



REDESIGNING

THE FUTURE

The role of (eco)design in making bioeconomy circular and sustainable



We live in a consumer society in which the well-being of citizens is ensured by the exchange of large quantities of goods and the economic growth is driven by the philosophy of taking, making, consuming and disposing. Due to this kind of thinking the production requires huge amounts of resources such as oil, soil, water, chemicals, ores and energy. The globalised world has allowed us relatively easy access to resources that are otherwise unavailable in our region. This social organisation approach has become incompatible with safe, sustainable and peaceful future for all humanity. We need an immediate solution that breaks the link between economic growth and resource depletion and recognize the scarcity of environmental goods like biodiversity, clean air, biosphere, fresh water and soil. The bio-based sectors are also hit by overuse of resources and waste accumulation and these have an increasingly depressing effect on our everyday life and damage to ecosystems.



Sustainable and circular bioeconomy helps not only to make our economy and lifestyle sustainable but also to regenerate the ecosystems which we destroyed from the beginning of the industrial revolution. Through design, we can replace the linear thinking with the circular one in order to close the loop, eliminate waste and pollution, and circulate products and materials. Design has played an essential role not only in modern economy but also throughout human history. It is not only about creativity, functionality and building new knowledge but it has been a form of social communication as well.



Design decisions influence the quantity of waste and pollution generated. For example the destruction of rainforests or soil depletion are the result of harmful design which does not take the interest of wildlife or natural resources into consideration. Eco-design may create a positive impact and has a transformative role by developing new business models and supporting the out of the box and system thinking. Briefly, design has the power to put the development on a new path and may support the spread of circular bioeconomy through the creation of innovative products, using bio-based materials instead of fossil-based ones, creating new business models and affecting the value chains.





SOME POSITIVE EFFECTS OF ECO-DESIGN:

It supports a holistic approach that considers environmental, social and economic impacts. It contributes to the decrease of carbon-footprint by optimising resource use and adopting eco-friendly production processes.



It contributes to resilience and climate adaptation.



It accelerates social changes by influencing consumer behaviour, inspires conscious decision-making and contributes to a sustainable lifestyle.



Design is a powerful tool for education and raising awareness about global problems. Through visually compelling graphics, animations and interactive experiences, we can communicate complex environmental issues in accessible and engaging ways.



Good practices

There are a number of organisations, sole designers and companies supporting the spread of eco-design or using it as a powerful tool to make businesses more sustainable. While the European Union promotes the wide spreading of eco-design with policy instruments, charity founder Ellen MacArthur is using her reputation to create evidence-based original research on the benefits of a circular economy and explore the opportunities across stakeholders and sectors, and highlight examples of how circular economy principles are being put into practice today. Furthermore several companies have already realised the opportunities in eco-design to decrease material use. For example **(1)** packaging industry may replace traditional plastics with biodegradable one, **(2)** furniture industry may use AI and 3D printing technology in generative design, **(3)** textile industry may use yarn made of cellulose fibrils from plant-based materials just to mention a few.



Industry 4.0 era may offer new solutions to the biorefinery process design and provide alternatives for biomass valorisation. By applying digital technologies we can increase production efficiency, productivity and quality, enhance operational flexibility; and integrate the production system with customers and the supply chain. We may extend the life of products by applying zero waste solutions or the principles of reuse or refurbishment.

Artificial Intelligence tools empower designers to develop interior spaces based on the concept of circular bioeconomy by using innovative materials.

Also we may decrease the harmful effects of Fast Fashion by the extension of fashion products' lifecycle and changing consumer behaviour. New, innovative bio-based materials and textiles offer sustainable alternatives to oil-based fibres (e.g. polyester) and help to lay the foundation of a more sustainable textile industry.

It can be seen from the above examples that by connecting the principles of the circular bioeconomy throughout the design process, we can make the bio-based sectors profitable.



(1) Nicholas M. Holden, Andrew M. Neill, Jane C. Stout, Derek O'Brien, Michael A. Morris. Biocircularity: a Framework to Define Sustainable, Circular Bioeconomy
<https://link.springer.com/article/10.1007/s43615-022-00180-y>

(2) Franklin Mgbemeje: Future: Strategies to Address the Climate Crisis. Download: 24 Jan 2024
<https://www.linkedin.com/pulse/designing-sustainable-future-strategies-address-climate-mgbemeje/>

(3) Ellen MacArthur Foundation: It's time for a circular economy
<https://www.ellenmacarthurfoundation.org/>

(4) Clauser, N. M., Felissia, F. E., Area, M. C., and Vallejos, M. E. (2022). "Integrating the new age of bioeconomy and Industry 4.0 into biorefinery process design,"
<https://bioresources.cnr.ncsu.edu/resources/integrating-the-new-age-of-bioeconomy-and-industry-4-0-into-biorefinery-process-design/>
(Downloaded: 26 Feb 2024)

(5) Cambridge Institute for Sustainability Leadership (CISL): Lignocellulosic in the fashion and textile industry
<https://www.cisl.cam.ac.uk/resources/sustainability-horizons/november-2018/lignocellulosic-in-fashion-industry> (Downloaded: 26 Feb 2024)

(6) 3D Printed Furniture: 12 Designs That Explore Digital Craftsmanship
<https://www.archdaily.com/996143/3d-printed-furniture-12-designs-that-explore-digital-craftsmanship>
(Downloaded: 26 Feb 2024)

(7) Generatív tervezés és a 3D nyomtatás
<https://filaticum.com/generativ-tervezes-es-a-3d-nyomtatás/>
(Downloaded: 26 Feb 2024)