

Department for the
Economy
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Draft

Circular Economy

Strategy for Northern Ireland

Annexes



ANNEX 1 - Northern Ireland’s legislative and policy landscape

Programme for Government¹

This **collaborative, cross-departmental** approach is fundamental to Circular Economy thinking. The Circular Economy Strategy is a key element in delivery of PfG outcomes, and the concept has been embedded within most emerging strategies.



Figure 1 Programme for Government Draft Outcomes Framework³¹

The Programme for Government includes the following three key outcomes:

- We live and work sustainably – protecting the environment.
- Our economy is globally competitive, regionally balanced and carbon-neutral.
- We have an equal and inclusive society where everyone is valued and treated with respect.



Climate Change Act

In February 2020 the Northern Ireland Executive declared a climate emergency² and in March 2022 passed the Climate Change Act³, which sets overarching targets for Northern Ireland of reducing GHG emissions to:

- 48% lower than the 1990 baseline by 2030
- net zero by 2050.

To achieve these goals, government has been tasked to develop sector-specific targets and climate action plans for a wide range of sectors:

- energy
- transport
- infrastructure
- business and industrial processes
- buildings
- waste management
- agriculture
- land use and forestry (LULUCF)
- fisheries
- financial assistance
- Public Sector/Departments leading by example.

Many other countries have considered circularity as a prerequisite to meeting net zero goals and tackling climate change and have therefore embedded it within their decarbonisation plans. We believe that embedding CE principles within our climate action plan, departmental plans and sectoral plans will greatly assist wider government in meeting its commitments.

The Investment Strategy for Northern Ireland⁴

The draft Investment Strategy for Northern Ireland (ISNI) lays out the framework to create a sustainable and resilient infrastructure and identifies priority areas for investment up to 2050. It is intended to assist government and our private sector partners to plan for the challenges of delivering Northern Ireland's largest-ever investment programme.

Objective One is 'to decarbonise our economy, assets and society', and the ambition to build a Circular Economy and use its principles are included.



Vision for a 10X Economy⁵

The Vision recognises that innovation and economic policy need to be combined to drive improved opportunities and wellbeing for all our people. Driving growth through innovation and converting this into economic gains can focus policy-makers and industry on the parts of the economy we want to make ten times better than they are today. Three public policy goals were identified for the vision, covering innovation led, inclusive and sustainable growth. It is intended to drive better social outcomes and promote opportunity for all.

The application of Circular Economy principles to deliver innovative approaches to resource management and supply chain redesign will provide Northern Ireland with many opportunities.

Skills and Supporting a Just Transition

DfE's Skills for a 10X Economy Report recognises that the skills of our workforce are critical in driving competitiveness, enabling growth and attracting investment. In the transition to a Circular Economy we need to protect working conditions and mitigate impacts on health, livelihoods, or job losses from restructuring. The Strategy sets a strategic framework for the development of our skills system to 2030 making 49 recommendations for various actions to be taken across government, business and wider society.

The Climate Change Act establishes the need to set up a Just Transition Commission that will be responsible for ensuring a just and fair transition to a low-carbon economy.

Green Growth⁶

The Green Growth Strategy is the Northern Ireland Executive's multi-decade strategy, balancing climate, environment and the economy. It sets out the long-term vision and a solid framework for tackling the climate crisis in the right way. The focus of Green Growth is ensuring that our natural assets can deliver their full economic potential on a sustainable basis. Our climate and environment affect all of us and we each need to take responsibility and consider how our individual actions impact the environment.

The strategy will be delivered through a Climate Action Plan that will provide an environment rich in biodiversity, more efficient use of resources, green jobs and opportunities.

Collaboration with the Green Growth Strategy is fundamental, given the overlap on data gathering, science-based evidence, creating a green public procurement policy and providing a just transition – all while pursuing economic growth and net zero carbon targets.



Energy

Energy accounts for almost 60% of our greenhouse gas emissions. The Energy Strategy⁷ sets out a pathway to 2030 that will mobilise the skills, technologies and behaviours needed to take us towards our vision of net zero carbon and affordable energy by 2050.

The strategy acknowledges that renewable energy sources and energy efficiency measures are only part of the solution, and that taking a whole-system approach to using less energy and utilising energy better will be essential. Under 'Do More with Less' the strategy seeks to reduce car travel, introduce minimum standards of energy efficiency with increased support for retrofitting and ensure new buildings are net zero ready by 2026/27.

