

CIRCULAR ECONOMY BUILDING BLOCKS

<p>Industrial symbiosis</p>	<p>There are two concepts of industrial symbiosis: (1). a classic concept of material resource flows and (2). a digital-age concept based on knowledge flows across networks. Example 'Kalundborg Symbiosis, Denmark' (Manufacturing Domain). An example of "physical exchanges of materials, energy, water, and by-products" between different co-located industrial facilities, e.g. in situations where the waste of one facility is used as a resource by another. For more info www.symbiosis.dk/en</p>
<p>Material resource efficiency</p>	<p>It's the process of reducing a number of material resources needed to produce one unit of a product or service, or simply put as "doing more with less". Example 'Car engines'. (Automotive Sector). During the economic crisis (2008), several EU car industry players introduced programs aiming at car fleet renewal. An alternative to replacing the old cars has been proposed by Stahel (2011) by remanufacturing, upgrading or replacing the engines, instead of replacing the whole car.</p>
<p>Renewable energy and energy efficiency</p>	<p>It's reduction of fossil fuels consumption and curbing GHG emissions (almost 41% of final energy in 2013 was consumed by EU construction sector only²⁴). Energy- efficiency measures (i.e. retrofitting) could save up to 75% of energy consumption. Example 'Deloitte Building, Netherlands' (Industrial Buildings). The combination of renewable energy and energy efficiency can be seen in the Deloitte office building in Amsterdam. Due to its specially designed LED lighting, heating and cooling systems, the building uses 70% less electricity than is consumed by the typical EU office building.</p>
<p>Biological products</p>	<p>Modern agriculture, mostly dependent on pesticides and fertilizers, came at a price to the environment and to the quality of agricultural products. Annual consumer food waste in the EU reached 47 million tonnes in 2016, most of which could be avoided. Example 'Just egg' (Agro-Food Domain). "Just Egg", a British hard boiled eggs manufacturer, based in Leicester, was paying about €36.000/year for burying its by-product - 480 tonnes of eggshells - into the landfill. Together with Leicester University it has developed a technology transforming the eggshells into powder (resource for the plastic sector).</p>
<p>Product life cycle extension</p>	<p>The idea is to design products in a way for them to serve longer, repair them, reuse and recycle. Some of the products, from umbrellas to power tools, have been available on the market for several decades. Other newly developed products are progressively following even stricter design constraints. Example 'Fairphone 2.0' (Mobile phones Manufacturing). Developed by the homonymous Dutch company, Fairphone 2.0 is the first modular smart phone inspired by the CE, designed for an upgrade, reparability and easy reuse and recycling at the end of the phone's (extended) lifespan (Fairphone, 2016).</p>
<p>Performance economy</p>	<p>It's "selling goods as services through rent, lease and share business models", or providing products as services (Stahel, 2016). According to the concept of the performance economy, the number of manufactured units of products will decrease, but the revenue for each unit produced will increase. Example 'B2B Leasing' (Manufacturing Domain). Washing machines, mobiles, lighting, etc. can be offered by producers as services, as it has been done in the construction industry since time ago by leasing large equipment and machinery (Ramirent, 2016).</p>
<p>Sharing economy</p>	<p>It entails the "peer-to-peer-based activity of obtaining, giving, or sharing the access to goods and services". Obviously, people have shared/exchanged products for thousands of years but today's exchange can take place via the internet on a far larger scale, extending the geographical constraints. Example 'Zipcar' (C2C business relationships). Zipcar (an American car-sharing company) takes 5-20 privately-owned vehicles off the road (University of Pennsylvania, 2015), potentially reducing both material consumption and CO2 emissions. Similar to Blablacar in Europe.</p>
<p>Platform economy</p>	<p>It's facilitating information exchange and direct interactions between buyers and sellers on a global scale. It's not impacting the CE per se, but enables CE building blocks (e.g. performance and sharing economies) and offers a bottom-up market approach of B2B, B2C and C2C trade/exchange. Example 'eBay, Uber' (C2C business relationships). In many cases, today's eBay buyers are tomorrow's sellers and today's Uber customers can be tomorrow's drivers (Van Alstyne, 2016). These dynamically changing roles and online interactions of B2B, B2C and C2C in real time create network effects on a scale larger than ever before.</p>



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