

Sustainability; a key concept in the development of the agri-food based bioeconomy

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Governing Board Meeting of the

Co-operative Research Programme: Biological Resource Management for Sustainable Agricultural Systems, OECD, 30th November 2018



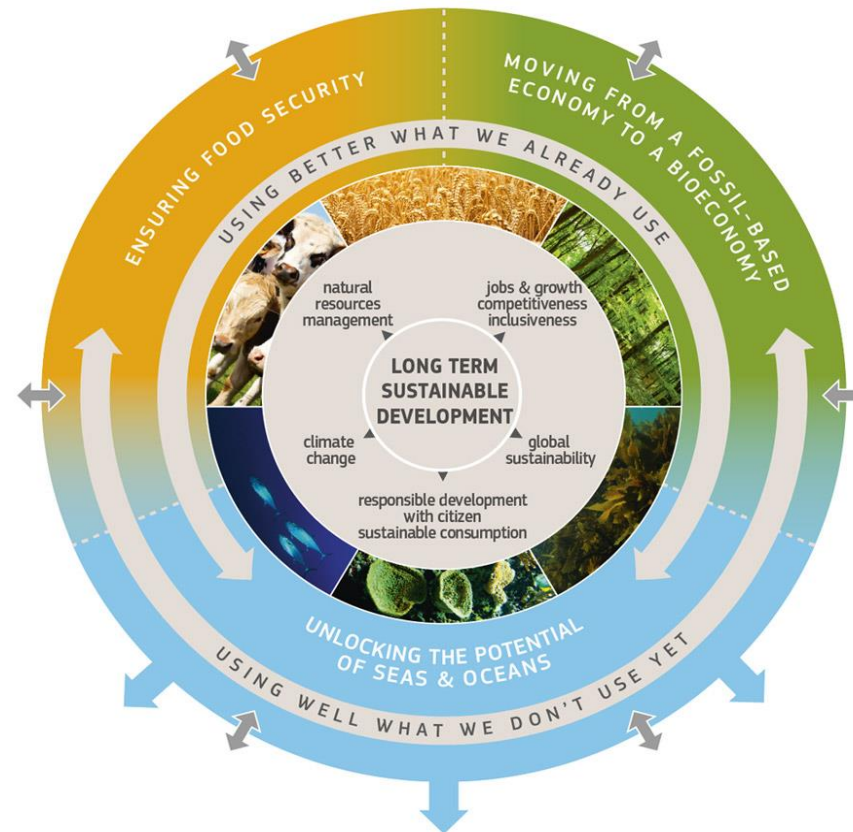
Presentation Outline

- The Bioeconomy
- Agri-food Waste and the Bioeconomy
- Irish Bioeconomy Activities



