Closing the Loop: Use of Circular Economy for Waste Reduction and Sustainability

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Circular economy (CE) is a new approach to production and consumption that emphasizes restoring the value of resources used. The term CE was first introduced by Boulding, an ecological economist, in 1966. Since the 1970s, CE has gained momentum and is viewed as a multidisciplinary concept that extricates economic growth from the utilization of resources and its social implications. It is an alternative to the linear economy, which generates waste that harms the environment and human health. CE aims to keep parts, products, resources, and energy in circulation for an extended period to create economic, environmental, and social benefits.

The importance of CE lies in the fact that natural resources are limited, and their circularity and energy maximization within systems can retain value from these resources even at the end of their life (Ghisellini et al., 2016). The depletion of natural resources is a global issue, and with the expected population growth and increased wealth by 2050, the demand for resources will almost triple (Godfray et al., 2010; Meadows et al., 2004). CE adopts a systems approach that prioritizes interdependence and holism to manage finite resources effectively (Ünal et al., 2018).

According to the World Economic Forum (2014) report, the adoption of CE presents a trillion-dollar opportunity for the global economy. Macro-economically, the adoption of CE can enhance resource productivity by 3%, resulting in cost savings of 0.6 trillion euros annually, with an additional 1.8 trillion euros in other economic benefits by 2030 (McKinsey & Company, 2015).

The restorative approach of CE can also result in a net material cost and saving benefits of over 600 billion USD per year by 2025 (The Ellen MacArthur Foundation, 2013). Adopting CE can lead to increased growth, competitive advantages, innovation, and reduction in costs, energy use, and emissions, leading to better supply chain and resource utilization (World Business Council for Sustainable Development, 2017).

Initiatives at the micro, meso, and macro levels are being undertaken to implement CE principles. The micro level involves initiatives specific to individual firms, such as reducing, reusing, and recycling (Ying & Li-Jun, 2012). The meso level involves eco-industrial parks, networks, and inter-firm collaborations to optimize resource utilization. At the macro level, government and policymakers are responsible for initiatives (Geng & Doberstein, 2008). MacArthur et al. (2015) identify three principles guiding CE cycles: increasing resource and energy circularity, reducing negative production effects, and conserving natural resources.

The Ellen MacArthur Foundation (2015) outlines six business actions for implementing CE principles, known as the ReSOLVE Framework. These actions include adopting renewable resources and energy, sharing resources, optimizing production systems with technology, keeping components and materials in closed loops, virtualizing products, and exchanging non-renewable goods for renewable ones.

