IRISH UNIVERSITIES ASSOCIATION

Public Consultation on the Department of the Environment, Climate and Communications Research and Innovation Strategy

IUA Sectoral Submission

August 2023

The Irish Universities Association (IUA) is the representative body for eight universities in Ireland:

- Dublin City University (DCU)
- Maynooth University (MU)
- University of Galway
- Trinity College Dublin (TCD)
- University College Cork (UCC)
- University College Dublin (UCD)
- University of Limerick (UL)
- Technological University Dublin (TUD)

On behalf of our eight member institutions, the Irish Universities Association (IUA) warmly welcomes the development of the Department of the Environment, Climate and Communications' inaugural Research and Innovation Strategy and the opportunity to feed into same.

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?**

UN Sustainable Development Goals (SDGs)

- There is a clear gap in relation to **capacity-building** for delivering the SDGs – applying the evidence from research to support people within the Department, and key societal actors outside of it, to act effectively to address the SDGs. For example, the National Heat Study – has this research been applied, supported by capacity-building, to generate innovation and actual behavioural change.
- DECC research activities should include a rigorous evaluation component, **to assess the impact** of its innovations on achieving the SDGs. For example, evaluating SEAI's innovations (e.g., grants to support making homes more energy efficient) in terms of their impact in addressing socio-economic disadvantage (social sustainability) as much as environmental sustainability. If only affluent people can afford the costs associated with home improvements to avail of these grants, then economically disadvantaged families will continue to have to spend more money heating uninsulated homes, thus increasing rather than reducing poverty and inequality.

Enhanced Societal Engagement and Participation

- The DECC R&I Strategy should emphasise research *with*, not just *for*, society. Research co-designed with the most disadvantaged stakeholders can help ensure that the challenges they face in relation to sustainability, the environment, and digitisation can be addressed, with the goal of furthering Ireland's progress on the SDGs, while simultaneously **'leaving no-one behind'** (as per SDGs, and per the Creating our Future campaign, which highlighted the digital divide, for example). For example, the National Dialogue on Climate Action group does

not include anyone other than research scientists. There is no input from those in, or involved in supporting, disadvantaged societal groups, or from practitioners in relevant areas, e.g., civil society organisations. This is a clear knowledge gap in relation to addressing the complex challenge of Climate Action.

Social Sciences and Humanities

- Many of the solutions to climate breakdown and biodiversity loss have already been identified by the physical sciences. Significant blocks to transformative action on climate and biodiversity take place in various societal arenas, such as politics, policy, economics, the media, and in society in general. The Social Sciences and Humanities have a vital role to play in strengthening Ireland's responses to these urgent challenges, but national funding continues to prioritise research and innovation activities in the natural sciences and engineering. It is key that genuine research funding opportunities are provided to enable AHSS researchers to engage collaboratively and influence climate research particularly that with a STEM component.
- An emerging finding from Ireland's Climate Change Assessment, particularly its volume 4, is the need for greater research capacity on the societal dimensions of our response to the climate and biodiversity crises, to underpin transformational approaches to climate action. Building on these observations, the Department should therefore fund more social science research, either directly or through agencies such as the SEAI and the EPA.
- DECC should approach all research and capacity-building in a transdisciplinary way, informed by a strong focus on sustainability – social, environmental and economic sustainability.

Enhanced Irish Research Infrastructure

- There is a need to develop a new national structure and associated strategy to support greater Irish participation in European Research Infrastructures associated with the Department's and Ireland's strategic ambitions. Global science is increasingly underpinned by shared large-scale infrastructure resources. Ireland needs to identify its priority investments in sustainability here to enable its research and innovation community to optimise its engagement internationally.
- Greater coordination of government departments with national research funding agencies on funded research activities to address foresight initiatives and departmental research interests is necessary. This will ensure that the objectives of policy makers are delivered on, and best value is achieved in return for public investment. The new science advisory structures proposed by government will enable this coordination to take place. These mechanisms should ensure transparency in relation to aligning research interests to optimise resources and avoid duplication.