The delivery of new technologies and systems to replace fossil fuels will benefit from the adoption of Circular Economy principles to consider the whole life cost at the outset.

Housing

Retrofitting existing homes (occupied and empty) will be central in helping to achieve an ambitious target of halving all carbon emissions by 2030. The Draft Housing Supply Strategy⁸ recognises the need to take a whole system approach, to work collaboratively to address current challenges. It includes measures to increase housing quality and supply, commitments on inclusivity and whole life costing to reduce emissions of existing and new homes. Government has committed to taking a place-based approach to provide well designed housing in locations that enable greater sustainability.

The initiatives to be delivered by the Housing Supply Strategy will benefit from the adoption of Circular Economy principles in design and delivery. Ultimately these will improve the quantity and quality of affordable housing and extend the lifetime of Northern Ireland's housing stock.

Environment, Agriculture and Food

The draft environment strategy for Northern Ireland⁹ is based on six key Strategic Environmental Outcomes. Two of these relate directly to the Circular Economy:

- **Outcome 4: Sustainable production and consumption.** This involves ensuring the production and use of products and services in a manner that is environmentally friendly, socially acceptable and economically viable over their whole life cycles.
- **Outcome 5: Zero Waste and a highly developed Circular Economy.** DAERA recognises that CE is a cross-departmental theme and encourages broad collaboration to raise awareness.



In the draft Food Strategy¹⁰ there is an aspiration that Northern Ireland will become a low-carbon society where natural resources deployed in food production are responsibly managed and associated environmental costs/benefits are appropriately valued and reflected across the food supply chain.

There is a clear ambition to embrace Circular Economy principles of nature-friendly farming practices, opportunities to create profitable and shorter supply chains, minimise food waste and redistribute surplus food.

The independent Strategic review of the Northern Ireland Agri-Food sector¹¹ also recognises the need for a “joined-up ‘Circular Economy’ which takes Northern Ireland’s nutrient surplus and repurposes it to decarbonise energy supply, replace imported fertiliser, peat compost and more”.

Bioeconomy

To build a future-proof agri-food sector, a circular approach has the potential to support jobs in rural communities and grow the economy, while also meeting targets of reduced carbon emissions and increasing sustainability. Innovative practices are leading to great advances in bioprocessing and bio-refining, which can replace high-carbon embedded products, such as concrete and plastics, with bio-based alternatives.

We have two policies that specifically support growth of a bioeconomy: DAERA’s Innovation Strategy¹² and DAERA’s Science Strategy¹³. The delivery of these strategies creates considerable opportunity to align priorities with other key stakeholders including AFBI, and embrace this emerging sector.

City and Growth Deals

Accelerating delivery of Northern Ireland’s four regional City and Growth Deals¹⁴ is a top priority for DfE and the Executive. There is over £1.2 billion to be spent across the City and Growth Deal projects that will catalyse growth in delivering the 10X Economy vision and ambition. These deals are centred on four pillars:

- innovation and digital
- tourism and regeneration
- infrastructure
- employability and skills

There is an opportunity for delivery of exemplar CE projects as part of the Deals. This would be achieved through aligning the funding programme and revamping existing procurement schemes to include CE principles and whole-life costing at the tendering stage.



Derry City and Strabane District Council is already incorporating Circular Economy principles within its business case proposals for City and Growth Deal funding.

Procurement

In Northern Ireland, public sector procurement has buying power in excess of £3 billion per annum. This represents a strong potential to shape markets and behaviours. Government can incentivise the uptake of circular products on the market by committing to spend a percentage of the procurement budget on those that embody circular design, contain recycled or bio-based content, are renewable or can be purchased as a service. To procure in a circular way involves looking beyond short-term needs and considering the longer-term impacts of each purchase. This includes questioning whether a purchase needs to be made at all.

The Green Growth Strategy also recognises the role of procurement and includes a commitment to develop a green public procurement programme.

At a local level, Belfast City Council, has committed to doing business with suppliers who place greater value on people, environment and ethical areas within their businesses.



ANNEX 2 - Jobs and Skills

The transition to a Circular Economy will impact employment. While some jobs will disappear or change, new 'circular' jobs will emerge. Certain combinations of skills will become more important, and workers and employers will be required to retrain and develop new skills to adapt to changing environments.

Just as highly skilled work in the design and engineering of new solutions is required, the Circular Economy requires manual and practical labour, and therefore has the potential to create opportunities for all types of workers.

