Chapter 1

Circular economy in the European context

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1.1 DEFINITION AND SHORT HISTORY OF CIRCULAR ECONOMY CONCEPT

The Circular Economy (CE) concept aims to replace the old paradigm of the traditional linear or open-ended economic model in which goods are manufactured from raw materials, sold, used, and then incinerated or discarded as waste. The old model has generated economic losses and has caused the degradation of natural ecosystems. The transformation of the linear economic model into a circular one involves the reconsideration of unsustainable aspects in order to identify opportunities for future development.

The specific notions of CE such as the shortage and perishable nature of resources, the preservation of the environment etc. have been introduced and developed by economic science over the last 250 years.

The concept of the circular economy dates back to the last decade of the 18th century, having its origin in Thomas Malthus' work on the principles of population, in which he advocates the idea of diminishing possibilities to feed the world as the population increases. Other personalities who write about the responsible use of natural resources, in this activity, are John Stuart Mill, Hans Carl von Carlowitz, John Law, Richard Cantillon, etc. (Lacy, 2015).

The introduction of the concept of CE in the economic literature cannot be attributed to a single author but rather to several schools of thought, which includes Industrial Ecology.

Industrial Ecology (IE) is a study aimed at understanding the circulation of materials and energy flows; therefore, IE must first understand how the industrial ecosystem works, how it is regulated and its interactions with

the biosphere in order to determine how the industrial ecosystem can be restructured to resemble how natural ecosystems function (Erkman, 1997). S. Erkman formulates four key principles for Industrial Ecology (Erkman, 2001):

- the systematic recovery of waste and by-products;
- minimization of losses due to dispersion;
- the dematerialization of the economy;
- reducing energy based on fossil hydrocarbons.

The IE proposal assumes the conversion of open cycles of materials and energy into closed cycles, resulting in less wasteful industrial processes. More recent theories such as performance economics, cradle to cradle, biomimicry and blue economy have helped to refine and further develop the CE concept.

Walter R. Stahel is recognised as one of the most important thinkers of the circular economy and the founding father of the performance economy. He has proposed a shift from traditional economy to what he calls the Functional Service Economy (Stahel, 2010). The switch towards a functional economy implies change in the whole organization of a company, in the whole strategy of the company and in its business model.

A functional economy leads to a reduced consumption of resources, materials and energy, optimizing the use of goods and services, proving its sustainability in relation to the traditional economy.

The functional service economy isn't limited to the tertiary economy. This type of economy is also applicable for the primary and secondary economy. The functional economy must be linked to the performance economy which has proposed three major objectives (Stahel, 2010): increasing wealth, increasing jobs, reducing resource consumption, as can be seen in figure 1.1.

New theories developed recently such as Biomimicry, Performance Economy, Blue Economy, Cradle to Cradle, etc. led to the development of the EC concept. Performance economics for example emphasizes sustainability by changing economic thinking from „doing things right to doing the right things" (Stahel, 2010).