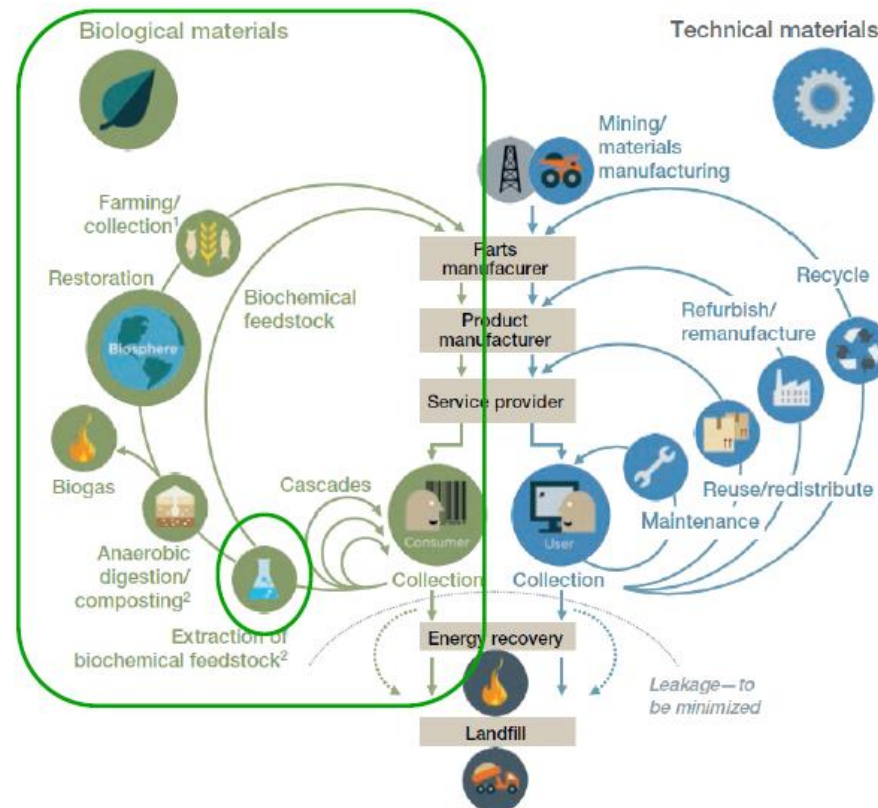
The Bioeconomy

As defined by the European Commission, refers to the "the production of renewable biological resources and the conversion of these resources and waste streams into value-added products, such as food, feed, bio-based products as well as bio-energy" (EC, 2017).



Bioeconomy – Circular Economy

The bioeconomy is often represented as the biological element of the circular economy, in which “the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised” (EC, 2017).



Bioeconomy Policies

Country	Strategy	Year	Institution
OECD-countries	The Bioeconomy to 2030—Designing a policy agenda	2009	OECD
EU	Innovating for Sustainable Growth—A Bioeconomy for Europe	2012	EC
The Netherlands	Framework memorandum on the Bio-based Economy	2012	The Dutch Cabinet
Sweden	Swedish Research and Innovation—Strategy for a Bio-based Economy	2012	Formas ¹
USA	National Bioeconomy Blueprint	2012	The White House
Russian Federation	State Coordination Program for the Development of Biotechnology in the Russian Federation until 2020 “BIO 2020”	2012	BioTECH 2030 ²
Malaysia	Bioeconomy Transformation Program—Enriching the Nation, Securing the Future	2013	Biotechcorp ³
South Africa	The Bio-economy Strategy	2013	DST ⁴
Germany	National Policy Strategy on Bioeconomy (in German)	2014	BMEL ⁵
Finland	Sustainable growth from bioeconomy—The Finnish Bioeconomy Strategy	2014	MEE ⁶
West Nordic countries	Future opportunities for bioeconomy in the West Nordic countries	2014	Matis ⁷
France	A Bioeconomy Strategy for France (in French)	2016	Alim’agri ⁸



Bioeconomy versus Biobased Economy Terms

Bioeconomy

- Used predominantly by the **OECD** - “transforming life science knowledge into new, sustainable, eco-efficient and competitive products” (OECD, 2009). Thus, “[t]he concept of the BE is focused on the methods of conversion of raw material into value added products” (Staffas et al., 2013) and in particular on biotechnology as a conversion technology.

Bio-based Economy

- Used by the **European Union (EU)** “focuses on the raw material rather than the conversion process” (Staffas et al., 2013) . The European Commission (EC) states that “a bio-based economy integrates the full range of natural and renewable biological resources—land and sea resources, biodiversity and biological materials (plant, animal and microbial), through to the processing and the consumption of these bio-resources” (EC, 2011).



Bioeconomy Perspectives; Policy and Stakeholders

Biotechnological, agro-ecological

- The biotechnology-centred vision of the bioeconomy was the first to emerge and closely tied to the agenda of the life sciences and biotech industry.
- The technological dimension is based on the contribution of technology to the bioeconomy over ecological principles.
- Only later were environmental objectives included—in particular climate change mitigation and the transition to a sustainable post-fossil society—and the focus of the narrative shifted somewhat toward an economy based on renewable biomass and “green growth”.