As part of 10X Economy and our Skills for 10X we have an opportunity to rethink our approach to the workplace that could improve the quality of work, promote inclusive workplaces and provide workers with continuous learning and upskilling so that they can adapt to the changing demands that come with innovation and new business models.

Growing New Skills

We will need to embed Circular Economy in our entire education system. For example, Further Education colleges and Higher Education Institutions will play a crucial role in providing the skills and delivering traineeships, apprenticeships and sector partnerships to drive changes through revised industry standards and qualification requirements.

In future, the principles of a Circular Economy (materials, remanufacturing, eco-design, recyclability, and practices that extend product lifetimes) will need to be integrated into all our lives, but especially in design, engineering, construction, industrial processes, and customer service.

Unless anticipated and resourced, skills shortages could derail long-term goals for circularity and jobs growth.



The following tables provides some findings from the Circularity Gap Report and our own research of how the Circular Economy could impact jobs and skills within the focus business sectors.

Table 1: Advanced Manufacturing	
Jobs and Skills	Pathways
Increased demand for test engineers, repair technicians and demand planners to oversee product development and supply chains.	Transform existing skills of product designers and development engineers to embrace CE, including design for disassembly, reuse or repair.
Increase industrial symbiosis facilitators, materials and research analysts.	Widen and diversify the pool of labour to include younger people and more females.
Support lean manufacturing to reduce material use and increase resource efficiency.	Develop mentoring programmes to engage and upskill workers, e.g., through use of voluntary charters.
Grow after-sales activities including financing, monitoring and repair services as CE business models are adopted.	Increase training in smart design, predictive maintenance, reuse of parts at end-of-life treatment.
Increase reprocessing capacity alongside an increase in the quantity and quality of recycle.	Increase expertise in creating innovative materials, technology and recycling equipment.
Expertise in utilising bio-based materials and other secondary materials in design and manufacturing.	



Table 2: Construction and Built Environment	
Jobs and Skills	Pathways
Secure the skills needed to retrofit and future-proof existing building stock.	Further and higher education providers are engaged in developing trade, profession-specific and digital skills needed to transition this sector.
Develop skills to decarbonise the domestic heating system with heat pumps or alternative energy sources.	Universities develop higher-level skills in science-based innovation.
Increased demand for skilled tradespeople to install insulation, repair leaks and install draught proofing.	The private sector is also engaged with education providers to ensure specific technologies and techniques are being taught.
Demand will increase for installers, maintenance technicians, construction managers and those adopting quality controllers.	Effort is needed to build knowledge and capacity with regards to embedding CE principles of reuse and refurbishment both in relation to the built form and the materials being used.
To support closed-loop cycling of materials, to divert materials from landfill, jobs will be created in sourcing, sorting, testing and supply of high-quality secondary materials and the means to distribute them.	There is a need to increase knowledge across trades and professions in order to increase the practice of retrofitting.
Digital skills in data analysis, project management, BIM and CAD technologies will increasingly be needed to enable higher-value reuse of materials.	There is a need to share understanding between design and practice for construction.
	Employers must upskill existing workers to promote lifelong learning and overcome skills shortages.



Table 3: Bioeconomy	
Jobs and Skills	Pathways
<p>Increased demand for agronomists and animal nutritionists and advisors on animal feed quality.</p> <p>Interpersonal skills will be crucial to engage with those in the sector.</p> <p>Opportunities could be created in biorefineries and anaerobic digestion with a range of occupations including process operators, bio-technicians, researchers and chemical engineers.</p> <p>Opportunities could increase for biodiversity experts through hedgerow management, woodland planting and restoration, rewetting boglands and peatlands.</p>	<p>The value of sustainability must be taught at all levels within agri-food chains.</p> <p>Educators in this space (CAFRE, AFBI) must review the type of skills being developed to meet future needs.</p> <p>Farming business groups need to become disseminators of new knowledge and learning.</p> <p>Traditional pathways within agri-food and business management can be combined with emerging areas such as data analytics – facilitated through platforms or forums to share understanding, data and expertise to develop digital skills and specialist advisors.</p> <p>Develop work-based and vocational pathways for technicians and operators.</p> <p>Support and facilitate collaboration across biology, chemistry, engineering and other disciplines to develop, scale and commercialise novel products and processes.</p>



