MOVING FROM A LINEAR MODEL TO A REGENERATIVE CIRCULAR ECONOMY

From 2004 to 2018, waste generation in the EU increased by 4% to reach 812 million tons per year[1]. In the quest for growth, we have generated an economic system based on a "take-make-dispose extractive industrial model" as the Ellen McArthur Foundation describes it.

We currently consume 75% more resources than earth can sustain, and natural resource extraction and processing make up approximately 50% of total greenhouse gas (GHG) emissions, according to the UN Global Resources Outlook 2019.

This is not sustainable.

The transition from our current linear economic model based on "Take-Make-Waste" to a circular economy grounded in «Take-Make-Recycle" is backed by many players, including institutions such as the European Commission.

A successful transition could cut GHG emissions by an additional 39%, according to the Circularity Gap Report 2021, and generate a $ 4.5 trillion market opportunity by 2030, according to the Circular Economy Handbook.

But what exactly are we talking about ?

The Ellen McArthur Foundation gives three principles to guide this transformation: "design out waste and pollution; keep products and materials in use, and regenerate natural systems."

Behind these concepts, there is the idea that after the first use — or worse, the single use — of a product, there are ways to make the most of all the inputs and flows (energy, material, information, etc.) used to produce it before throwing it away. The key is reconsidering what is today defined as waste in order to produce new value via both the biological cycle and the technical cycle.

On the technical side, the aim is to have a restorative system where products can either be reused, repaired (life extension) or separated into different pieces to remanufacture new products. Recycling to produce a new raw material -- such as for paper or aluminum -- should be the solution of last resort.

On the biological side, there is a regenerative cycle, where biological material such as food or fabric is used to its maximum and then safely returned to a natural system in order to rebuild and restore the environment. First, cascade processes enable new uses for the original product before it takes the recycling route. For example, clothing can be reused and then transformed into stuffing material. Then, specific methods can produce additional value by providing fertilizers, energy and chemical components.

[1] Latest Figures available on Eurostat

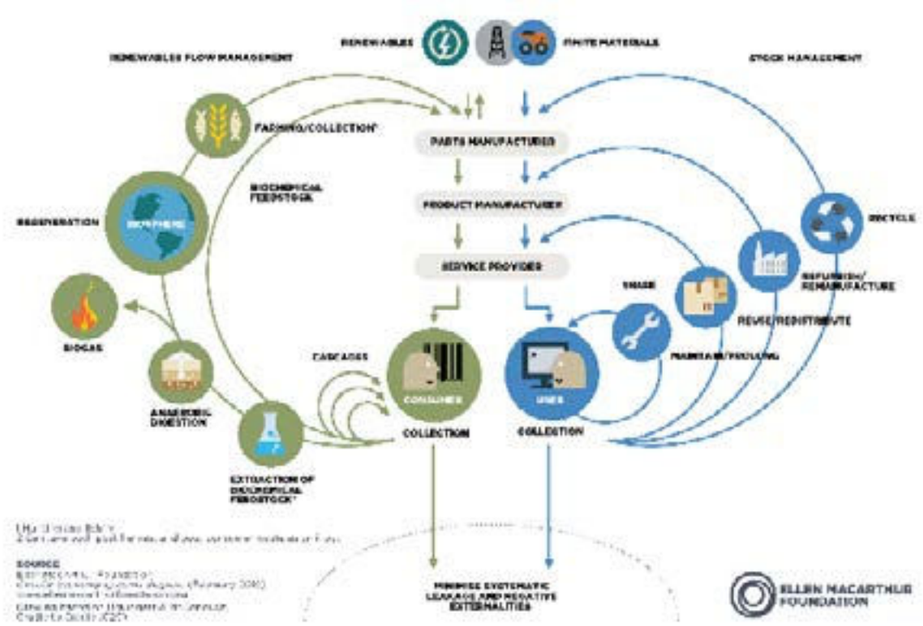
SEPTEMBER 2021

The circular bioeconomy : a step further to regenerate the environment

A circular bioeconomy model[2] uses biological resources to produce food, feed products, materials and energy with renewable and recycled biological resources.

Biodegradable products such as food waste, agricultural co-products, wood residues or some materials can return to the earth through a natural cycle (anaerobic digestion, composting). These cycles feed the soil and contribute to the growth of new natural resources.

