Centre Chair: ████████████████

E-mail: ████████████████████

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To Whom it May Concern:

On behalf of the Chartered Institution of Wastes Management (CIWM), Republic of Ireland Centre, I attach herewith our submission in response to the Public Consultation on the Department of the Environment, Climate and Communications Research and Innovation Strategy.

CIWM Ireland acknowledges that this submission is subject to the provisions of the Freedom of Information Act 2014 and access to information on the Environment Regulations 2007-2014.

We welcome the opportunity for continued stakeholder engagement and active involvement in the various committees and task and finish groups, both now and for the long-term future.

Kind Regards,

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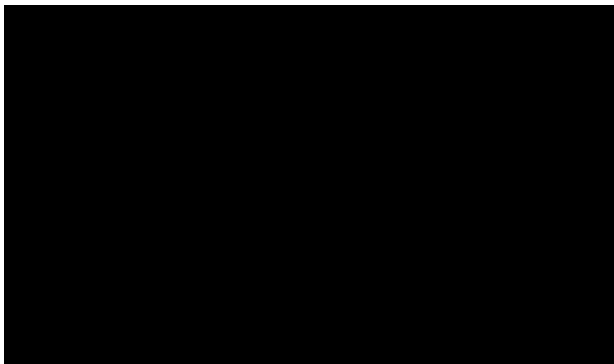
CIWM is the leading professional body for the resource and waste management sector with a purpose to move the world beyond waste. Representing over 6,000 individuals in the UK, Ireland and overseas, CIWM has a mission to unite, equip and mobilise its professional community to lead, influence and deliver the science, strategies, businesses and policies for the sustainable management of resources and waste.

CIWM is recognised as the foremost professional body representing the complete spectrum of the waste and resources sector. This gives the Institution the widest possible view and, perhaps more pertinently, an objective rather than partial view, given that our goal is for improvement in the management of all wastes and resources.

CIWM Ireland is one of ten CIWM Centres. CIWM Ireland represents most sectors of the waste management industry in Ireland such as academia, consultancy, EPA, local authority, construction, waste collectors, producer responsibility and social enterprise.

Research and Innovation Strategy Consultation Paper

1. What gaps do you see in the Department's current research and innovation activities? How should we address those gaps in the Department Research and Innovation Strategy?

DECC has responsibility for the Climate Action Plan, oversight of target achievement in relation to the Climate Act and sectoral emissions ceilings, yet the research and innovation related to key areas pertaining to Climate Action is resourced and designed by other departments and agencies. CIWM Ireland believes this is a gap which needs addressing, R&I relating to Climate Change related areas should have input, if not oversight by DECC. CIWM Ireland note Agriculture, Land Use and Transport are key and will have direct effect on biowaste to land, bioenergy etc.

CIWM Ireland suggests it is important that the Strategy provide a framework for DECC to provide for Research in all areas related to Climate Change and emissions targets and drive innovation not just in relation to the Circular Economy and industry, but the BioEconomy related to land use and land use change.

2. What actions can the department take to identify future trends in the areas under our remit?

CIWM Ireland proposes widen stakeholder R&I outreach on Climate Change Innovation to include areas, currently resourced and managed by other Departments, as these have direct effects on DECC's remit and targets.

Ensure there is DECC representation on all Research and Innovation Committees/Boards related to Climate Change (including Agriculture), Circular Economy, BioEconomy and Transport.

3. Are there specific thematic areas relevant to the Department's remit which you would like to see more research and innovation activity in? How can this be achieved?

CIWM Ireland outlines several specific areas below:

- Critical Raw Materials (CRM); management of CRMs in waste is on EU agenda as high economic importance. 34 critical raw materials including 16 strategic raw materials have been identified as prerequisite for a green and digital transition and a review of waste management of materials containing CRMs, to deliver on the EU Critical Raw Materials Act 2023, will have a direct effect on waste management.