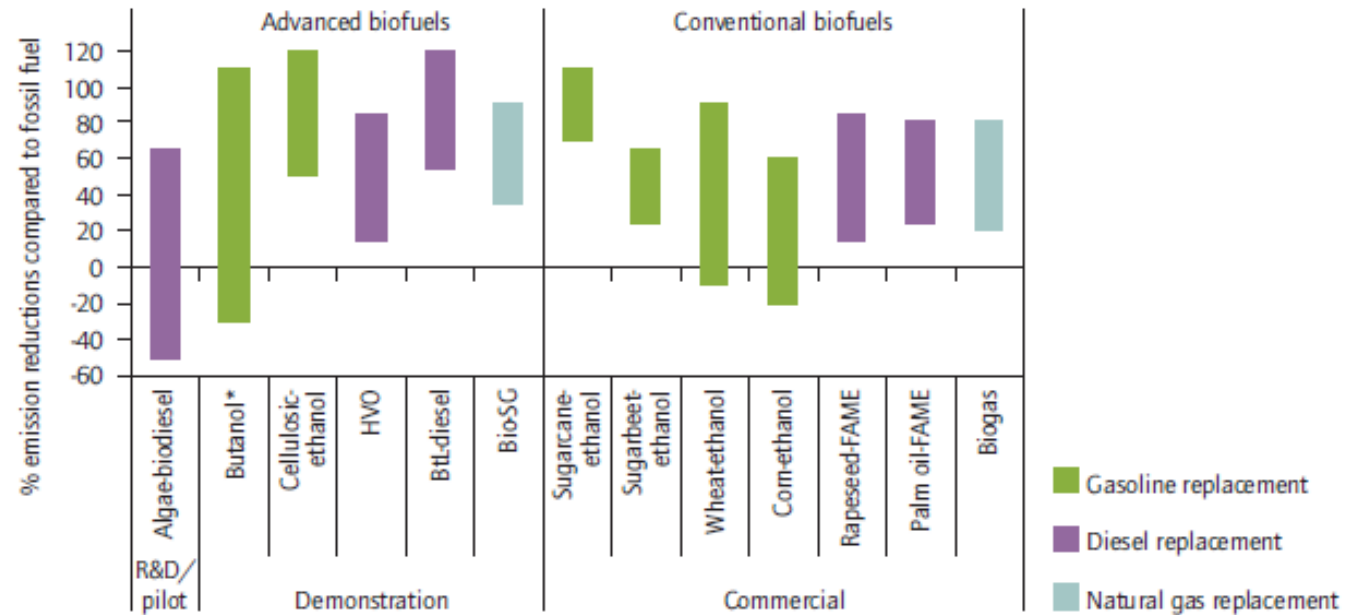
Bioeconomy and the Environment

- Assumption that sustainability is an inherent characteristic of the bioeconomy, or the expectation of benefits under certain conditions.
- However – we must be careful about interventions:
 - Single or multiple environmental impact reduction interventions in a production system may not reduce the environmental impact – and may have the opposite effect.



Lessons Learned - Biofuels

- Renewable Energy Directive (2009/28/EC)
 - Requiring each Member State to set national indicative targets to ensure that a minimum proportion of biofuels is placed on their markets
 - 2% biofuel on market by 2005, 5.75% by 2010 and 10% by 2020
- EU Biofuel sustainability criteria
- Experience of biofuel policies and impacts shows that the bioeconomy cannot be considered as “self-evidently sustainable”.



Note: The assessments exclude emissions from indirect land-use change. Emission savings of more than 100% are possible through use of co-products. Bio-SG = bio-synthetic gas; BtL = biomass-to-liquids; FAME = fatty acid methyl esters; HVO = hydrotreated vegetable oil. Source: IEA analysis based on UNEP and IEA review of 60 LCA studies, published in OECD, 2008; IEA, 2009; DBFZ, 2009.



Summary of Bioeconomy Policy Issues

- The dominant “green growth” narrative regarding the bioeconomy has been criticised for being too reliant on technology by those who are more in favour of ecological practices and a more comprehensive understanding of societal sustainability.
- The current mainstream vision of the bioeconomy has been further criticised on the basis that available biomass will be insufficient to meet the demand if food security and the maintenance of environmental capital and ecosystem services are given priority.
- The technology-based approach will reinforce the excessive consumption of resources and that sustainable consumption and behaviour change must be part of the transition process.



Summary of Bioeconomy Policy Issues

- Many countries indicate that sustainability standards and guidelines should be developed and agreed on at international level.
- This is being addressed by the programme on sustainable bioeconomy guidelines being developed under FAO's coordination (FAO 2016).