[2] https://www.wbcsd.org/Programs/Circular-Economy



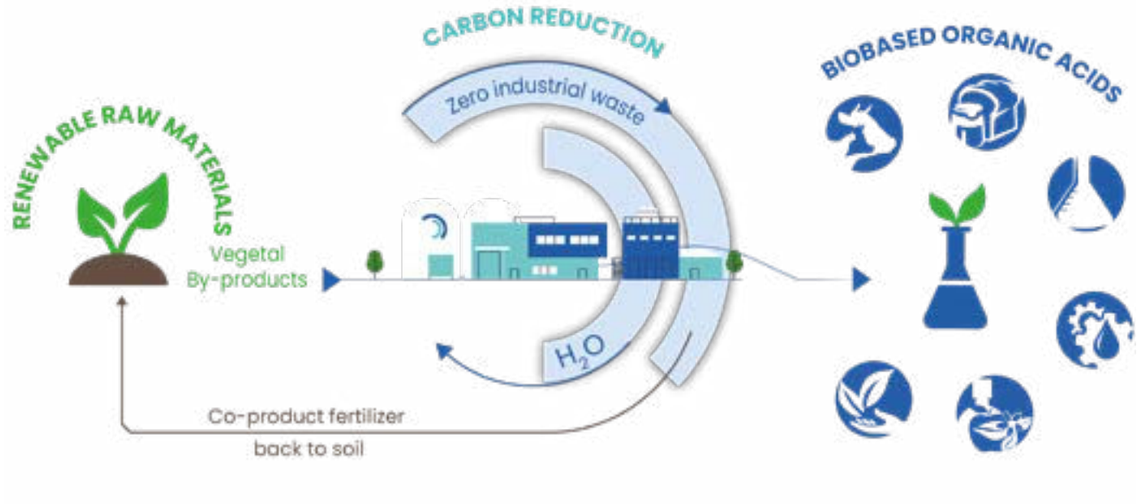
Source : The value loops of the circular economy (the Ellen MacArthur Foundation)

AFYREN's circular bioeconomy model solves the equation of business efficiency and low environmental impact

AFYREN has designed and developed a technology to manufacture biobased ingredients that are innovative, sustainable and efficient solutions for sectors including food, feed, aromas and perfumes, lubricants, material sciences, and life sciences.

These biomolecules, a family of 7 natural organic acids, are derived from the revalorization of non-food biomass and will be available on an industrial scale and at a competitive cost, offering the same chemical properties as those produced from petroleum derivatives, but with only one-fifth of the carbon footprint.

"When we created AFYREN, the objective was to provide a sustainable and competitive alternative to petro-sourced molecules used by many industries» explains Jérémy Pessiot Managing Director and Founder of AFYREN. «From a production standpoint, the fermentation technology we designed can work with different feedstocks such as beet or corn. We made the strong choice to use agro-industry co-products, in order to enter into a complete circular bioeconomy model. All the strategic choices we made for AFYREN were made based on this objective — to solve the equation of business efficiency and lowest environmental impact."



The whole concept of AFYREN is based on an advanced circular bioeconomy approach, with several levels of circularity, involving resource efficiency, resource renewability, recycling, and local procurement.

- Feedstock: Raw materials are not only renewable, they are agricultural by-products. The choice to use by-products was mainly made in order not to compete with agricultural land intended for human food. To minimize its impact on the planet as much as possible, Afyren uses by-products that are renewable from one agricultural season to the next.

- Process:

- All products generated by the Afyren process are valorized and/or recycled: in addition to the seven organic acids produced, a fermentation residue is formed and returned to the soil as fertilizer (useable in organic farming) to reproduce a biomass production cycle. Consequently, no industrial waste is generated in this process.

- The manufacturing process consumes water in a controlled manner thanks to a water recycling system used during the fermentation phase. The process requires very little water as it operates in a closed loop and maximizes the water present in the biomass used as raw material.

- Local procurement: Last but not least, AFYREN is supplied with local or regional renewable raw materials (within a few hundred kilometers); its first plant is located in the North East of France, at the epicenter of sugar beet production, and close to its potential customers in Germany, France and the Benelux.

A circular economy benefits the earth, the society and the economy

The goal of an advanced circular bioeconomy approach like Afyren's is to have a significantly smaller environmental impact compared to traditional production, for the benefit of the planet and society.

The carbon footprint of AFYREN's acids is on average 81% lower than equivalent fossil-based acids on the market. The intent is to set up solid regenerative production processes so that current and future generations can continue to enjoy Earth's valuable resources and avoid scarcity.

This should be more than enough motivation for most organizations to support and encourage circular production approaches, but the reality is that corporations need to take shorter-term stakeholder interests into account and deliver positive financial results.

But moving to a circular production process can provide a competitive edge. Only 9% of our economy is circular[3] but a growing number of early adopting companies, such as Patagonia or Unilever, already understand that efforts to make production more sustainable are an investment in future success.

Already "83% of consumers think it is important for companies to design products that can be reused, recycled and never go in a landfill" according to an Accenture report. The most engaged actors in the movement to fight climate change will see the role industrials can play in circularity and will demand more action to close the technical and biological loops.

More than any sector, the chemical industry's future depends on how it meets environmental challenges

Chemistry plays a crucial role in circularity by enabling the recovery of precious metals (electronic devices) and non-biodegradable components (plastics). The partnership between Renault, Veolia and Solvay to recycle batteries from electric cars is a good example of cooperation and innovation in this area that unlocks business potential.

Chemical companies — faced with the prospect of resource scarcity, the urgent need to manage industrial waste, and the growing demand for more specialty materials — have no other choice than to integrate circularity into their business model.

The most visible efforts in this direction aim to improve plastic waste management by increasing recyclability and developing processes to transform it into other safe and useable chemicals. Yet the chemical reactions required often consume considerable amounts of energy and in some cases require additional virgin petroleum products.

This is where renewable feedstocks come in. The transition to bioeconomy business models in the chemical industry can provide momentum for the circular economy as a whole.

Despite all these environmental, economic and societal mid-term benefits, the pressure of climate change means that additional levers to accelerate a massive adoption of circularity are needed.

[3] HTTPS://WWW.CIRCULARITY-GAP.WORLD/2021