CIRCULAR ECONOMY ACTION PLAN: RESEARCH CHALLENGES AND OPPORTUNITIES AHEAD

Setting the scene

These are unprecedented times for the future of Europe: the need to drive the post-COVID recovery on a sustainable path and the parallel preparation of the 2021-2027 EU budget and R&I programmes have the potential to give a real boost to the achievement of the European climate-neutrality objective by 2050.

EU policymakers have confirmed their commitment to drive the economic recovery through sustainable, green investments and digital development by reaching an agreement on a bold EU budget and Recovery Plan. Despite the heavy cuts to the Horizon Europe budget, the energy sector remains one of the main areas of action to significantly reduce CO2 emissions while boosting economic recovery. As part of the European Green Deal[1], the adoption of new political strategies will help guiding investments and regulation in the fields of energy system integration, industrial policies, circular economy and more.

There is therefore a momentum to identify the R&I challenges and industrial opportunities of tomorrow and to coordinate efforts towards the achievement of new energy and climate priorities in Europe. **The research community has a key role to play**, both in advancing research on identified political priorities, as well as in advising policymakers on the way forward through excellent fundamental research and focus on low TRLs for the advancement of new breakthrough technologies, materials and systemic approaches.

Prepared within the framework of the SUPEERA project[2], this series of policy briefs aims at identifying in latest EU policies relevant to the energy research community concrete R&I challenges towards the achievement of the Clean Energy Transition. The analysis of the policies identified will have the two-fold objective of supporting recommendations towards the EERA membership and the SET-Plan ecosystem at large, as well as to identify potential areas for investments in energy R&I for EU policymakers. Specifically, this paper will focus on the Circular Economy Action Plan, published on 11 March 2020 by the European Commission, as a key European Green Deal measure for a cleaner and safer environment

[1] COM(2019) 640 final
[2] https://www.supeera.eu/

“A new Circular Economy Action Plan – For a cleaner and more competitive Europe”

The European Commission’s Circular Economy Action Plan outlines the strategy to reduce waste and to increase the environmental soundness of production processes in the EU, with the aim to decouple economic growth from resource use.
The Circular Economy Action Plan revolves around 3 main areas for action and 7 key value chains where improvements in the management of materials, waste and services can be implemented.

Action Area	Identified R&I challenges
Designing sustainable products	1) Increasing **recycled content** in products. 2) Mobilising the potential of **digitalisation of product information**. 3) **Reducing carbon** and environmental **footprints**. 4) Establish a common **European Dataspace for Smart Circular Applications**
Empowering consumers and public buyers	1) Public procurement as a means of pushing circular products and services 2) Consumer involvement through shared economy and repairs as part of product and service development
Circularity in production processes	1) Promoting **circularity in industrial processes.** 2) promoting the use of digital technologies for **tracking, tracing, and mapping of resources**

Key Value Chains	Identified R&I challenges
Electronics and ICT	1) Improving the **energy efficiency of electric and ICT devices**
Batteries and vehicles	1) Improving **performances of rechargeable batteries**, to phase out non-rechargeable ones. 2) Increasing the **use of recycled materials** in battery production. 3) Increasing the **use of alternative fuels** in place of fossil ones. 4) Advancing, more in general, the **development of batteries**, in order to increase the sustainability of the sector
Packaging	1) Studying and developing **new materials or combinations of materials for packaging** purposes
Plastics	1) Developing and harmonising methods for **measuring unintentionally released microplastics.** 2) Increasing the use of **bio-based, biodegradable, and compostable plastics**
Textiles	1) Concepts for reuse and extended lifetime for textile-based goods involving consumers
Construction and buildings	**1)** Addressing the **sustainability performance of construction products**, including the **possible introduction of recycled content requirements** for certain construction products 2) Improving the **durability** and **adaptability** of built assets

	3) Improving the **energy efficiency of buildings**, so to increase their sustainability and to increase energy savings
Food, water, and nutrients	No R&I challenge identified

In addition, the Commission has identified a series of **cross-cutting issues** related to the development of a circular economy, in particular the relationship between circularity and climate neutrality:

- Analyse how the **impact of circularity on climate change mitigation and adaptation** can be measured in a systematic way.
- improve **modelling tools to capture the benefits of the circular economy** on **greenhouse gas emission** reduction at EU and national levels.
- Incentivise the **uptake of carbon removal** and increased carbon circularity.

Research is needed before market-ready solutions are deployed:

Building on the work started in 2015 with the first Circular Economy Action Plan (CEAP), which introduced many important legislative actions such as the EU Eco-design Directive, the main and most recognizable goal of the new CEAP is to facilitate recycling and create a space for recycled products within the production process. In this framework, research and innovation (R&I) play a relevant role in setting the modalities of the transition towards a circular economy model. Nevertheless, the European Commission fails to mention R&I in several areas where it has the potential to contribute greatly. Indeed, alike its predecessor, the new CEAP is mainly focused on policy objectives, leaving only a **marginal space to R&I strategies**, especially if compared to the prominence given to market- and customer-oriented objectives.

This is true for example for **carbon capture and storage**. While reducing emissions is important, further action can be taken regarding the current levels of carbon dioxide in the environment and, in this respect, R&I could play a central role in advancing developments in many sectors. These include but are not limited to the strategic use of raw materials, energy-efficient processes, and advanced digital tools for life-cycle assessment.

Other areas of high importance are **materials**, **alternative fuels**, and **batteries**. Concerning the first one, it is important to stress the role of more environmentally friendly and circular extraction technologies. The development of advanced/innovative materials and fabrication processes to increase lifetime efficiency and facilitate reuse/recycling is also crucial and cannot be properly completed without a boost in research activities.

The role of **digitalization** in the energy sector is also of pivotal importance in order to reach the EU's objectives. The inclusion of cutting-edge technologies (e.g., advanced manufacturing,

automated microstructural characterization) is central to the transition to a sustainable, circular economy. Nevertheless, their development is very technology-specific and requires significant research efforts.

Furthermore, the Commission fails to mention other two areas of strategic importance. These are the **waste-to-energy** process and **energy efficiency**. As for the first one, R&I could provide helpful support towards system that use municipal and industrial waste to produce energy in a clean and sustainable way. Research into repurposing of biological waste into biofuels could be an important asset for the successful transition to circularity in the EU. On this matter, the Commission published a report in 2017 highlighting the role of waste-to-energy in the circular economy, which reads "*improving the energy efficiency of waste-to-energy processes and promoting those processes which combine material and energy recovery can* ***contribute to decarbonising*** *key sectors such as heating and cooling or transport and to reducing greenhouse gas emissions from the waste sector*". However, no mention of this is made in the new Circular Economy Action Plan.

In sum, these issues highlight the need to look at circularity not only limited to specific value chains but take a systemic view across the value chains.

Conclusions

The Circular Economy Action Plan will play a crucial role in the success of the European Green Deal in years to come. Reaching higher levels of recycling and better manufacturing design can be fundamental instruments in the fight against carbon emissions.
In this context, it is more important now than ever to consider the role that R&I can play in developing and deploying solutions that will accelerate the circular transition. In particular, to make sure that market-level developments can be introduced, research at low TRLs is needed to ensure their sustainability and functionality. It is crucial for the next research framework programme Horizon Europe to contribute towards the overall goal of climate-neutrality, by pushing forward research and innovation towards a completely circular economy.