- A review of E-waste to achieve EU target of 10% extraction of CRMs from waste of the annual consumption by 2030.

- Persistent Organic Pollutants (POPs), including plastic/bioplastic in soil and water – this area requires study to ensure that actions taken regarding waste management, do not adversely affect our soil and water resources in the future.

- Review of the potential market and impact for the second life EV and large-scale storage batteries, along with standards for reuse.

- Review of used textiles as a feedstock for chemical biorefineries.

- Review of measures both economic and infrastructural that will be required to meet new prevention, reuse and repair national targets set out in the National Waste Management Plan for a Circular Economy.

4. Have you views on the impact of disruptive technologies such as AI, Quantum and 6G as part of the digital transformation agenda and the implications of these technologies for the Department?

AI

There are various drivers to support the transition to a Circular Economy (CE) at a larger level in Ireland and one of the most important factors is digitalisation. Digital technologies, such as the Internet of Things (IoT), Big Data, Cloud Computing, Blockchain, and other online digital platforms, all falling under the broader category of industry technologies, are seen to be the primary factors in the transformation of CE approaches. Digitalisation enables new and greater forms of control, optimisation, and collaboration, helps in informed decision–making around production and consumption, and uncovers a broad range of possibilities in terms of CE. As outlined in the report of Digital Europe (https://www.digitaleurope.org/resources/digital-action-climate-action-8-ideas-to-accelerate-the-twin-transition, accessed on 13 March 2023), the usage of digital technologies could help to achieve a 20% reduction of global carbon emissions by 2030.

Of all the possible technologies within the digitalisation domain, the field of artificial intelligence (AI) is seen as having the greatest potential to influence the development of CE. AI is a critical technology with the potential to support the broader infrastructure needed to implement circularity in real-world practices and to accelerate a shift towards a regenerative economic model. Despite a great deal of discussion around the use of AI in CE, there is little clarity on how AI is being used in a practical sense within the CE.

Further research such as that being reviewed by Maynooth University will play a pivotal role in providing direction in AI's practical use within the Circular Economy. One of the most attractive characteristics of AI algorithms is their ability to perform specific tasks and improve themselves iteratively based on the data or information they are collecting or accessing. The potential applications of AI are numerous. However, the most impactful and well known include: computer vision, natural language processing, recommendation systems, and optimisation. AI holds transformational potential for CE in many diverse ways including: hidden pattern identification, data analysis, predictive analysis, reverse logistics, improved process optimisation, and enhancing responsiveness.

The important role AI can play in the transition to a CE and how it can be further used to optimise a circular infrastructure is seen in three high-potential CE opportunities, namely:

- **AI design of new circular products**: CE puts a strong focus on innovative design to maintain the utility and value of products, components, and materials at all times. Such designs can empower increased cycles of reuse, repair, and recycling of many products and their constituent materials. This is a difficult task. However, AI can be a helpful tool in enabling product designers to manage this complexity through **iterative assisted design processes**. These processes allow for rapid prototyping and testing, leading to better design outcomes in a shorter period of time. In this way, **new products can be formed through circular design** and these products

can then be safely maintained and preserved in the economy for a longer period. As a result, the amount of resource extraction and waste production associated with excessive product development can be reduced substantially.

- **AI can also help in predicting how materials change over time**, such as their overall durability and potential toxicities. This type of information can help in advancing the reverse logistics and maintenance of products.

  Operating circular business models: Developing sustainable business models requires organisations to run business processes such as manufacturing, marketing, pricing, sales, and logistics using CE principles. AI has already been involved in introducing new business models underpinned by CE principles. For example, by **analysing massive real-time consumer data**, AI can help in setting product pricing and demand predictions appropriately. **AI supports predictive maintenance** which can prolong the lifetime of equipment by minimizing the cost and use of spare parts. AI-assisted circular business models such as asset sharing, product-as-a-service, and take-back provide new opportunities for circularity. This in turn helps save money and resources.