Table 4: Tourism	
Jobs and Skills	Pathways
Digital skills as online offering for travel becomes more prevalent.	Further and higher education providers are engaged in developing trade, profession-specific and digital skills needed to transition this sector.
Circular procurement to extend and optimise material and asset use and reduce waste (non-toxic, designed for maintenance, reuse, etc).	Universities develop higher-level skills in sustainable travel and tourism.
Marketing professionals who can differentiate and position businesses to take advantage of new business models.	Education providers to ensure specific technologies and techniques are being taught – raise general awareness of impacts of tourism.
Asset sharing and products as a service business.	Effort is needed to build knowledge and capacity with regards to embedding CE principles of reuse and refurbishment for capital assets.
Mobility as a service.	Employers must upskill existing workers to promote lifelong learning and overcome skills shortages.
Regulator roles around climate and environmental protection.	
Transport solutions – electrification/non-fossil fuel.	



Just Transition for jobs

The Just Transition Commission, due to be established by way of the Climate Change Act, will become responsible for protecting people against worsening working conditions, health impacts, reduced livelihoods and job losses caused by the need to reduce carbon emissions. As part of this work, we will identify potential winners and losers through hands-on 'road mapping' to shape effective mechanisms and partnerships nationally and internationally. And we need to do this now rather than waiting for 'at risk' sectors to be negatively affected by market and regulatory changes.



ANNEX 3 - Focus Areas

As discussed in the main report, we identified four **sectors** and four **material flows** that need to be targeted with CE policy interventions. We also explained why we have not considered others in more detail at this stage.

Sectors	Material Flows
Construction and Built Environment	Food
Advanced Manufacturing	Textiles
Bioeconomy	Electricals
Tourism and Hospitality	Packaging

Opportunities to increase Circularity

Our Circular Economy Coalition was asked to highlight opportunities to increase circularity within each focus area. These opportunities are presented at the end of each section to highlight the current level of ambition and provide a glimpse of what circularity **could look like** in those sectors/material flows. However, given the early stage we are at on the Circular Economy journey, we have focused on high-level proposals for circular systems change which would be necessary to enable many of those identified opportunities.

Sectors

Construction and Built Environment

The Construction and Built Environment sector consumes about 50% of global raw materials, uses 36% of global energy and is responsible for a third of the waste generated in the EU¹⁵.

Though the sector is the largest generator of waste, it is one of the few recovering and recycling significant volumes of waste. Construction, Demolition and Excavation waste makes up the bulk of our 7.9% circularity metric.

Given the scale of this sector's material footprint and waste, it offers immense potential to implement greater circularity. A report from the EMF advises that **38%** of global emissions could be reduced if CE principles were applied to construction¹⁶.



To transform the sector:

- we must advocate rethinking of resource use, making retention, reuse and retrofit of our buildings the norm
- use more efficient, and less emissions-intensive materials and processes
- project managers must first consider using existing building stock before taking forward a proposal to build new
- we need to increase the provision, quality and accessibility of secondary and regenerative materials.