New and Enhanced Bilateral R&I Partnerships

- Identification of potential new bilateral collaborative opportunities to support the deepening of relationships with EU and non-EU countries which are mutually beneficial for research and innovation linked to the sustainability challenge and that align with other government strategies such as Global Ireland. Consideration for new bilateral research and educational relationships should be given to countries with shared values and include those with which we want to enhance our existing partnerships and those with which Ireland wishes to forge new and emerging relationships. New and enhanced bilateral R&I partnerships could be considered with the US, the UK, New Zealand and Canada. Emerging relationships should be

considered with India, South Africa and other African nations developing their scientific ambitions amongst others.

All Island and UK-Ireland Research Cooperation

- Advancing R&I cooperation on an all island and UK- Ireland basis through new mechanisms including the introduction of new joint appointments on a North/ South basis in target areas such as sustainability, energy, agri-food, quantum and next generation communication technologies. In addition, through new programmes that support researcher mobility across the Island and across all career levels including new Centres for Research Training on an East-West basis. Consideration could be given for funded programmes to establish clusters in these areas on an all-island and UK-Ireland basis.

Blue-skies Research

- While impact is important, we should not forget about the importance of supporting blue skies research, individual disciplinary research or indeed the scaling up of innovations to test their viability.

Specific Research Gaps to be prioritised for Ireland to effectively translate its climate ambitions into climate action:

- ➢ **Improving subnational analysis of GHG emissions and removals.** Research is needed to improve sub-national estimates of energy use and associated emissions as well as for emissions and removals from agriculture and land uses, and other emissions, potentially through the development of a distributed analysis system, dashboard or repository for sharing information. This should be linked with and support the official analysis provided by the National Inventory system.

- ➢ **Energy efficiency and demand-side management.** Further research is required to understand the barriers and drivers of energy efficiency and demand-side management in Ireland. This would help in understanding the enablers required for policymakers and stakeholders to develop targeted strategies to promote sustainable energy practices.

- ➢ **Foresight into future technologies.** More analysis is required to inform Future Energy Choices beyond 2030 relating to the scale and magnitude of technologies that will help get us to net zero emissions.

- ➢ **Quantifying Carbon dioxide removals to bridge evidence gap.** There is a need to quantify the extent of carbon dioxide removals required to provide a clear pathway for climate neutrality which should take account to the climate impacts of emissions as well as risks associated with the permeance of removal solutions particularly nature-based solutions.

- ➢ **Balancing agricultural emissions via management of terrestrial sinks.** Despite the recognition of the importance of agricultural emissions and land-use removals, there is a critical research gap in determining the specific levels of emissions that can feasibly be balanced with land-use practice.

- ➢ **Expanding use of observational data.** Continued enhancement and development of the national inventory within the LULUCF sector is very important. This can be enabled by increasing use of observational data from soil flux towers and atmospheric sites, as well as the use of remote sensing and enhance activity data derived from such observations.

- ➢ **Integrated assessments.** Addressing the knowledge gaps including an integrated assessment of whole of economy transitions and transformation options. These would include agriculture, energy and land-use is.

> **Mobilising Climate Action.** Research is needed to identify effective strategies and interventions to effectively engage with citizens and communities, build societal capacity, and mobilise society wide climate action.

> **Integrating Mitigation and Adaptation.** There is a critical need for research to uncover the synergistic co-benefits that can be derived from implementing integrated mitigation and adaptation measures.

> **New economic paradigms implications of transition to low carbon future.** Addressing the research gap in Ireland regarding the economic implications of energy and livestock reductions is essential, this will provide policymakers and stakeholders with insights necessary for evidence-based decision-making and the development of targeted policies.

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

- It is very positive to see DECC being involved in, and coordinating, Cross-Department Working Groups such as the Civil Service Research Network. **Breaking down silos** is an essential way to identify future trends at a higher level, and a key component of transdisciplinary research to address wicked problems such as the SDGs.
Working in partnership across sectors and agencies, such as with the **community and voluntary sector** (which is not really mentioned in the consultation document) would also support DECC to identify more effectively future trends in the areas under its remit.

- It is important to fund the basic research to impact continuum. The future ideas and trends will come from fundamental research. These ideas will lead to future technologies or solutions for climate mitigation/adaptation, environmental protection etc.

