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To Whom It May Concern:

Trinity College Dublin: submission on developing Ireland's bioeconomy

We welcome the publication of the Bioeconomy Discussion Document, which recognises the importance of the bioeconomy to the wellbeing and prosperity of the country, and considers an area where Ireland can play a role as a global leader in terms of research and education.

More efficient and effective use of our biological resources, particularly to replace climate-change inducing fossil fuel technologies and products, has the potential to significantly improve our long term wellbeing. With increased investment, new technologies, and new industrial applications, it is inevitable that new challenges will arise. In particular, these challenges will present in areas such as the sustainability and renewability of natural capital resources. These resources underpin not just the bioeconomy as defined in the Bioeconomy Discussion Document, but other sectors such as tourism and people's health and wellbeing on local and national scales.

Trinity College Dublin is a world class university, with an internationally recognised expertise in issues around the bioeconomy. In particular, researchers in the School of Natural Science consider the way in which natural resources - including raw materials, marine environments and agricultural sites – can best be employed for the benefit of the country's citizens, whilst maintaining environmental stability and sustainability. The strength of Trinity's expertise and commitment to this area is seen in the development of the E3 initiative. A key element of Trinity's long-term strategy is to create a new building on campus to house engineering and the natural sciences in E3 – known as the Engineering, Energy and Environment Institute. E3 will harness Trinity's expertise and advance research that addresses Ireland's economic priorities in this area.

Our response to the Bioeconomy Discussion Document follows its format.

1. **What is the bioeconomy?**

Our natural capital is the source of existing and new materials for bio-based industries. The sustainability of the natural capital underpinning the bioeconomy is critical to the overall sustainability goals. It should be noted that policies aimed at addressing the bioeconomy *may* address sustainability

and environmental protection. This is not a given, however, and long term understanding of the complexities and ecologies of the bioeconomy are required to ensure sustainability.

We note that though marine biotechnology is taken into consideration, it appears overlooked in some areas in favour of a focus on agriculture. The marine sector has huge potential as detailed in the Marine Biotechnology Taskforce Report.

- We recommend explicit linkage of natural capital concepts to the bioeconomy definition. The concept of capital which can be used and renewed is helpful in the framework of the circular economy. Renewal and restoration of natural capital is critical for the sustainability of the bioeconomy. We recommend engagement with the Irish Forum on Natural Capital to provide expertise in this area.
- We recommend the employment of a full life cycle assessment (LCA), and quantification of natural capital impacts for real environmental sustainability.
- We recommend greater consideration of marine activities within the bioeconomy.
- We recommend that the Interdepartmental Group should include representatives of the Department of Culture, Heritage and the Gaeltacht with responsibility for Natural Heritage (biodiversity, natural capital) as these natural resources underpin the bioeconomy and have the potential to be impacted by changes in the use and re-use of raw materials.

2. Benefits of the bioeconomy

We note the suggested opportunity to '[reduce] our dependency on natural resources and imported materials'. This seems problematic, as our understanding is that 'natural resources' will include biological resources (i.e. resources on which the bioeconomy relies), and the shift from a fossil fuel based economy will necessarily involve greater dependency on biological components of natural resources.

It should also be noted of second, third and even fourth generation biofuels, that these do not compete with land for food (e.g. seaweed) and can be carbon negative not just carbon neutral.

- We recommend that the strategy focuses on reducing dependency on *non-renewable* natural resources (or resources that do not renew as quickly as they are depleted).
- We recommend greater consideration to algal biorefinaries, which are developing climate change mitigation technologies.

3. What is the bioeconomy in Ireland?

The discussion paper asks '*How can a high-level policy statement on the bioeconomy assist in progressing the development of the priority value chains identified?*' We would suggest that this could be addressed by considering and/or insisting on complete LCA of these value chains. For example, it is important that potential waste products from bioeconomy activities do not exacerbate waste problems.

We would encourage the government to take a broader reading of the bioeconomy, incorporating the positive contributions of smaller scale, community-based, grassroots innovations (e.g. food growing, cooking and eating). This might be in the form of community supported agriculture schemes, urban farms and gardens, social innovation hubs, or other similar initiatives. In addition, the government

should consider the role of smaller scale activities when it comes to necessary aspects of the bioeconomy and circular economy, such as recycling and re-use.

- We recommend that the strategy recognises the role of Ireland's citizens in contributing to the bioeconomy.
- As previously noted, we recommend that the NDCHG is included in this Interdepartmental Group.
- We recommend consideration of blue technology. This is an underdeveloped area with significant potential, not only in terms of food and biofuels, but also in the development of clinical and high value products.