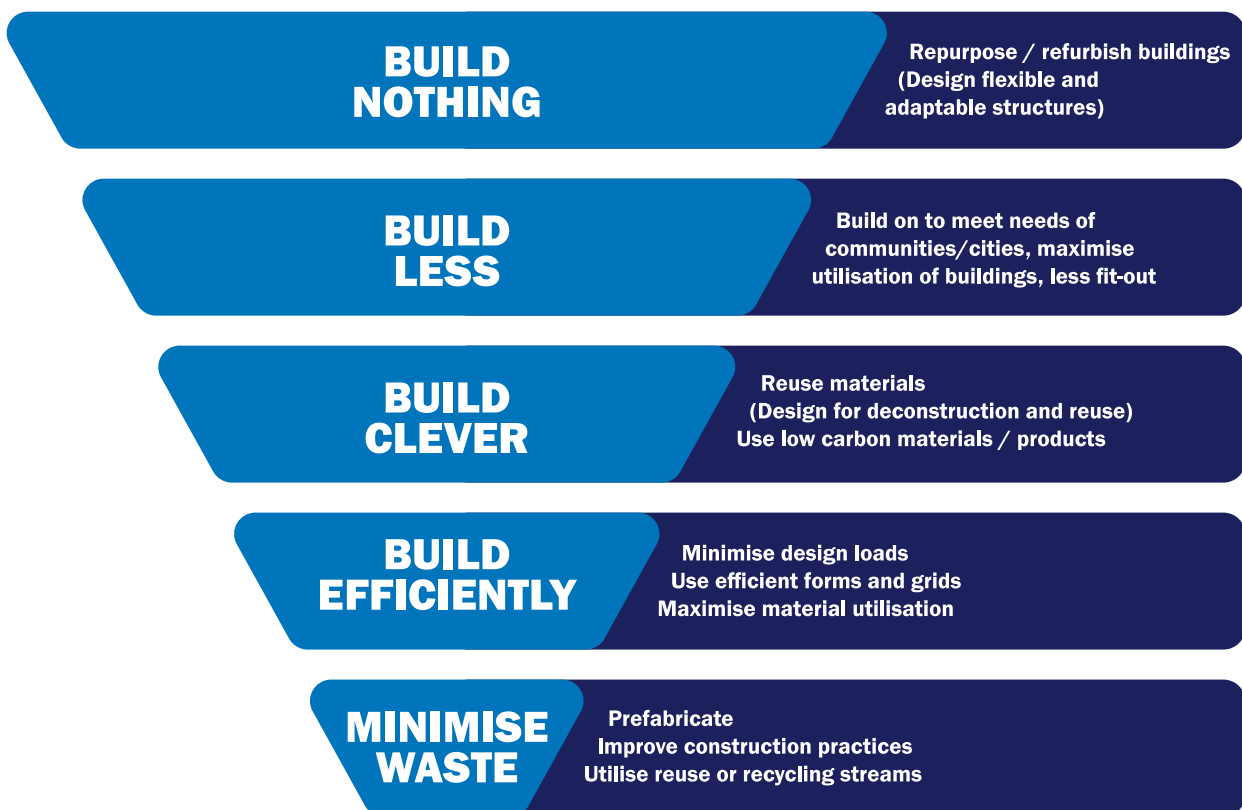


Figure 2 Embodied carbon reduction strategy

Figure 2¹⁷ shows the hierarchy of reducing carbon. Refurbishment including retrofitting and future-proofing buildings comes ahead of repurposing, followed by deconstruction or disassembly, then remanufacturing and recycling. The hierarchy also recognises the role of biogenic, regenerative and renewable resources/materials over use of finite virgin materials.



A complete step-change

Transforming this sector will require considering the full life-cycle of projects. To help in this, the Construction Innovation Hub has developed a Value Toolkit¹⁸. This defines value, *taking into account and measuring the benefits to people, the environment, society and the physical goods produced*.

The Social Value¹⁹ Unit in Northern Ireland has pioneered this to some extent by introducing the need for contractors to add social value in the delivery of capital projects, through employment opportunities to disadvantaged groups.

The planning system will also be an important instrument to bring about circular change within this sector.

CASE STUDY

Circular Economy in London

The Mayor of London introduced the need for CE statements to be submitted on major planning applications to demonstrate how CE principles had been considered in the design of the development.²⁰

Greater London is also setting up Circularity Hubs, where materials from dismantled buildings can be sent for reuse or transformation and refurbishment.²¹ This is one example of circularity being deployed in the sector, and there are many more across Europe as a result of the Horizon 2020 Circular Construction in Regenerative Cities (CIRCult) project.²²

Derry City and Strabane District Council has recently committed to incorporating sustainability criteria into the Council's planning processes and Council-led construction projects – a positive step in raising demand for more circular practices.



Table 6 provides a summary of the opportunities identified by the Circular Economy Coalition to increase circularity in this sector. We have presented these under the three Circular Economy principles.

Table 6: Circular Opportunities for Construction and the Built Environment		
Design out waste	Keep stuff in use	Regenerate natural systems
Extend the investment horizon to 100 years.	Roll out a nationwide programme of retrofitting, starting with empty homes.	Provide incentives to support car-free developments.
Planning policy to favour retention – circularity recognised as a material consideration.	Procurement criteria to include green credentials and whole-life costing.	Provide grants to plant trees and improve green spaces.
Building regulations that consider embodied carbon and whole-life performance.	Embodied carbon to be assessed and reported in a standardised industry approved format.	Increase biodiversity with the delivery of green and blue infrastructure.
Regulate and measure Construction & Demolition Waste with targets.	Pre-demolition surveys to become compulsory to identify value in materials.	Incentivise nature-based solutions on developments e.g., Sustainable Urban Drainage Systems (SUDS).
Refurb is VAT-free and New Build pays 20% VAT.	Develop markets for secondary materials with quality control and assurance.	Promote use of natural materials and develop markets for bio-based materials.
Support greater innovation in material design and optimisation.	Support material sharing (online platforms and regional material hubs).	Invest in research and development to bring regenerative materials to the marketplace.
Guidance and training to inform design and material choices.	Invest in skills development in repair, retrofit and disassembly.	Promote ‘Grow your Own’ community gardens within schemes.
Design for adaptability, deconstruction and repurposing of materials.	Capture data on materials to inform future maintenance and reuse through mandatory use of Building Information Modelling & Material passports.	Circular construction awareness campaign.
Promote sustainably sourced materials – preferably local and standard sizes.	Bring forward planning legislation that means permission must be sought before demolition can take place.	