- It is critical to adopt **a truly interdisciplinary approach** to research. Where AI is perceived as being important as a capacity, moreover it should be seen as an enabling technology to develop solutions for example: Monitoring capability using satellite, in-situ, meteorological etc can all be integrated using machine learning. There is therefore a need to value truly integrated research. Similarly, engineering and computing domains can play a key role in biological sciences – understanding the impacts of climate change on ecosystems, or in physical sciences in developing marine energy systems using computational fluid dynamics.

- Consideration could be given to introducing a structure within the Department for engaging with external experts. For example, the UK Department for Digital, Culture, Media & Sport have established a 'College of Experts' which is made up of external experts from across academia and industry to provide a mechanism for the department to access external expertise and guidance on future trends in areas under the Department's remit.

- The development of structured **horizon scanning projects** could be enabled by the Department or via the science advisory structures across government. Initiatives could be looked at in other countries including in the UK where several government departments/ bodies have their own Futures or Horizon Scanning teams, and they connect with others from across the public sector with an interest in Futures through their Heads of Horizon Scanning Network as part of the UK Government Office for Science. The publication of reports from these horizon scanning and future initiatives could take place similar to the UK Ministry Defence Horizons Scanning Reports on global strategic trends or UK Government Foresight projects.

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?**

Climate Governance in Ireland

- There has been limited analysis to date of **climate institutions and governance arrangements** in Ireland. Considering the significant evolution of the governance landscape in recent years because of the Climate Action and Low Carbon Development (Amendment) Act 2021 and related processes, further research is needed to study the implications of these changes and provide a basis for further strengthening of the framework, with a focus on three areas in particular. First, research is needed on how the layering of new climate governance arrangements on existing institutions plays out in the distinctive context of Irish politics and policymaking. Second, future research ought to focus on the governance of sectoral climate action challenges. Third, further research on climate governance at local and regional level, and in a multilevel governance context, would help to strengthen climate action responses and avoid fragmentation.

De-carbonisation technologies and transition strategies

- Focus should be directed towards **de-carbonisation technologies and transition strategies** to fully understand the projected impacts of climate change across sectors and regions. Research in climate change adaptation strategies, combined with societal engagement and behaviour change studies, can enable effective planning and foster community engagement.

Circular Economy and Bioeconomy in Ireland

- **Circularity** is key for climate change mitigation, promoting biodiversity, enhancing resource use efficiency, and fostering sustainable economic growth. For this to be realised, research and innovation in technology, business models, and policy frameworks is urgently needed. This is a key focus of the UCD led SFI BiOrbic Centre which looks at renewable biological resources and converting waste into value-added products like food, feed, bio-based products, and bioenergy.

Renewable Energy Resources

- Ireland's renewable resources are vastly greater than its energy needs and thus Ireland is primed to develop into a major international energy exporter. To realise this, investments in test beds to trial and develop power conversion, energy storage, transmission, and integration technologies are critically needed. This would signal clear intent and position **Ireland as a global leader in energy transmission and renewables technologies**, moving from being a traditional technology adopter/follower, thereby being a technology developer would result in greater indigenous capacity to develop large scale renewables and transmission technology.
- **Offshore Wind Energy** – an area of massive potential for Ireland in terms of meeting its own energy needs and also in terms of exporting renewable electricity and renewable fuels. UCC also houses the LIR National Ocean Test Facility, a unique research infrastructure for the development of offshore wind energy.

Enhanced Public Engagement and Communications

- Identification of key stakeholders and communities of interest and characterise and analysis of the debates and discourses taking place in each of these groups. Once it has been identified how these groups conceive of and approach the challenges of climate change and biodiversity loss, these insights can be employed to **create targeted engagement strategies**.

- It is evident that a **significant communications campaign** - aimed at informing the public of the changes necessary for a just transition to a **zero-carbon society**, and recruiting public support for such measures - will have to be undertaken by the Department. There is an extensive body of research in the field of climate and environmental communications which finds that a range of messages, framings, platforms, and channels must be mobilised to reach and engage fragmented audiences. The Department should consider a major programme of establishing research aimed at identifying how different sectors, groups, and communities, such as farmers, coastal communities, the corporate sector, the transport sector, construct climate change in their separate discourses.

