Bioeconomy Action Plan

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Introduction:

University of Limerick (UL) research is addressing a number of global challenges including affordable and clean energy, sustainable cities and communities, climate action and public health. By working together across disciplines, our community is achieving fundamental breakthroughs whilst ensuring research is rapidly translated into economic and social impacts for Ireland and beyond. Within our research strategy, Wisdom for Action 2022-2027 UL has articulated four mission-orientated challenge areas: *sustainable society, healthy society, smart society and inclusive society.* The University is tackling these mission-orientated challenges through collaboration and innovation founded on strong academic disciplines. As a young university, our very existence is due to the vision and determination of the community around us and as such we feel that we are an integral part of our city/region and its future. The opportunity to provide insights to inform the national Bioeconomy Action Plan is welcome. Members of the UL academic and research community working across the areas of agriculture, food science, environmental biology, materials science and biosystems engineering have provided insights based on their research to inform this critical national plan.

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Pillars of the Bioeconomy Action Plan

Co-ordination across sectors and national structures/initiatives: The governance pillar must seek to co-ordinate and identify linkages across government policy and taskforces. For example, the Shannon Estuary Economic Taskforce (SEETF) has made recommendations in their interim report[1] in connected areas of development of biogas/biomethane infrastructure, importance of a broad plan which would incorporate agri-food (particularly dairy, meat) and bioenergy (forestry, peat) sectors, need for rural industrialisation to positively engagement with communities and a focus on solutions of national scale. In addition, the SEETF interim report incorporated specific recommendations in the area of biomethane in particular.

Greater clarity and representation across all pillars: The following outlines recommendations across all pillars:

- *'*The inconsistencies in the description of **the Agriculture, Forestry/Food and the Marine** pillar are concerning. The pillar is named both as Agriculture, **Forestry** and the Marine and changes to Agriculture, **Food** & the Marine. Considering the significance of both sectors in terms of carbon neutral/negative potential this is a major concern and evidences how poorly Forestry is represented. There is no mention of the potential for wood products to displace energy intensive building materials such as concrete or steel. There is space for this area to grow as evidenced in a recent publication involving Prof Ken Byrne, University of Limerick[i.]
- ***Biodiversity'*** should be combined with Nature to create *'Biodiversity and Nature'*. As part of the Biodiversity & Nature pillar there is a need to include land regeneration[2] for ecosystem services for example carbon sequestration.
- ***'Climate and Circular'*** to form a different cluster which would include land regeneration for ecosystem services.

Impact on communities and planning reform: There is an urgent need for national guidelines in relation to the siting of biomethane plants, and for updates to the guidelines already in existence for wind energy. This is an important factor contributing to the long-term positive engagement with communities in the overall development of the bioeconomy and the issue sits across governance and communities pillars. Incentivise action, measure, reward and communicate to call others to action to drive a continuously evolving dialogue across stakeholders which takes into account the need for positive engagement with communities.

Key performance indicators

A holistic view of key performance indicators is required which incorporates health and societal impacts: Key performance indicators are critical to the measurement of implementation of the Action Plan and must be multi-faceted with base-line metric system around health such as the air quality and water quality as set out by the relative EU directives. This approach supports the area of societal impacts. We would recommend that a targeted number of qualitative and quantitative indicators should be created in Ireland, so the progress towards a more circular mode can be monitored throughout the years

[1] Shannon Estuary Economic Taskforce Interim Report as presented to Tánaiste and other governmental leaders, and presented at Fourth Ambition of the Irish State by the Taoiseach in December 2022. https://www.gov.ie/en/publication/9c790-shannon-estuary-economic-taskforce-interim-report/

[2] Ecologically engineered solutions to rehabilitate mining waste and mine sites, by Dr Ronan Courtney

Data on industrial side-streams: For industry, the generation of by-products and side streams should be quantified, so a national database on the amounts and types of side streams would be generated. Specific project calls have the potential to drive development of these databases and incentivise the (re)use of industrial side streams.

Parity across pillars: The Industry Pillar has been given a benchmark of responsibility (11.5% GHG) and no other pillar is given the same representation. As part of the KPI's all pillars should be quantified accordingly and glaring omissions removed from the ethos of the Bioeconomy Action plan. Where is the other 88.5% GHG being generated and how is agriculture contributing?

Health (human and ecosystem): are critical factors which should be incorporated into the key performance indicators which would contribute to genuine engagement with communities and local government to inform policy.

Research Development & Innovation

Ireland needs to engage in the cascading principle whereby higher value applications are preferentially derived from biological resources, the utilisation of waste bioresources from forestry and agriculture are key to produce next generation sustainable and advanced engineering materials for composite materials development to be deployed in automotive, biomedical and energy applications.

More specifically we need to invest in technologies and research for (waste) biomass separation into its constituents and it subsequent processing into valuable materials (spinning into fibres and weaving of these fibres into fabrics for composite materials)[3].