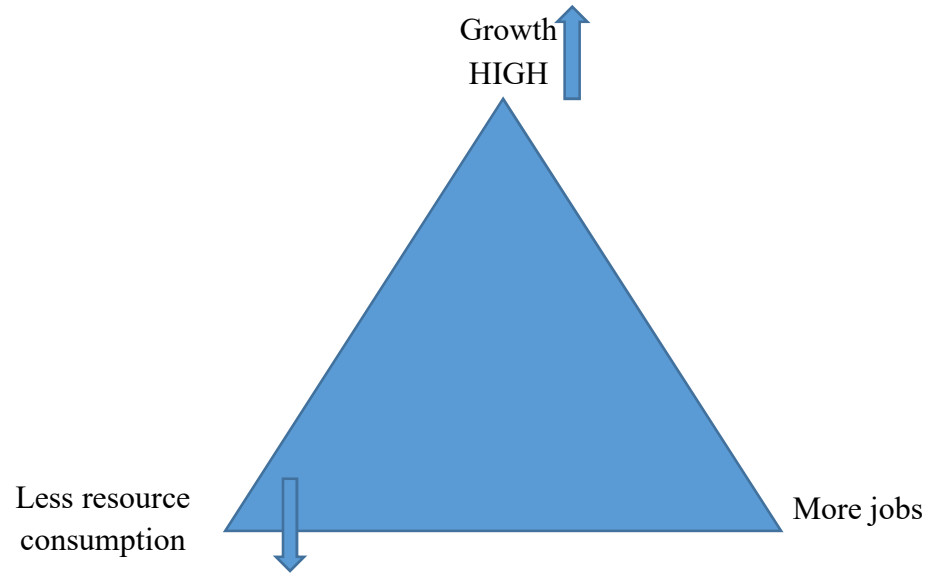

Fig.1.1 The performance economy objectives (Stahel, 2010)

The Cradle to Cradle concept belongs to a chemist (the German Michael Braungart) and an architect and economist (the American Bill McDonough), being seen as a process of recycling goods and services from the production period.

It is based on three principles:

- eliminating the concept of waste (waste becomes raw material);
- the use of renewable energies;
- supporting diversity.

The concept of Biomimicry belongs to Janine Benyus, who in 1997 used it in her book Biomimicry: Innovation inspired by nature, in the sense of imitating nature, in which materials and energy do not generate waste. In other words, the concept promotes sustainability by applying strategies derived from nature.

The theory of biomimicry is based on three principles (McGregor, 2013):

- nature as a model for solving human problems;
- nature as a measure or standard of innovation;
- nature as a mentor, source of innovation.

Blue Economy based on the philosophy of ZERI (Zero Emissions Research and Initiatives) was introduced by Gunter Pauli in 2004. It promotes the use of seas and coasts for activities as an innovative and competitive business model.

These new theories and CE have a big common point of view: the traditional linear economic system is not sustainable and it must be replaced by a new system that is much more environmentally friendly. The following figure shows schematically the paradigm shift proposed by the CE, from linear economy into circular economy:

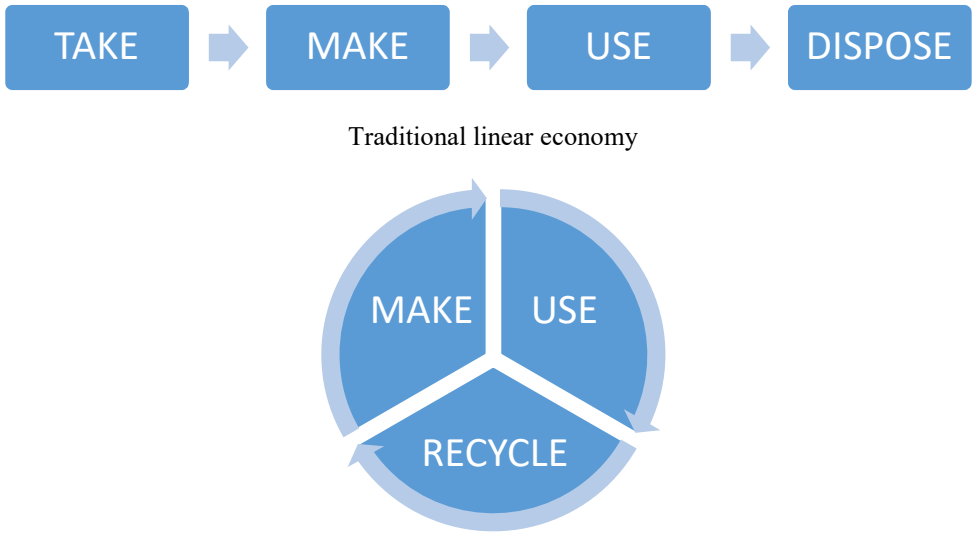

Fig.1.2 Traditional linear economy system vs Circular economy (Instarmac, 2020)

The evolution of the circular economy bears the imprint of the political, social and cultural systems in which it developed. Thus, in Germany, the concept of circular economy penetrated through the environmental policy of the 1990s, in Great Britain, Denmark, Switzerland and Portugal, the EC concept was and is used in connection with waste management.

China is another country which has implement and develop the CE concept. In China, the EC concept is used for the new product and technologies development and for the improvement of industry management. More than that, China has integrated CE in its national strategy.