- **Optimizing circular infrastructure**: One of the most important aspects of CE is that materials and products are repeatedly used rather than being consumed and disposed of. To support this, an extensive circular infrastructure of collection, sorting, separating, and treatment is needed. This infrastructure then assists and integrates the efficient reusing, repairing, and recycling of products. There are numerous areas where AI can help optimize the infrastructure required to circulate products and materials in the economy. Many of these focus on the capabilities of AI-powered **image recognition** algorithms. One leading example is **mixed-material stream-sorting using** AI image recognition techniques combined with robotics. Automated **multi-part disassembly** of products, considering the condition of the products using cameras and sensors, is also used. The decisions made during the design phase of products, (design for re-use) have an important role to play in improving the future re-manufacturing and recycling opportunities for many products.

Quantum

The second wave of quantum technology is on the way. Quantum mechanics was discovered a century ago, eventually leading to everyday technologies such as lasers and semiconductor electronics. But we still haven't taken full advantage of its more remarkable effects, such as "distributed entanglement," a phenomenon in which objects are inextricably linked, even when physically separated over large distances.

Quantum Key Distribution's (QKD) unique ability to provide unconditional, cast-iron security, is a sought-after technology by cryptographers as it provides the only route to guaranteed security against all possible future advances in code-breaking ability – including those enabled by other quantum technologies such as quantum computing. There are practical applications for QKD in secondary resource management in areas such as deposit & refund, battery passports, anything with a unique id code.

6G

6G is the name for the sixth generation of cellular networks, which will deliver truly omnipresent wireless intelligence. Expected to become available early in the 2030s, the 6G research journey is already well underway. Through the global, end-to-end lifecycle tracking of goods, autonomous supply chains can accelerate a full circular resource economy. Digital-asset tracking can reduce waste and automatize recycling. Taken together, this requires truly global coverage with excellent energy-, material-, and cost-efficiency, embedded autonomous devices and sensors, and a network platform with high availability and security.

There is huge potential within the resource management sector to develop the Circular Economy and the 6G platform offers the connectivity to achieve the Net Zero goal. There are however security and privacy issues associated with 6G, high-trust cyber-physical systems connecting humans and intelligent machines require extreme reliability and resilience, precise positioning and sensing, and low-latency communication. This places high demands on 6G security capabilities, but also on its ability to provide assurance that the required capabilities are in place. 6G networks must give this assurance to users and operators – in deployment as well as during operation – in the form of security awareness and resilience.

On the personal level, 6G security capabilities must respect privacy and personal data ownership in a connected world. It must be powerful and yet easy to adapt to users' preferences, to provide the platform required.

Finally, it should be noted that while these developments could deliver benefits for the Circular economy transition, there are also potentially significant impacts. The hardware, software and data involved in their expansion comes with a large carbon footprint due to associated material and energy consumption. This must be taken into consideration when balancing the relative benefits of these disruptive technologies.

5. How can the Department better communicate its research and innovation needs?

CIWM Ireland believes better communication can be achieved by releasing direct Research & Innovation proposals on E-Tenders.

6. How can the Department work more effectively to source evidence from the national research and innovation community to support its work in policy development, policy implementation, and the uptake of new technologies?

CIWM Ireland cannot provide a more effective method for the Department to source evidence from the national research and innovation community, however it is strategically positioned to disseminate information and provide training and updates on new technologies coming from the research and innovation community. Outreach to representative bodies such as CIWM Ireland will support policy development, implementation and uptake of new technologies.

However, as outlined in Impact 2030: Ireland's Research and Innovation Strategy, the establishment of a new competitive R&I funding agency to be established by way of a landmark research bill will bring together the functions and activities of the Irish Research Council and Science Foundation Ireland. This new agency, it is hoped, will continue to support excellent research within disciplines and build greater interdisciplinary research activity in Ireland and promote this research to policy and policy implementation and thereby further the uptake of new technologies in Ireland.

