THE CIRCULAR ECONOMY AND THE 'INDUSTRIAL SYMBIOSIS'

PKE Pomeranian Branch, as part of the project ***"Baltic Youth-s-visions, innovations and initiatives to Green Deal implemented in local communities,*** *funded by the Project Support Facility (PSF) of the Council of the Baltic Sea States (CBSS), is carrying out educational tasks.*

The basis for young people's involvement is expanded multidisciplinary knowledge. Climate and energy transformation are part of the second pillar of the European Green Deal, and the following study aims to provide an overview of this issue

1. THE CIRCULAR ECONOMY - DEFINITION

The diagram below shows a simple schematic of the processes in our current economic system. We start with the extraction of raw materials, which then go through the production stage to produce the desired products. The finished products are then distributed to consumers, who use them and dispose of them in landfills or incinerators. This simple economic system, known as the 'linear economy', works to generate waste.

Figure 1: A simple process diagram of the current economic system of 'linear economy'

We have two main problems here:

- We do not reuse or recycle any waste from the system, which means that we need new material every time we run the process. The raw material has to be fresh.
- Waste generation contributes to greenhouse gas emissions. This also means that all the energy, materials and value used in that product now become waste. We are throwing away resources that are still valuable. This is a major flaw in our current economic system.

The closed-loop economy is a sustainable business model that uses waste, keeping products in the value chain for as long as possible. To understand the principles of the closed loop economy, we need to understand the 4Rs system - Re-think, Reduce, Reuse, Recycle.

- Re-think - rethink at the design level the quantities of materials or processes needed
- Reduce - reduce the use of virgin material as much as possible
- Reuse - reuse materials in the same value chain
- Recycle - recycle materials to create multiple products

The first two 'R's (Re-think and Reduce) are more important because we should focus on reducing waste production, if not eliminating it entirely. If we follow this principle, our simplest value chain will look like the one in Figure 2. We have raw materials, production, distribution and consumption, as in a linear economy, but instead of wasting used materials, will return to become new raw materials. Where appropriate, materials from different stages are reused throughout the value chain.

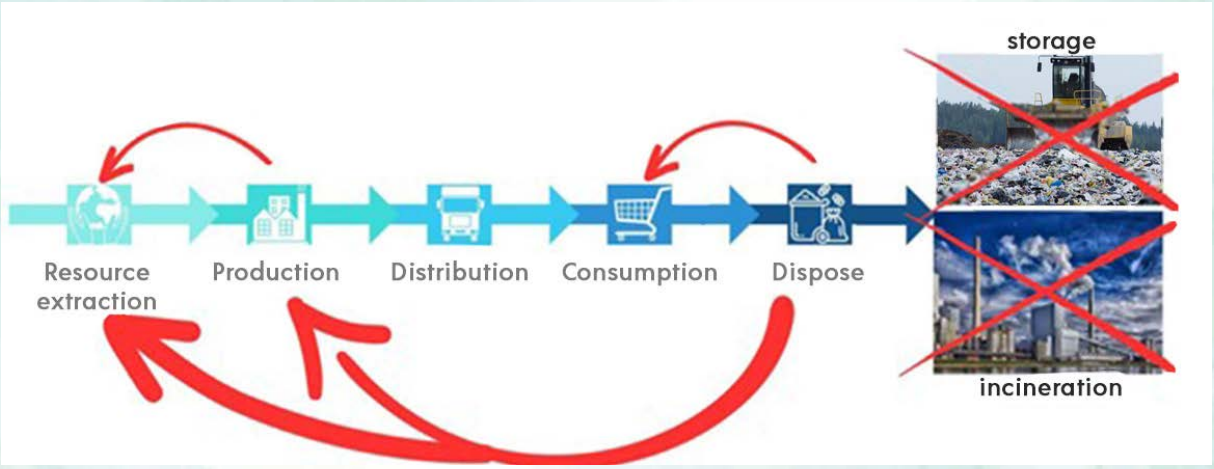

Figure 2: Process diagram, considering the circular economy

The principles of the circular economy can be summarised in three main points:

✓ Design out waste and pollution: primarily this means stopping the production of waste.