The circular economy is an important part of the EU policy on sustainable development. For the European Commission, CE is an economic model that maintains the value of materials and products for as long as possible.

The European Commission proposed the new Circular Economy Action Plan in 2020, which aims for a clean and competitive world by adopting the regenerative economic model. (European Commission, 2020).

1.2 CIRCULAR ECONOMY PRINCIPLES

The concept of circular economy is based on several principles.

These principles were taken from the theories underpinning CE.

Their list varies depending on the various authors who substantiated the basic aspects on which the circular economy is based.

Thus, the Ellen MacArthur Foundation considers three principles that underlie the circular economy (Coste-Maniere, 2019):

- assessment of waste and pollution;
- long-term storage of materials and products;
- regeneration of natural systems.

Weetman considers four principles that underlie the circular economy (Weetman, 2016):

- waste is equal to raw material;
- resilience through diversity;
- renewable energy;
- systemic thinking.

The British Standards Institution considers six principles of the circular economy (The British Standards Institution, 2017):

- systemic thinking (the holistic approach of organizations in understanding how individual activities operate within the wider system of which they are a part);
- innovation (as a means of sustainable management of resources through the design of processes, products and services);

- stewardship (managing the impact of their decisions and activities within the system);

- collaboration (internal and external collaboration through agreements in order to create added value);

- value optimization (maintaining the highest value of products, components and materials l);

- transparency (openness towards sustainable transition decisions and clear, accurate, honest and timely communication).

Despite the diversity among this principle sets, all of them highlight the importance to implement the CE concepts into the companies in order to achieve a sustainable development.

1.3 AREAS OF APPLICATIONS

The fields of application of the EC are very wide, it includes many countries and sectors, the EU being the leader of the transition to a circular economy at the global level.
In the EU, the Circular Economy targets the chemical industry, the construction sector, the packaging sector, the forestry sector, the textile, food, automotive, mining and metal, plastic, defense, etc.
The concept of Circular Economy was imported to China from Japan and Germany and treated as an important part of the national scientific development strategy.
According to national scientific development strategy the circular economy concept has been implemented in some Chinese companies from industrial sectors ranging from steel and iron, metal manufacturing, coal excavation and processing, to power generation, chemicals, construction materials and light industries (Geng, 2008).

1.4 EU ACTION PLAN FOR THE CIRCULAR ECONOMY

The first Circular Economy Action Plan was adopted by the European Commission in 2015 and includes measures to stimulate Europe's transition to a

circular economy. These seek to help close the loop on product life cycles through greater recycling and reuse (European Commission, 2015).

The plan includes concrete actions to be taken in areas such as plastics, food waste, construction, critical raw materials, industrial and mining waste, consumption and public procurement. The proposed actions support the circular economy at every stage of the value chain, from production to consumption, repair and remanufacturing, waste management, etc.

In 2018, the European Commission and the Council of the European Union have adopted new directives on waste. In accordance with these directives, the members of the European Union promote a series of measures in order to reduce and even prevent food waste, as they assumed through the 2030 Agenda for Sustainable Development, adopted in 2015 within the UNO.

Those measures try to reduce food waste in primary production, in processing and manufacturing, in retail and other distribution of food, in restaurants and food services as well as in households (EU target for recycling is 75% of packaging waste and 65% of municipal waste by 2030).

In 2018, the European Commission also adopted other initiatives in the area of the Circular Economy Action Plan. In this sense, a directive is proposed to reduce the impact of plastic products on the environment and a regulation with minimum requirements for water reuse.
In 2020, the European Commission has proposed and adopted “A new Circular Economy Action Plan for a cleaner and more competitive Europe”. This plan has an ambitious goal: to achieving climate neutrality by 2050 and decoupling economic growth from resource use. Among the measures proposed in this plan we can mention the following (European Commission, 2020):

- designing sustainable products;
- reducing (over)packaging, packaging waste and another types of waste (food waste, textile waste);
- high-quality sorting and removing contaminants from waste;
- using of biodegradable plastics and of bio-based plastics;
- water reuse including in industrial processes.
- creating a well-functioning EU market for secondary raw materials

etc.

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