

## **Circular Economy**

A **circular economy** (often referred to simply as "circularity") is an economic system aimed at minimizing waste and making the most of resources. In a circular system resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing energy and material loops; this can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling. This regenerative approach is in contrast to the traditional linear economy, which has a 'take, make, dispose' model of production

Proponents of the circular economy suggest that a sustainable world does not mean a drop in the quality of life for consumers, and can be achieved without loss of revenue or extra costs for manufacturers. The argument is that circular business models can be as profitable as linear models, allowing us to keep enjoying similar products and services

### **Sustainability**

Intuitively, the circular economy would appear to be more sustainable than the current linear economic system. Reducing the resources used, and the waste and leakage created, conserves resources and helps to reduce environmental pollution. However, it is argued by some that these assumptions are simplistic; that they disregard the complexity of existing systems and their potential trade-offs. For example, the social dimension of sustainability seems to be only marginally addressed in many publications on the circular economy. There are cases that might require different or additional strategies, like purchasing new, more energy efficient equipment. By reviewing the literature, a team of researchers from Cambridge and TU Delft could show that there are at least eight different relationship types between sustainability and the circular economy.

### **Scope**

The circular economy can cover a broad scope, findings from the literature show that researchers have focused on different areas such as industrial applications with both product-oriented and services, practice and policies to better understand the limitations that the CE currently faces, strategic management for details of the circular economy and different outcomes such as potential re-use applications and waste management.

The circular economy includes products, infrastructure, equipment and services, and applies to every industry sector. It includes 'technical' resources (metals, minerals, fossil resources) and 'biological' resources (food, fibres, timber, etc). Most schools of thought advocate a shift from fossil fuels to the use of renewable energy, and emphasize the role of diversity as a characteristic of resilient and sustainable systems. It includes discussion of the role of money and finance as part of the wider debate, and some of its pioneers have called for a revamp of economic performance measurement tools.

One example of a circular economy model is the implementation of renting models in traditional ownership areas (e.g. electronics, clothes, furniture, transportation). Through renting the same product to several clients, manufacturers can increase revenues per unit, thus decreasing the need to produce more to increase revenues. Recycling initiatives are often described as a circular economy and are likely to be the most widespread models.

## Beginning of the Circular Economy

As early as 1966 Kenneth Boulding raised awareness of an "open economy" with unlimited input resources and output sinks, in contrast with a "closed economy", in which resources and sinks are tied and remain as long as possible a part of the economy. Boulding's essay "The Economics of the Coming Spaceship Earth" is often cited as the first expression of the "circular economy", although Boulding does not use that phrase.

The circular economy is grounded in the study of feedback-rich (non-linear) systems, particularly living systems. The contemporary understanding of the Circular Economy and its practical applications to economic systems evolved incorporating different features and contributions from a variety of concepts sharing the idea of closed loops. Some of the relevant theoretical influences are cradle to cradle, laws of ecology, looped and performance economy, regenerative design, industrial ecology, biomimicry and blue economy.

The circular economy (CE) was further modelled by British environmental economists David W. Pearce and R. Kerry Turner in 1989. In *Economics of Natural Resources and the Environment*, they pointed out that a traditional open-ended economy was developed with no built-in tendency to recycle, which was reflected by treating the environment as a waste reservoir.

In the early 1990s, Tim Jackson began to pull together the scientific basis for this new approach to industrial production in his edited collection *Clean Production Strategies*, including chapters from pre-eminent writers in the field, such as Walter R. Stahel, Bill Rees, and Bob Costanza. At the time still called 'preventive environmental management', his follow-on book *Material Concerns - Pollution, Profit and Quality of Life* synthesised these findings into a manifesto for change, moving industrial production away from an extractive linear system towards a more *circular* economy.

## Emergence of the idea

In their 1976 research report to the European Commission, "The Potential for Substituting Manpower for Energy", Walter Stahel and Genevieve Reday sketched the vision of an economy in loops (or circular economy) and its impact on job creation, economic competitiveness, resource savings, and waste prevention. The report was published in 1982 as the book *Jobs for Tomorrow: The Potential for Substituting Manpower for Energy*.

Considered as one of the first pragmatic and credible sustainability think tanks, the main goals of Stahel's institute are to extend the working life of products, to make goods last longer, to re-use existing goods and ultimately to prevent waste. This

model emphasizes the importance of selling services rather than products, an idea referred to as the "functional service economy" and sometimes put under the wider notion of "performance economy". This model also advocates "more localization of economic activity".

Promoting a circular economy was identified as national policy in China's 11th five-year plan starting in 2006. The Ellen MacArthur Foundation has more recently outlined the economic opportunity of a circular economy, bringing together complementary schools of thought in an attempt to create a coherent framework, thus giving the concept a wide exposure and appeal.

Most frequently described as a framework for thinking, its supporters claim it is a coherent model that has value as part of a response to the end of the era of cheap oil and materials, moreover contributing to the transition for a low carbon economy. In line with this, a circular economy can contribute to meeting the COP 21 Paris Agreement. The emissions reduction commitments made by 195 countries at the COP 21 Paris Agreement, are not sufficient to limit global warming to 1.5 °C. To reach the 1.5 °C ambition it is estimated that additional emissions reductions of 15 billion tonnes CO<sub>2</sub> per year need to be achieved by 2030. Circle Economy and Ecofys estimated that circular economy strategies may deliver emissions reductions that could basically bridge the gap by half.<sup>[18]</sup>

## **Moving away from the linear model**

Linear "take, make, dispose" industrial processes, and the lifestyles dependent on them, use up finite reserves to create products with a finite lifespan, which end up in landfills or in incinerators. The circular approach, by contrast, takes insights from living systems. It considers that our systems should work like organisms, processing nutrients that can be fed back into the cycle — whether biological or technical — hence the "closed loop" or "regenerative" terms usually associated with it. The generic circular economy label can be applied to or claimed by several different schools of thought, but all of them gravitate around the same basic principles.

One prominent thinker on the topic is Walter R. Stahel, an architect, economist, and a founding father of industrial sustainability. Credited with having coined the expression "Cradle to Cradle" (in contrast with "Cradle to Grave", illustrating our "Resource to Waste" way of functioning), in the late 1970s, Stahel worked on developing a "closed loop" approach to production processes, co-founding the Product-Life Institute in Geneva. In the UK, Steve D. Parker researched waste as a resource in the UK agricultural sector in 1982, developing novel closed-loop production systems. These systems mimicked and worked with the biological ecosystems they exploited