7. How can the Department engage more effectively with all stakeholders in the national research and innovation system? If you are responding on behalf of an organisation, please state how the Department could more effectively engage with your organisation.

CIWM Ireland is a professional membership organisation, as outlined in the introduction above. CIWM Ireland welcomes any direct or indirect engagement with the Department and engages in various for a related to waste management and the Circular Economy. Direct representation by CIWM Ireland members on the Waste Advisory Group (WAG) has provide a beneficial 2-way communication channel which has been an effective means of group communication to date. If specific communication in relation to particular work carried out on R&I is required, CIWM Ireland can be contacted directly at

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8. Should the Department seek to grow its capacity to carry out in-house research? If yes, how can this be achieved?

Yes, CIWM Ireland believes the Department should grow its capacity for in-house research. The model has been achieved for Agriculture in the past with a dedicated research and

advisory body funded by the DAFM (Teagasc). A similar state agency with a dedicated research fund for Climate Change related R&I, would / should not be limited to the CE, but also the BioEconomy and land use as there is significant cross-over. Ultimately it serves better to accommodate all areas with related targets to work together – not to duplicate work thus improving efficiencies of scale.

9. Are there examples internationally of Government strategies on research and innovation in climate, communications / digital, circular economy, cyber security, energy or environment that we should examine? If so, can you provide details?

CIWM Ireland asked that it be noted these are not Government Strategies per se but are related strategic programmes.

The SRIA was developed based on eight priority themes (biomass and biotechnologies, chemicals, construction and demolition, food, plastic, raw materials, waste and water) and builds on four societal areas that face sustainability challenges (urban areas, industrial systems, value chains and territory and sea) to identify priority areas to tackle EU region-wide issues and facilitate the circular economy transition.

An important move to catalyse ecosystem action on the circular economy, **The Circulars Accelerator** (an evolution of the highly successful Circulars Awards) is a bespoke, action-oriented program that supports trailblazing circular innovators across the globe to overcome their barriers to scale. It is led by Accenture, in partnership with Anglo American, Ecolab and Schneider Electric. The World Economic Forum and UpLink – a leading digital platform for scaling innovation and driving progress towards the UN Sustainable Development Goals – are key collaborators of this initiative.

Horizon Europe
Work Programme 2023-2024 8. Climate, Energy and Mobility

The Circular Economy and Digitalisation: Strategies for a digital-ecological industry transformation Ramesohl, S., Berg, H., & Wirtz, J. (2022). The Circular Economy and Digitalisation – Strategies for a digital-ecological industrial transformation, study within the project "Shaping the Digital Transformation", Wuppertal, January 2022.

10. Are there any other matters you wish to raise in relation to the development of the research and innovation strategy?

CIWM Ireland wishes to highlight the following:

In November 2021, EU Ministers with responsibility for R&I agreed a new European policy framework, which includes:

- The Pact for R&I, which is an overarching, long term strategy and includes common values and principles, jointly agreed priority areas and the tools required to drive implementation at EU and national level;
- The ERA (European Research Area) Policy Agenda, which sets out the specific actions to be progressed during the period 2022 – 2024; and
- New governance structures to ensure the effective implementation of the ERA priorities. The ambitious framework reflects the commitment of Member States and the European Commission to take a different approach to ERA implementation to develop a single market for knowledge. With our fellow Member States, Ireland will select the ERA actions that we will be committed to implementing at national level. Ireland is committed to playing its part to ensure the successful implementation of the new ERA priorities, a noted ***priority is to broaden and deepen enterprise innovation capability, especially within indigenous SMEs***, this is an area under-exploited. To progress R&I at pace a pathway to progress small scale projects with universities is difficult at best, it would be useful for DETE to provide an R&I pathway for SMEs to develop research and innovation ideas with universities, with funding commensurate with progressing projects to pilot stage.