✓ Maintain materials and resources in the value chain: design for sustainability, reuse, remanufacturing and recycling so that products and materials continue to circulate in the chain.

✓ Regenerate the natural system: use renewable energy sources and design the system so that the end product returns to the soil to support regeneration.

2. Why do we need to implement a circular economy model?

The circular economy reduces the amount of waste generated, conserves natural resources and reduces greenhouse gas emissions. This helps protect the environment, biodiversity and can contribute to mitigating the effects of climate change. The closed-loop economy model also encourages the efficient use of resources, meaning that fewer raw materials are needed to produce products. This leads to cost reductions for businesses and reduces the strain on natural resources.

Overall, the circular economy is a sustainable and viable alternative to the linear economy that can have a positive impact on the environment, society and the economy.

3. EU Green Deal Solutions for the Circular Economy The European Union leads in promoting and implementing the circular economy

In 2015, the EU adopted a comprehensive action plan for the circular economy, which aims to 'close the loop' of the product life cycle and transform the EU economy into a more sustainable, resource-efficient and competitive one.

Some of the key initiatives and measures undertaken by the EU to promote a circular economy include:

✓ Waste reduction and recycling: at least 55% of municipal waste should be recycled by 2025 and this target should increase to 65% by 2030.

✓ Promote closed-loop product design.

✓ Promote a system of extended producer responsibility, which requires producers to take responsibility for the environmental impact of their products throughout their life cycle. This can include measures such as product take-back and recycling programs.

4. 'Industrial symbiosis' – definition

Industrial Symbiosis is a collaborative approach in which different industries and companies work together to improve their sustainability and efficiency through by exchanging resources, materials, and energy. It involves reusing waste and by-products from one industry as raw materials for another, creating a a closed-loop system that reduces waste and promotes a circular economy.

There are many examples of industrial symbiosis around the world. Here are some of them:

- Kalundborg Eco-Industrial Park in Denmark, where a network of companies exchange waste and by-products, including steam, water and gypsum.
- Symbiosis programme in Norway, which connects companies to exchange surplus materials, energy and water.

- The Kwinana industrial area in Australia, where companies collaborate to exchange waste and resources, including using waste heat from one plant to power another.
- The Port of Rotterdam in the Netherlands, where different companies exchange materials, heat and energy to improve their efficiency and reduce their environmental impact.
- The One Island One Factory initiative in Ghana, which promotes collaboration between local companies to create closed-loop resource utilization systems and waste reduction.
- The Symbiosis Centre of Excellence in India, which facilitates the exchange of resources among companies in different industries such as paper, chemicals and steel.
- The COGEN Europe platform, which promotes the use of cogeneration systems (CHP) to improve energy efficiency and reduce emissions in European industry.
- North East England Process Industry Cluster (NEPIC) in the UK, which promotes collaboration between companies in the chemical, pharmaceutical and biotechnology sectors to share resources and specialized knowledge.

5. Environmental and economic benefits of introducing industrial symbiosis

Environmental benefits	Economic benefits
✓ reduction in waste	✓ reduction in waste and disposal costs
✓ decreased air, water and soil pollution	✓ increased sustainability of the workplace/company
✓ reduced exploitation of natural resources	✓ increased competitiveness
✓ reduction of overall ecological footprint on the planet	✓ creation of new business opportunities
✓ reduction in raw material consumption	✓ mutual cooperation
	✓ expansion of business area
	✓ cost-sharing

6. EU Green Deal solutions for industrial symbiosis

Industrial symbiosis is an important element of the European Green Deal, which aims to create a circular economy where resources remain in use as long as possible and waste is minimised. Industrial symbiosis is seen as a key strategy to achieve this by encouraging companies to share resources, energy and by-products to reduce waste and emissions.

The Green Deal includes several initiatives to promote industrial symbiosis, such as:

✓ The Circular Economy Action Plan, aimed at increasing the use of secondary raw materials in the production process.

✓ The European Industrial Strategy, which calls for stronger cooperation between businesses to create a more sustainable industry.

✓ The Green Deal also provides funding opportunities for research and innovation in industrial symbiosis and other circular economy practices.

SOURCES:

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