To make progress in this sector:

- Government could bring forward a strategic programme – including subsidies and incentives – to retrofit buildings, including existing empty homes, commercial buildings, and derelict sites.
- The sector would also need to be incentivised to invest in electric or low-carbon-fuelled machinery to reduce its carbon footprint.
- Stakeholder engagement will be crucial to make the secondary building materials market competitive, and will require collaboration across the entire value chain from architects, manufacturers, designers and regulators to contractors.

Advanced Manufacturing

Advanced manufacturing is a fast-growing sector, and its technologies are crucial to increasing circularity. These technologies include Artificial Intelligence (AI), big data analytics, cloud computing, internet of things and 3D printing.

We have recognised the importance of this sector and as part of the Vision for a 10X economy, the Makers Alliance was established in 2021. This is an independent industry-led body with a mandate to drive the sector forward. Growth in this area is vital for our economy and according to Invest Northern Ireland, recent employment in overall manufacturing in Northern Ireland has grown more than four times faster than the rest of the UK and now accounts for over 15% of GVA²³.

The sector in Northern Ireland has particular strengths in plastics and polymer research, composite design and manufacturing, precision manufacturing, materials handling, electronics and off-site construction.

We support several centres of excellence that are leading research and development into technological solutions to unlock greater growth, including the planned national Advanced Manufacturing Innovation Centre (AMIC). It will be created as part of the Belfast Region City Deal to provide SMEs with access to the latest technologies and expertise in design and simulation. It will draw upon digital and data capabilities of the Global Innovation Institute (GII) to deliver the facility. GI is another arm of the Innovation and Digital Pillar of the £1bn Belfast Region City Deal, providing a cross-disciplinary digital innovation hub led by Queen's University.

Finance will be essential for business, to help share risk and investment costs associated with adopting CE business models e.g., installing more resource efficient machinery, rethinking logistics and distribution. Invest Northern Ireland, The Matrix Panel, International Synergies (IS) and others are all currently providing specialised support for embryonic CE projects.



Adoption of industrial symbiosis, which is the process by which wastes, or by-products of an industry or industrial process become the raw materials for another, could allow companies to become more competitive and improve material resource productivity and efficiency, while minimising the level of waste generated. Business will need to share knowledge, infrastructure and utilities to grow in the future and this provides one method of doing that.

Table 7 provides a summary of the opportunities identified by the Circular Economy Coalition to increase circularity in this sector.

Table 7: Circular Opportunities for Advanced Manufacturing

- Support industry to scale up established CE business models which build sustainability into design, improve material efficiency, utilise secondary materials and reduce waste.
- Generate R&D through challenge funds, engaging universities and innovation centres.
- Run competitions to stimulate discussion and action in relation to behavioural change and technological innovation.
- Incentivise entrepreneurs and start-ups in this sector to embrace CE business models.
- Work with existing manufacturing networks to promote CE and seek to make circular practices the norm.
- Ensure corporate tax benefits are linked to environmental performance.
- Update the waste regulatory framework to enable and unlock opportunities for reuse, repurposing and reprocessing.
- Create policy and regulations linked to the waste hierarchy that will maintain and optimise the value of materials by refocusing activities towards prevention, reduction and reuse as opposed to end-of-pipe waste management.
- Build in circular targets regarding resource use when developing sector-based climate action plans.
- Provide a robust measuring framework and reporting system to assess performance at a sector-wide level and for individual businesses.



Bioeconomy

The bioeconomy comprises those parts of the economy that use renewable biological resources from the land, sea and forest (referred to as feedstocks) in order to produce food, feed, products and energy. These sources of feedstock are referred to collectively as biomass.