Agri-Food Waste



Europe generates around 700 million tonnes of agricultural waste!

Current Solutions

Animal feeding



Composting & fertilising



Anaerobic digestion



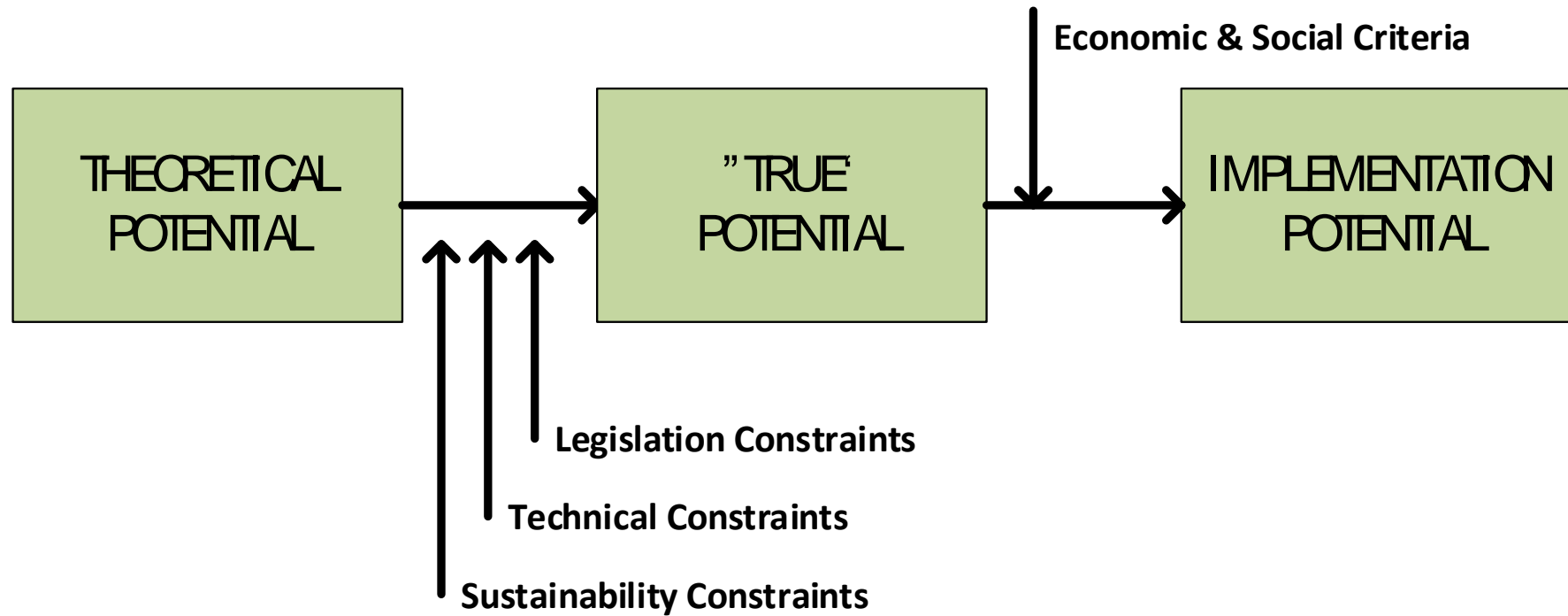
Incineration



Landfilling

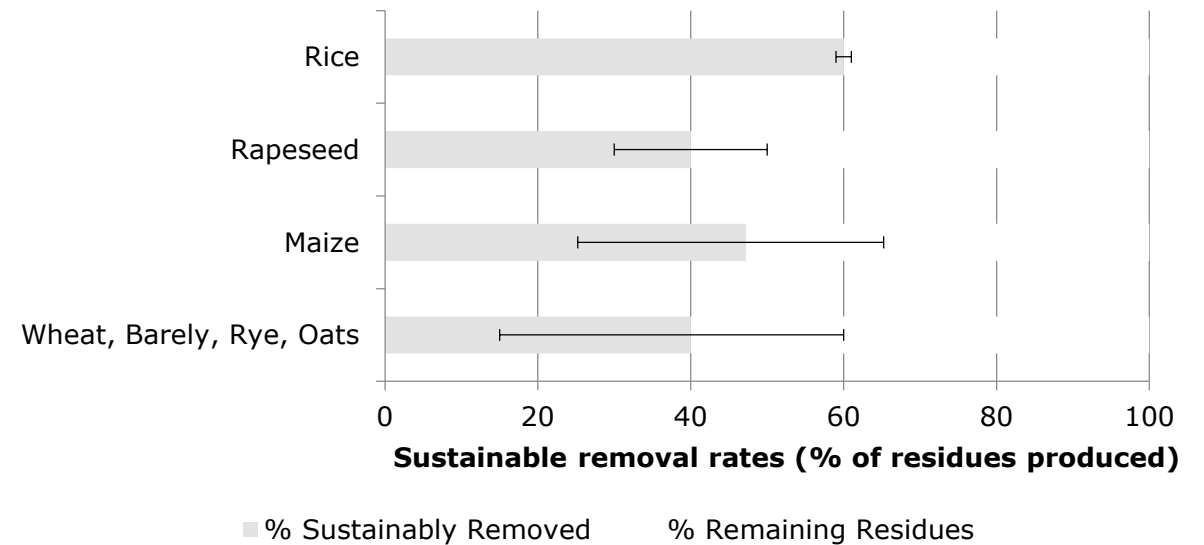
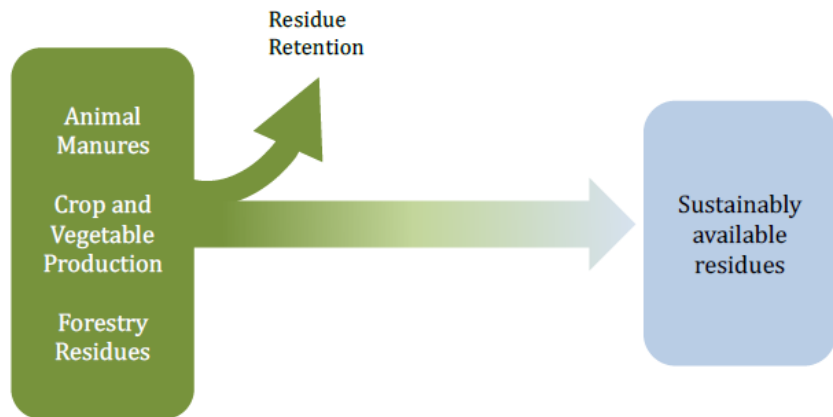


Agri-Food Waste Availability



Agri-Food Waste Availability

Quantification of sustainable removal rates - the level of agricultural residues removal that can be achieved without causing adverse effects on the performance of agricultural systems.



Source: AgroCycle D1.3 - Report on the holistic analysis of AWCB chains and logistics of AWCB valorisation systems

Agri-Food Waste Availability: Avoidable and Unavoidable

- There is an inherent wastage in the form of unavoidable waste (by-products, co-products, residues) built into agri-food systems that cannot be prevented.
 - E.g. on average $\frac{1}{4}$ of a vegetable crop is not edible (peels, leaves, stems, roots, etc.).
- While there are unavoidable agri-food wastes, significant amounts of food waste is avoidable.

Waste Type	Description
Avoidable	Avoidable wastes are material streams that have been mismanaged and disposed of, and are typically a mixture of different components (heterogeneous). These include wasted foods generated in processing, retail, catering and households. Avoidable agri-food waste occurs when foods are discarded because they are regarded as 'suboptimal', or when they pass their 'best-before' date, or due to product flaws
Unavoidable	Unavoidable agri-food wastes, on the other hand, are materials arising from food production systems that are not consumable, typically described as by-products, co-products, or residues (eg manures, crop residues, leaves and peels). Unavoidable agri-food wastes cannot be prevented and are typically homogeneous streams.



Avoidable food waste from on-farm cosmetic grade-outs estimated to be up to 50 million tonnes per year in the European Economic Area.

