European Commission

RESEARCH & INNOVATION
ENABLES THE TRANSITION TO A CIRCULAR ECONOMY

30 November 2022

Achieving the objectives of the **European Green Deal** requires a **circular and sustainable bioeconomy.** Research and innovation (R&I) plays an essential role in enabling and accelerating this transition, **unlocking new ways of producing and consuming that respect planetary boundaries and life on earth.**

The European Commission has adopted the **Circular Economy package II**:

1 Communication on **bio-based, biodegradable and compostable plastics**

2 Regulation on **packaging and packaging waste**

Review of the Packaging and packaging waste directive to reinforce the essential requirements for packaging and establish EU level packaging waste prevention measures and targets

3 Communication on **Carbon removal certification**

CIRCULAR ECONOMY

The package will **promote the transition to a circular plastics economy**, **reduce packaging waste**, **encourage re-use and recycling**, and **set down rules on monitoring, reporting and verifying the authenticity of carbon removals**. EU-funded R&I plays a crucial role in developing a circular economy. EU R&I framework programmes, including **Horizon 2020 (2014-2020) and Horizon Europe (2021-2027)**, address specific elements of the package and help make its aims a reality.

"The transition to a circular and sustainable bioeconomy will lower emissions and pollution, create new jobs and value chains, and ultimately safeguard the planet's health. European research and innovation will enable us to identify, develop and scale up new ways to reduce, reuse and recycle."

Mariya Gabriel, EU Commissioner for Innovation, Research, Culture, Education and Youth

Research and Innovation

EU R&I supports a circular plastics economy

For biodegradable plastics and compostable plastics, producers should focus investments in applications where there are genuine environmental benefits in using such plastics. EU-funded R&I, including the Circular Bio-based Europe partnership and the EU Mission 'Restore our Ocean and Waters by 2030', deals with circular bio-based plastic created from sustainably sourced biomass, in particular secondary biomass. Biomass is organic, non-fossil material of biological origin that includes residues from agriculture, forestry and aquaculture and fishery, dedicated crops and forestry, micro-organisms, and bio-waste.

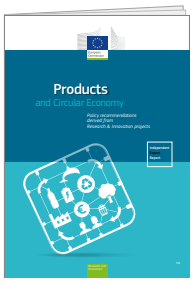
EU-funded R&I aims at both ***increasing the durability of bio-based plastic*** for safe reuse and high-quality recycling, and at ***enabling the safe biodegradation of bio-based plastic*** in different environmental conditions and timeframes, depending on their applications.

EU R&I promotes sustainable packaging

EU-funded R&I on sustainable packaging focuses on circularity and the use of bio-based materials, including bio-waste.

Projects have addressed topics such as decontamination of materials for recycling, recycling of complex materials, and novel forms of packaging.

The 2020 report on '**Products and circular economy: policy recommendations derived from Research & Innovation projects**' provides an overview of projects and conclusions regarding challenges and promising concepts to increase the circularity of consumer products.



EU R&I promotes carbon removal and storage

EU-funded R&I on carbon removal covers a wide range of topics. Projects have developed innovative bio-based products underpinned by nature-based solutions. These allow for increased carbon storage in soils, in long-duration materials, such as bio-based construction materials (e.g. engineered wood or bio-based insulation materials), or through sustainable biomass production (e.g. on marginal lands with low agricultural or economic value, affected by natural constraints).

Other EU R&I projects focus on improving photosynthetic efficiency of plants, algae and other autotrophic organisms. This increases their assimilation of carbon dioxide, boosting biomass yields, the efficiency of biomass processing, and the recovery of nutrients and materials.

Further EU-funded R&I on Carbon Capture, Utilisation and Storage (CCUS) supports work on mitigating emissions in carbon-intensive industries, such as cement and steel production, CCUS in electricity generation, and Carbon Dioxide Removal (CDR) technologies to obtain negative emissions, in combination with bioenergy production and direct air capture and storage.

BIO-BASED, BIODEGRADABLE AND COMPOSTABLE PLASTICS

Horizon 2020
ended 2020
part of the BBI JU*

REFUCOAT

developed fully recyclable bio-based food packaging with enhanced gas barrier properties and new functionalities, as an alternative to current metallised and fossil-based packages.

Horizon 2020
ended 2020
part of the BBI JU*

AFTERLIFE

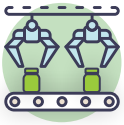
developed a process to extract the different solid components from the waste water, which are then treated to obtain high-pure extracts and metabolites or, alternatively, to be converted into value-added biopolymer (polyhydroxyalkanoates [PHAs]), which are biodegradable.

PACKAGING WASTE

Horizon 2020
ended 2020

CIRC-PACK

aimed to make the plastic packaging value chain more sustainable. The project decoupled the value chain from fossil feedstocks, reduced the negative environmental impact of plastic packaging, and created an effective after-use plastics economy by incorporating the use of alternative bio-based raw materials.



Horizon Europe
ends 2026

BUDDIE-PACK

will support the large-scale introduction of reusable and refillable packaging, and increase consumers' acceptance and use of it, in turn reducing costs, virgin and single-use plastic consumption, and CO_2 emissions.

Horizon Europe
ends 2025

R3PACK

will substitute complex multilayer plastic packaging with high-performing fibre-based packaging, and demonstrate optimisation of large-scale reuse schemes covering different types of food product.

CARBON REMOVAL

Horizon Europe
ends 2026

MIDAS

will develop, evaluate and optimise sustainable low-ILUC (indirect land-use change) feedstock by developing selected industrial crops and cropping systems on European marginal agricultural land in a climate-resilient and biodiversity-friendly way to support feasible bio-based value chains.

Horizon Europe
ends 2026

MARGINUP!

proposes a strategy to secure use and return profitability on marginal lands. Its main objective is to introduce climate-resilient and biodiversity-friendly non-food crops for sustainable industrial feedstock in marginalised and low-productivity lands.

Horizon 2020
ended 2021

LEILAC

developed a novel technological solution to reduce significantly the carbon emissions in the production of lime and cement in its pilot plant in Lixhe, Belgium. The proposed CCS solution is inexpensive from both economic and energetic points of view, without the use of additional chemicals in the process.

Horizon 2020
ended 2019

STEPWISE

achieved improved carbon capture rates in steel production, with higher energy efficiency and lower costs in a pilot installation in Luleå, Sweden, by scaling up CO_2 capture from Blast Furnace Gases.

*Bio-Based Industry Joint Undertaking

More information:

Research and innovation for the European Green Deal

Circular economy action plan

Publications Office of the European Union

© European Union, 2022 | Reuse of this document is allowed, provided appropriate credit is given and any changes are indicated (Creative Commons Attribution 4.0 International license). For any use or reproduction of elements that are not owned by the EU, permission may need to be sought directly from the respective right holders. All images © European Union, unless otherwise stated. Images source: © MicroOne # 305386384 © ylivdesign # 284725008, 2019. Source: Stock.Adobe.com. © Flaticon – all rights reserved.

PDF ISBN 978-92-76-59065-1 doi:10.2777/44587 KI-04-22-185-EN-N