Figure 3²⁴ below presents an overview of biomass sources at a global level and how they can be utilised to create a variety of products.

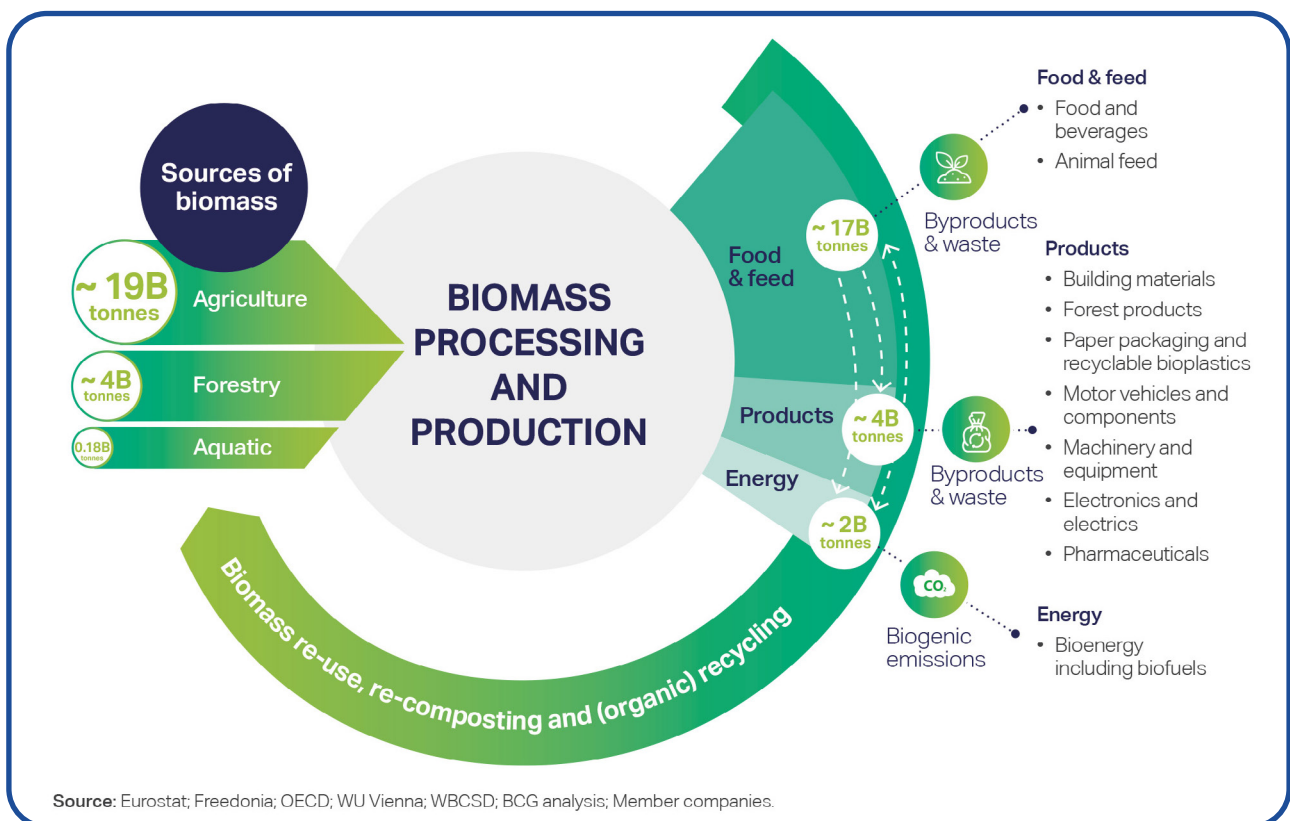


Figure 3: Biomass contributing to the Circular Economy

With an annual turnover of around €2 trillion and employing some 22 million people, the bioeconomy is one of the EU’s biggest and most important sectors, encompassing agriculture, forestry, fisheries, food and chemicals.

The Republic of Ireland has a national policy statement on the bioeconomy and recognises it as a crucial sector for decarbonisation, sustainability and circularity. We recognise that intensive farming is unsustainable due to GHG emissions and the excess nutrients (phosphorus and ammonia) produced by the sector. Emerging technologies such as biotechnology, precision farming and eco-agriculture offer potential solutions to increase productivity without causing environmental damage. Cascading, valorising and utilising residues on farms could help address some of the current challenges.



