in promoting circular economy policies and initiatives, the United States faces unique challenges in making similar progress. Despite notable examples of circular economy initiatives, widespread adoption is hampered by a lack of awareness, a fragmented regulatory landscape, and insufficient financial incentives.

To overcome these barriers and unlock the full potential of the circular economy in the US, concerted efforts are needed on several fronts. These include establishing robust regulatory frameworks, targeted investment in research and infrastructure, and fostering collaboration between government, business, academia and civil society.

By aligning policies, investments and collective actions with the principles of the circular economy, the US can harness its considerable resources to boost sustainable development and mitigate environmental degradation. As we navigate the complexities of the global economy, embracing the circular paradigm offers a path to a more prosperous, equitable and resilient future for all.

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