The best way to scale up processes and generate knowledge and clear indicators are by integrating research performing organisations (RPO) and stakeholders in different industry sectors (e.g. energy, food, pharma, chemicals, etc.). Conjoined projects where the technologies and products are developed and tested in RPO's and further optimised and scaled up in the industry should be prioritised and supported through a competitive submission- based approach for all public and private engagement routes.

Within this pillar a number of activities are relevant:

- Identifying and aligning appropriate external themes to the bioeconomy and how they can help complement the bioeconomy in achieving its objectives, are key issues the RD&I pillar should focus on.
- Integrating research organisations and companies to develop new approaches to mitigate the generation of industrial side streams and wastes and decarbonise Ireland's industrial activities.
- Generation of databases of industrial side streams and wastes to inform the utilisation of industrial side-streams to develop new products and technologies e.g. valorisation of organic waste.
- Commercialisation of the innovations surrounding the above and generating new markets for engagement both from an Institutional and Industrial perspective.
- Valorisation of Irish side streams and wastes under Agriculture Food/Forestry and the Marine through the development of feasible technological approaches.
- Use of biorefinery approaches to develop new ingredients and products for human and animal consumption.

[3] See European Commission funded projects led by Prof Maurice Collins – VIBES (next generation recyclable composites) and LIBRE (producing carbon fibre from forestry by-products)

- The study of different production systems on the sequestration of carbon and its effects on production yield and quality traits of foods.
- Establish evidence-informed policy benchmarks together with long-term capturing and monitoring of data via a national open-source digital repository and mapping of the bioeconomy measures nodes to enable AI growth and data validation nationally.

Potential initiatives (funding mechanisms and financing instruments) to support RD&I and wider investment in the bioeconomy

- Dedicated funding mechanisms for upscaling innovations in Bioeconomy, for example the Enterprise Ireland Innovation Partnership Programme model.
- Public competitive investment fund dedicated to bioeconomy-based initiatives.
- Establish regional bioeconomy innovation districts, for example the Shannon Estuary, Mid-West, Midlands, which can offer tax incentives for innovation.
- Fund infrastructure within Higher Education sector available for R&D and access for industry-based bioeconomy analysis.
- Bioeconomy Innovation Credits: Creating a transparent and publicly managed carbon credit and bioeconomy innovation credit system
- Public competitive investment fund dedicated to bioeconomy based initiatives.
- Establish regional bioeconomy innovation districts, for example the Shannon Estuary, Mid-West, Midlands, which can offer tax incentives for innovation.
- Fund infrastructure within Higher Education sector available for R&D and access for industry based bioeconomy analysis.

Knowledge & Skills

A holistic approach to knowledge and skills from early education through to higher education.

Higher Education (senior leadership and knowledge translation): Focus on recruitment of senior research leadership in the field to support the bioeconomy. A model similar to the SALI professorships scheme, launched by the Minister for Higher Education, whereby a central fund would be available to seed fund a programme to attract world-leading talent in the space to Ireland.

There is a need for knowledge translation supports which address deficiencies in the chain from basic research to product development. This requires a mix of several skill sets upon a base of biotechnology expertise, these include commercialisation, entrepreneurship, finance, marketing and management.

Primary & Secondary Education: The knowledge and skills pillar provides a welcome opportunity to invest in biodiversity education at primary and second level. Much of the research funding in science education focusses on wet laboratory work and there is an opportunity to broaden this to understand the importance of biodiversity and the opportunity of bioeconomy.

[i] R. Sikkema, D. Styles, R. Jonsson, B. Tobin, K.A. Byrne,
A market inventory of construction wood for residential building in Europe – in the light of the Green Deal and new circular economy ambitions, Sustainable Cities and Society https://doi.org/10.1016/j.scs.2022.104370. (https://www.sciencedirect.com/science/article/pii/S2210670722006758)
Abstract: Wood is an energy efficient, low carbon construction material that if carefully managed can contribute significantly to European climate policy goals in urban environments. The aim of this study is to assess the current construction wood use intensity the ratio of apparent national consumption of wood for

construction (in m3) to the useful floor area of newly finished dwellings (in m2) and to identify when and where additional policy measures are required. Results show that Cyprus/Malta have the smallest use with a ratio of 0.01, Estonia/Romania the greatest use with a ratio of 0.32. The need for additional policy measures, was assessed using the Boston Consultancy Group (BCG) matrix with four product development phases, based on the aforementioned ratio versus future growth. Six, twelve, eight and two countries are in the “Introduction“, “Growth”, ”Maturity” and “Decline” phases, respectively. At the EU level, the European Commission should consider introducing a Renewable Material Directive, in which a Non-biogenic Material Comparator shows the average GHG substitution effect of using wood for construction. At the international level, a new harvested wood product (HWP) category in the IPCC Guidelines is recommended for construction wood with a longer lifespan than the current HWP categories.