Other

- **Biological sciences, biodiversity, ecological sciences** need to be further prioritised to provide a greater understanding of impacts of anthropogenic activities including climate change.
- **Interdisciplinary Engineering** Programmes are needed, as are programmes to encourage engineers (mechatronics in particular) to remain in research.
- Multidisciplinary and Interdisciplinary research –truly **collaborative and integrated research** to develop ideas to solutions is needed.
- The environmental aspect of sustainability is quite well represented in the consultation document. The **economic and social dimensions of sustainability** seem to be less well represented and could benefit from further R+I alongside the environmental dimension. This can be achieved by increasing collaboration with Research Performing Organisations (RPOs), statutory, industry and community partners.
- It is unclear what relationship / collaboration takes place with other research institutes, such as Teagasc, which are outside the remit of the DECC. A **whole-of-government approach** to ensure alignment and to derive benefits from synergies would be useful.

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?**

Digital Transformation, Disruptive Technologies and Digital Twins

- There is a particular opportunity with **Artificial Intelligence** and **Machine Learning** in the consolidation of siloed national data sets combined with earth observation data to support decision-making in environmental policy, energy management, and digital infrastructure planning. AI and ML can process vast datasets rapidly, providing key insights for environmental conservation, energy optimisation, and policy decisions. They can greatly enhance energy storage and transmission systems by optimising grid operations and predicting energy demand. Advanced analytics can process large volumes of data from various sources to provide valuable insights.
- Research & Innovation test beds are needed to develop and **trial disruptive technologies** including power conversion, energy storage, transmission, and integration to significantly improve the efficiency and resilience of our national grid and ensure optimal integration of renewables. In addition, experiential training programmes are needed to continuously upskill

the Irish energy sector in these disruptive technology fields. For example, UCD's Energy Institute hosts such a testbed at its Integrated Energy Lab and could scale nationally.

- **Digital twins** (virtual replicas of physical systems) in combination with AI and analytics, through simulation and analysis of complex systems such as the national grid can optimise energy management, predict system failures, and plan infrastructure upgrades, leading to more resilient energy networks.

- Development and deployment **of future wireless technologies** such as 6G to enable faster, more reliable data transmission which is key for real-time environmental and energy systems monitoring and for enhanced digital inclusivity, requires significant research funding and infrastructure investment as well as updated regulatory frameworks.

- Where disruptive technologies can be integrated that is where the greatest impact will be. Very often we see development of AI for example with a tag-on application. What is needed is using **AI as an enabler** to help address research questions.

- AI will be hugely impactful on all areas of research going forward. It will be critical to ensure that opportunities to encourage **truly interdisciplinary research** is supported and facilitated, particularly offering opportunities for AHSS researchers to gain the experience to truly engage with and impact the implementation of AI in society.

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

- The Department could **publish their research priorities annually** as part of their regular strategic planning process to demonstrate policy interests to HEI/research sectors nationally and internationally and relay areas they will require external science advice on. This would act to ensure that there is greater coherence between government departments on research interests resulting in reduced duplication and greater opportunities for cooperation.

- These areas of research interests should be **updated annually** and may include specific research questions. This will have the dual impact of making researchers aware of areas that government departments require external science advice on and will also inform researchers of areas of research that they could work on to support government policy development.

- To help inform these areas of research interests relevant departments could meet/ hold **workshops** to seek academic input to inform the new areas. A similar approach could be used to communicate innovation needs too.

- There is potential for a **research project** with regards to improving the **Science/Policy interface for Climate, Energy and Biodiversity research** in Ireland. Such a project could explore how to embed meaningful two-way communication between the Government and HEIs to support the Climate, Environmental, and Energy policymaking process from a communications and research funding policy lens.

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?**

- Active ongoing **relationship-building and collaboration** with HEIs, RPOs and with industry and community partners. The latter are particularly important in supporting the update of new technologies and behaviour change in relation to climate change, for example. This engagement process would need to be supported by capacity-building for all stakeholders to ensure it is effective and mutually beneficial.