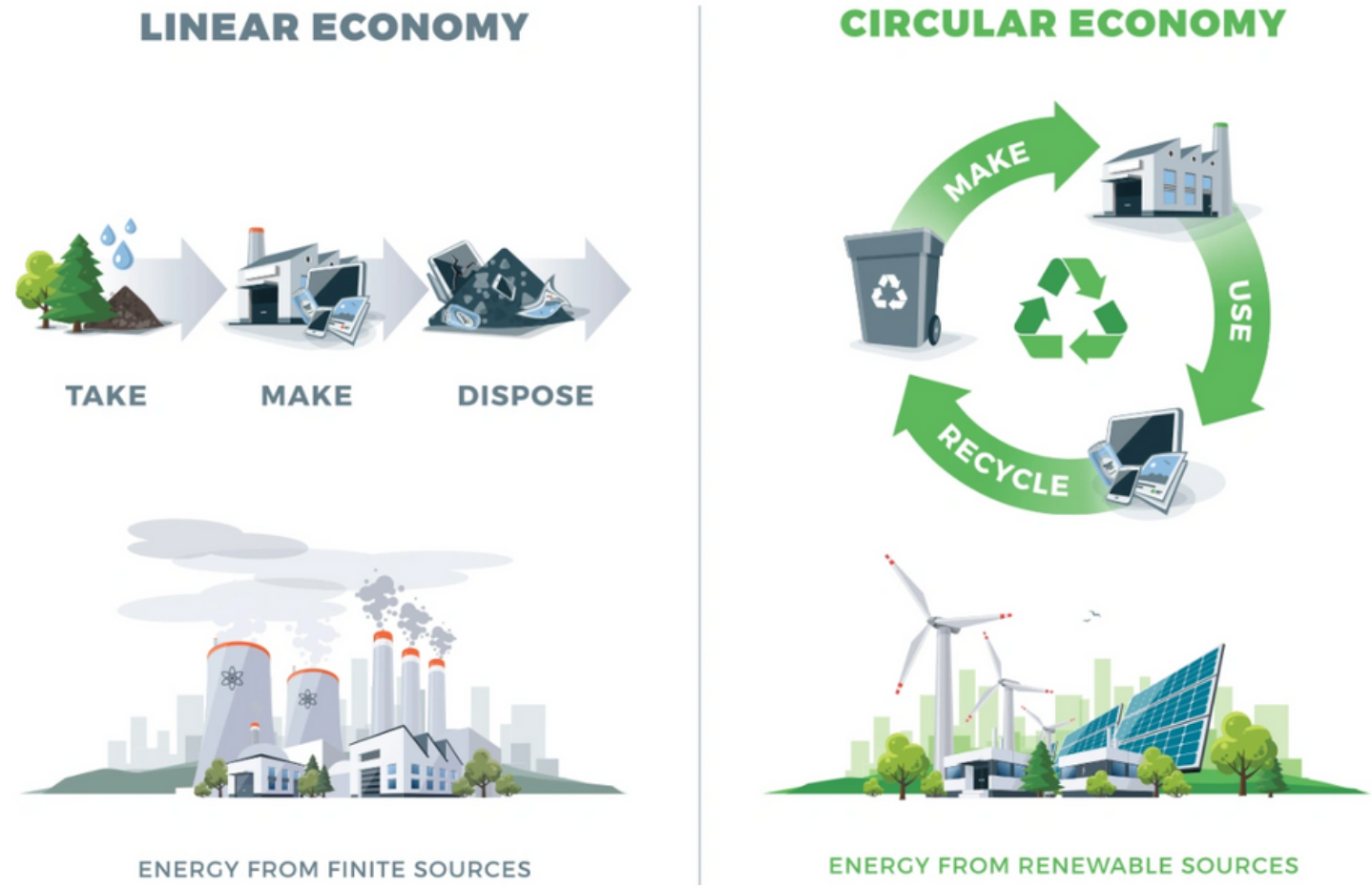

Figure 1:Linear Vs. Circular Economy (Source:https://blogs.iadb.org/sostenibilidad/en/circular-economy-now-or-never/)

The circular economy can reduce waste through a number of different mechanisms. One of the most important is the use of closed-loop systems, in which a product might be designed to be disassembled and its components reused in new products. This not only reduces waste but also helps to conserve resources, as it decreases the need for virgin materials.

Another way in which the circular economy can reduce waste is through the use of product-service systems. In these systems, consumers pay for access to a product rather than for ownership of it. This incentivizes manufacturers to design products that are durable and long-lasting, as they will need to remain in use for longer periods of time. This approach can also reduce waste by encouraging manufacturers to take responsibility for the end-of-life of their products and to design them so that they can be easily repaired or recycled.

In addition to reducing waste, the circular economy can increase sustainability by reducing the demand for finite resources and decreasing the environmental impact of production processes. By keeping materials in use for longer periods of time, the circular economy can help to conserve resources and reduce the need for virgin materials. This can lead to a more sustainable use of resources and a decreased reliance on environmentally damaging extraction processes.

Furthermore, the circular economy can decrease the environmental impact of production processes by incentivizing the use of renewable energy and reducing harmful emissions.

By designing products to be recyclable and by utilizing closed-loop systems, the circular economy can reduce the amount of waste that is sent to landfills and incinerators.

This, in turn, can decrease the amount of greenhouse gases that are produced and help to mitigate the impacts of climate change. While challenges are still to be addressed in implementing a circular economy, such as designing products for circularity and creating the necessary infrastructure for recycling and reuse, the potential benefits are clear. By embracing the principles of the circular economy, we can create a more sustainable and resilient future for ourselves and for the planet.

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Furthermore, the circular economy can decrease the environmental impact of production processes by incentivizing the use of renewable energy and reducing harmful emissions. By designing products to be recyclable and by utilizing closed-loop systems, the circular economy can reduce the amount of waste that is sent to landfills and incinerators.

SOURCE- Research gate

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