Agri-Food Waste Availability

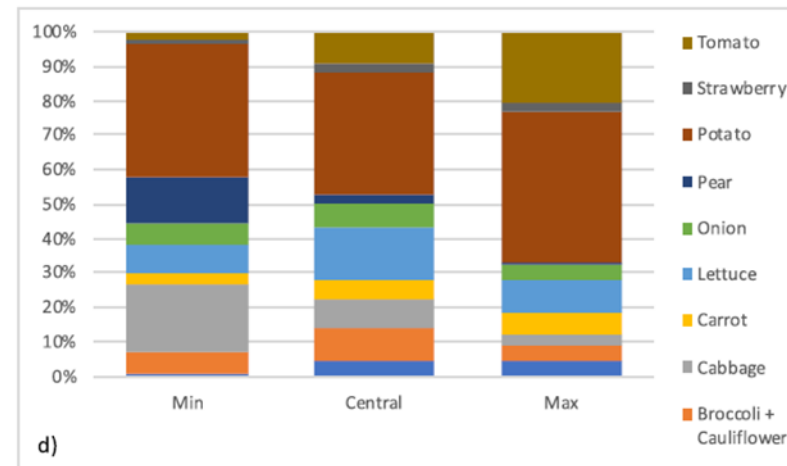
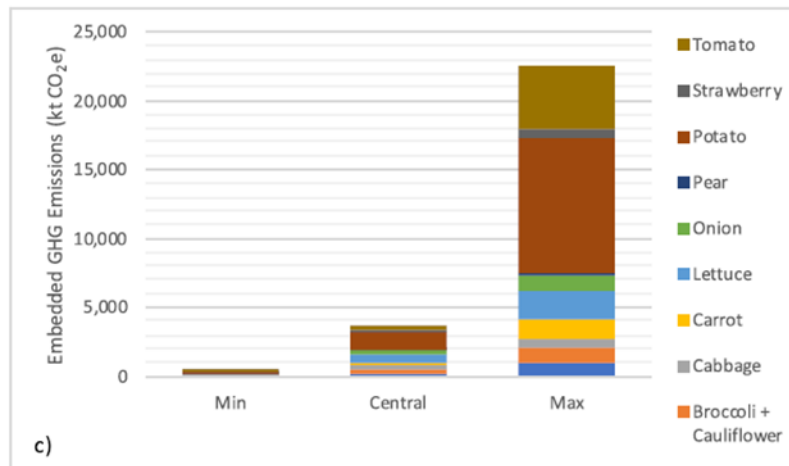


Source: AgroCycle D1.3 - Report on the holistic analysis of AWCB chains and logistics of AWCB valorisation systems

Embedded emissions in avoidable food waste

Emissions arise from;

- Application of fertilisers, creating direct emission of nitrous oxides from soil processes.
- Energy for planting, harvesting, transport.



- The later in the supply chain a product is wasted, the higher are its environmental impacts.



Bioeconomy activities in Ireland

National Bioeconomy Policy Statement – March 2018

Sustainable use of renewable biological resources



Decarbonisation / Changing Economic Model



Mitigation



Economic Opportunity / Rural Employment



A coordinated cross-sectoral approach will be required to make the transition to a low carbon and circular economy and society.



AgriChemWhey

An integrated biorefinery for the conversion of dairy by-products to high value bio-based chemicals.



AgriChemWhey

AgriChemWhey will build a first-of-a-kind, industrial-scale 25,000 tonnes (100% dry matter) biorefinery to valorise dairy processing by-products to several added value bio-based products for growing global markets, such as lactic acid (LA).

- Optimise and scale-up process biorefinery technologies
- Establish a new dairy processing by-products to high value-added products value chain
- Establish industrial symbiosis with local partners to valorise side streams arising from the biorefinery process
- Ensure techno-economic viability and successful long-term commercial operation of the biorefinery
- Develop a blueprint for replication of the AgriChemWhey model in other regions across Europe



AgriChemWhey



Agri Bio Circular Economy

Develop new sustainable value chains for the circular bioeconomy in Ireland by maximising value and minimising environmental impacts through cascading of biomass for production of biobased products and energy.

- ABC Economy will engage with key stakeholders through project partner, Cré, and project collaborators, Tipperary County Council and Monaghan County Council, to develop sustainable value chains based on the bioresources available in each region.
- Key stakeholders (primary producer, processors, waste management companies etc.) will be engaged throughout the project to identify important resources, constraints to valorisation, and potential opportunities.



Thank you for your attention.

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