- Consideration could be given to introducing a structure within the Department for engaging with external experts. For example, the UK Department for Digital, Culture, Media & Sport have established a 'college of experts' which is made up of external experts from across academia and industry to provide a mechanism for the department to access external expertise and guidance to support work in policy development, policy implantation and the uptake of new technologies.
- Agencies like the EPA for example are a great **science to policy interface** and their effort to track research outputs is a model that should be replicated to identify potential innovation.

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.**

- Greater awareness in the Department of the **expertise available in the research system** to support policy making is necessary. A multitude of actions could be enacted to support this recommendation including:
  - the introduction of a brokerage or matching service,
  - training in sourcing science advice needs to be developed and expanded to be more readily available for government departments/officials.

- There is also a need for **a greater understanding of policy design in the system**. The policy challenges associated with climate have demonstrated the benefits of involving social scientists to advise on policy design. It is critical that policy design and implementation is evidence-informed, and that policy impact is evaluated and measured by government. This would require robust evaluation of policies/interventions and meaningful collaboration between policymakers and researchers. This would have the dual impact of demonstrating to researchers involved in policy the relevance of their work and encourage HEIs and other research organisations to play an even greater role in contributing to evidence-informed policy making. This could also support how **research impact in the context of policy is measured.**

- Include the **SDGs**, and a requirement for **community engagement**, in all calls for competitive research funding. This would focus R+I on achieving the SDGs, broaden the range of stakeholders involved in R+I, and ensure that R+I is more connected to lived experiences and **practice-based knowledge**, which will be essential when it comes to addressing the SDGs.

- R+I for collaborative research; identification of key research topics of mutual interest; identification of relevant community and industry stakeholders; collaborative design and development of research processes and methods with stakeholders, for mutual benefit.

- Ongoing **engagement with the research community** would be a welcome initiative. For example, ████████ visit to the DCU Centre for Climate and Society in July 2022 was very welcome. In previous years (pre-pandemic), ████████ (EPA) undertook visits to HEIs early in the calendar year to inform the development of each year's EPA Research Call. Such visits could be repeated, or an annual research priorities workshop could be held with invitations extended to the research community. It would also be very useful to receive feedback on such meetings, and to develop them into an ongoing two-way dialogue.

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

- There is potential for the Department to play an important role in creating a two-way, reciprocal process of capacity building. For example, departmental officials could be seconded to work with university-based researchers on specific research projects. Likewise, university researchers could work in the department, in collaboration with the department's in-house research team. This sharing of expertise, methodological approaches, and research cultures could be of benefit to both parties.

Ireland also needs:

- demonstrator sites for research where the research pipeline can be facilitated from fundamental science to demonstration. For example: modular wastewater treatment infrastructure where new technologies can be tested for chemicals removal, solids removal; sludge characterisation and application.
- renewables test facilities at 1/16 scale for example.
- funding for scaling up (numbers of units) of research outputs to demonstrator – for example development of multiple units for test in different scenarios.
- This demonstrator/test requires engineering capability therefore support for engineering research programmes is needed to retain engineers in research.
- Support for hackathons to look at solving problems through research.

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?**

- Netherlands - City Deals focus on collaboratively developing 'solutions to complex global challenges, from the imperative of achieving sustainability (transition towards renewable energy, circular economy, etc.) to promoting social justice (inclusion and equity) or continued vitality (new economic models)'. City Deals are 'agreements between a select number of cities, national government departments, civil society and the private sector to tackle a specific and self-defined problem. [They act...] as a vehicle for cooperation and commitment by mobilizing stakeholders to pool their resources (e.g., financial, legal, expertise) to work together outside of standard operating procedures.' Each individual Deal addresses an SDG-related topic, from circular economy to urban food to public safety, through collaborative knowledge sharing, experimentation and innovation. DECC could spearhead the development and piloting of City Deals (and potentially an expansion of the idea include to Rural Deals) across Ireland to address these themes.
- **Denmark**'s Climate Act provides a robust roadmap for reducing greenhouse gas emissions significantly by 2030 and achieving climate neutrality by 2050, aligning with the department's climate goals.
- **New Zealand**'s Zero Carbon Act also places a strong emphasis on the role of research in climate change mitigation and adaptation.
- The **Netherlands'** Government-wide Programme for a Circular Economy sets a leading example in aiming for a fully circular economy by 2050. This involves significant investment in research areas such as resource efficiency and sustainable product design, central to promoting a circular economy.