4. What existing strategies shape the Irish Bioeconomy?

The vision of Ireland's National Biodiversity Strategy is:

"That biodiversity and ecosystems in Ireland are conserved and restored, ***delivering benefits essential for all sectors of society*** *and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally."*

The development of the Bioeconomy, with its vision of smart and sustainable growth from biological resources, needs to ensure that it benefits from the biodiversity components of our natural capital. Development of this industry must also be compatible with the broader sustainability goals of society, including the conservation and restoration of ecosystems underpinning the Bioeconomy and potentially further impacted by the expansion of this sector.

- We recommend that the National Biodiversity Strategy be included in this list of existing strategies that shape the Irish bioeconomy.
- We recommend inclusion of, or reference to, policy documents from the Irish Forum on Natural Capital.

5. Approach at European Level

To consider the bioeconomy as the biological element of the circular economy is to underestimate the role of ecosystems in the circular economy. The bioeconomy is based on extracting biological materials (from natural or artificial "habitats") and creating a market for them, whereas there are a great many more ecological (i.e. biological) processes which contribute to the circular economy (e.g. decomposition of waste; filtering and detoxifying air, land and water etc.).

- We recommend that Natural Capital concepts are integrated into policies (see the Natural Capital Coalition). In particular, it is important to recognise that addressing the bioeconomy will not automatically address - let alone solve – environmental problems that we face. Due consideration needs to be given to ecological perspectives.

6. Objective

With regard to the utility and effectiveness of a National Policy Statement, we recommend that the government considers the successful development of the Irish Forum on Natural Capital as it has demonstrated an ability to gain cross-sector support.

With regard to the identified risk of over-exploitation and biodiversity loss, the government should support the investigation of methods to future-proof the bioeconomy and develop it in accordance with various global change scenarios. For example, climate change mitigation and adaptation processes should be included explicitly in the development of all biofuel technologies.

7. Establish Common Principles

The word 'sustainable' can be applied in different ways. Notably a sustainable industry can be defined as one which has long-term financial value, rather than one which necessarily accounts for effects on the environment and actively reduces those impacts. Environmental sustainability (achieved when the rates of resource depletion are less than renewal) is acknowledged as "an integral, core principle of the bioeconomy". However, there is no mention of the ecosystems and biological natural capital that comprise part of that environment.

Ecosystem services such as water regulation and filtration, temperature modification, pest control and pollination are provided by a broad suite of species that support the use of the industrial target species. In order for the industrial target product (crop, tree, seaweed, livestock) to be produced efficiently and sustainably, the broader ecosystem function and sustainability needs to be addressed.

The science of ecology can guide the sustainable use, management and restoration of natural capital, including scarce natural resources. Ecology is concerned with the renewal of populations, communities and ecosystems which provide the products and services in the bio-based industries. In particular as the climate changes we are seeing responses in plant and animal populations on land and in the sea that will result in shifts in their locations and performance, with consequences for the raw materials of bio-based industries. We will also be faced with the emergence of new pests and diseases.

- We recommend that government policy on the bioeconomy recognises that the economy is a subset of the environment, not the other way around, and that the economy can only grow within physical constraints imposed by the environment.
- We recommend that the principle of sustainability be explicitly extended to the broader ecosystem services which support the production and sustainability of the industrial target product.
- We recommend explicit recognition of the emerging threats to the location and performance of plant and animal populations for bio-based industries. There may also be opportunities provided by shifts in location and performance. Prior notice of both threats and opportunities will enable timely adaptation.
- We recommend engagement with ecologists, including the Irish Ecological Association, to provide expertise in this area.

8. Identify the actions needed to pursue opportunities

As noted above, the creation of a national policy statement should include consideration of the (necessary) activities of small civic groups and individuals. Additionally consideration of other externalities is essential. Adopting Natural Capital accounting systems – incorporating the 'full' value of production into prices - might lead to the increased take-up of more sustainable products.

When considering regulatory policies, we note that the current 'review' of all aquaculture licences and the application processes needs urgent attention. Delays of many years for approval are seriously

hindering the development of the marine biotechnology sector. Where industry is starting to harvest wild ecosystems (e.g. kelp beds in West Cork), this requires urgent attention and should be included in any sustainable development strategy.

- We recommend the creation of a register or inventory of 'waste' products from all sectors, and methods for transporting and distributing them.
- We recommend the use of financial instruments and dis/incentives to address waste and encourage the circular economy.

9. Support and Monitor Progress

We recommend the creation of an independent body of stakeholders involving cross-disciplinary and cross-sectoral expertise, including representatives not directly involved with the bioeconomy, to monitor progress and to recommend appropriate interventions and supports.

In order to properly address the challenges and potential benefits of engaging with the bioeconomy, funding should be made available by appropriate funding bodies (Science Foundation Ireland, the Environmental Protection Agency, the Marine Institute inter alia), and address research activities across the TRL spectrum. Fundamental research in this area will remain vital in informing research and approaches that are undertaken at near-to-market and commercial levels.

We trust that the above information will be helpful in the development of policies relating to the bioeconomy in Ireland, and reiterate our gratitude for this opportunity to feed into the process.

Yours sincerely,

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