- Furthermore, the **Dutch National Climate Agreement** offers a substantial framework for innovation in sectors like agriculture, energy, and industry, crucial for meeting EU and international emissions reductions targets.
- In communications and digital technologies, the **UK's Digital Strategy** underlines the importance of research and innovation in areas like AI, quantum computing and cybersecurity, pivotal for promoting investment in communication networks and enhancing citizen engagement with digital technology.
- Estonia's cybersecurity strategy, characterised by a comprehensive approach to digital security, emphasises the importance of ongoing research, public-private partnerships, and citizen engagement, offering important lessons in cybersecurity and fostering digital engagement.
- **Singapore**'s Smart Nation Initiative further underscores the commitment to securing digital infrastructure and driving innovation, using AI, data science, and IoT. Denmark's Energy Agreement 2018-2024 further provides a model for fostering innovation in renewable energy technologies, vital for ensuring a sustainable and competitive national energy supply.
- Finally, regarding environmental conservation, the UK Government's 25 Year Environment Plan and **New Zealand**'s Environment Aotearoa strategy both emphasise research and monitoring for the protection and enhancement of natural habitats. These could contribute to the sustainable management and development of inland fisheries and geological resources. The integrated approach of these countries underlines the significance of research and innovation in meeting environmental and conservation objectives.
- The work of the DCU's Climate Centre with media organisations has identified a need to increase capacity and environmental literacy within the media sector. Levels and quality of climate change coverage in the provincial press and local radio are in need of remediation. The Department could examine supporting an initiative similar to Yale Climate Connections whereby a free, independent, multimedia environmental news service is provided by a university-based team of student reporters and senior, professional editors.

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

- The definitions of research and innovation, while specific to this strategy are not allowing for innovations as transfer of domain knowledge e.g., membrane technologies for food applications could have applications in the water domain. Innovation must be seen as adapting technology or knowledge also to address a research question or challenge.

Key areas that must be addressed:

- It is important that we lead in areas of climate mitigation – peatland and wetland activities – paludiculture for example, addressing mixed ecosystems rather than just forestry-based solutions. This area needs research.
- Agriculture – the impact of intensification is significant on the environment and therefore research must address a re-thinking of this industry.
- Renewables; (marine, hydrogen, solar) and integration into the grid.
- Water and wastewater treatment – there is potential to create technologies that are modular and suited to 100,000 PE.
- Safe materials – legislation in relation to nano must be considered where up to now, we have not adequately considered the hazard and risk associated with nanotechnology.

- Dedicated funding could be ring fenced as part of specific research grants where relevant to enable evidence for policy work to be conducted by the research team.

- More opportunities for sharing research reports/policy briefings beyond the Department for which it was developed would ensure wider recognition and awareness of the work. For example, UCD's EMPowER project's research in Electric Vehicle uptake was shared with both the Department of Transport and the Department of the Environment, Climate and Communications enabling cross departmental exposure of science advice.

- Further opportunities for secondments between Government Departments/Agencies could be explored to enhance knowledge exchange and to strengthen collaboration, e.g., Research Fellowship programmes. By way of example the UCD Energy Institute has had strong collaboration with SEAI in recent years through the Research Fellowship Programme where researchers have been co-supervised by UCD Academics and SEAI.

- Consideration needs to be given for methods to recognise researchers who are involved in providing science advice to government.

- Government should utilise an across departmental approach to strengthen business R&D investment through increased investment in mechanisms to support HEI-industry partnerships and collaboration in priority areas linked to Ireland's Climate Action Plan.

- It is unclear what role, if any, the Digital Hub plays in relation to the R&I strategy for communications/digital, cyber security etc.

Irish Universities Association

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