Nutrient cascading chains could be developed for products with high-carbon sequestration potential that are in abundance locally. This approach positions energy recovery as the last option because value is lost in the process. Value hierarchies and cascading principles need to be incentivised to ensure residues from agriculture, food and forestry are valorised at the highest level possible.

We need to be maximising resource efficiencies by using biomass in products that create the most economic value over multiple lifetimes.

- With a focus on nutrient recovery, there is an excellent opportunity for Northern Ireland to become an exporter of bio-based fertilisers.
- Another idea put forward by the Circularity Gap Report is the opportunity to diversify crop production. It recommends exploration of options to produce bio-based materials and composites that could support decarbonisation of other sectors – for example hemp, which was used to create hempcrete for application in the Rediscovery Centre, Dublin.

The Circularity Gap Report suggests setting mandatory targets for the recovery of nutrients from slurries, manures and sludges – as a means of signaling to the private sector the need for investment in resource-efficient processes.

Given its early stage, focus for the bioeconomy is on positioning businesses, including micro-enterprises, SMEs and large firms, to realise the potential opportunities as global progress gathers pace. Growth of the sector will require lead innovators to transform value chains, which is very capital-intensive, high-risk and will only happen in an innovative environment that can support those businesses to progress from research to market.

Table 8 provides a summary of the opportunities identified by the Circular Economy Coalition and our own research to increase circularity in this sector.


Table 8: Circular Opportunities for Bioeconomy

- Improve valorisation pathways for organic by-products and waste by reviewing waste regulations and definitions. Support the development of sustainable biofuels and bioenergy.
- Consider introducing targets to reduce the use of chemical products within the agri-food sector.
- Facilitate innovation in bio-refineries to create high-value materials and chemicals, e.g. bioplastics, pharmaceuticals, nutraceuticals.
- Develop a national approach to nutrient management.
- Increase regenerative agriculture: biomass crops, water cycling, carbon sequestration, biodiversity improvements with adequate incentives to farmers.
- Foster open dialogue with the farming community to explore what is achievable in the short, medium and long term.
- Explore opportunities to produce yields of bio-based materials that would reduce the demand for virgin materials from other sectors, namely construction.

Tourism and Hospitality

This is a broad, collective industry ranging from food and drink services, restaurants and bars to accommodation providers, entertainment activities, events, travel agencies and tourist attractions.

Its extensive reach could be utilised to lead behavioural change and given the impact of Covid-19, now is the time to rethink business models and consider the impact of operations.

Given the complexity of this sector, there is no single measure on how it performs. To date we have measured the number of overnight stays and the associated expenditure as a gauge of performance. But this approach does not indicate the scale of demand on resources. Moreover, the sustainability of the sector is not currently assessed and stakeholders acknowledge a lack of understanding in relation to Circular Economy and its opportunities.

CASE STUDY

Tourism Northern Ireland

Tourism Northern Ireland (TNI) has developed a sustainability toolkit²⁵ to support the sector. It provides advice on how businesses can audit themselves, including how to calculate their carbon footprint. It offers suggestions of how to adopt 'greener' practices including reducing waste, providing refill stations, supporting reuse of assets and minimising their impact on the environment.



The Circularity Gap Report recommends a clear strategic vision for the sector, with targets in relation to reduction in emissions, resource use and waste generation.

It would make sense to include such considerations within the Sustainable Regenerative Tourism Strategy that TNI has committed to deliver. Significant investment would be required to train, equip and support the sector in adopting new ways of working and being measured. Investment in alternative transport solutions will be needed to reduce air travel, increasing sustainability of sea travel and improve public transport at a local level.

The sector should prioritise the following steps:

- Reframe how people think of destinations and hospitality ecosystems.
- Protect and optimise the natural environment for the long-term.
- Instil zero food-waste messages through tourism and hospitality courses.
- Provide dedicated training on sustainability and circularity of resources within the sector.

DAERA has sought to support sustainable tourism through its Rural Tourism Collaborative Experiences Programme. This scheme brings together a cluster of rural businesses and partners to develop an end-to-end visitor experience and encouraging visitors to stay longer in the area.

Within hospitality, businesses must be supported and rewarded for implementing CE business models, for example:

- replace single-use items (napkins, tablecloths, hand towels) with reusable items, ideally made from secondary materials
- utilise fully reusable containers, bottles and glasses
- procurement of good quality second-hand and remanufactured hotel accommodation products
- switch purchasing models to leasing and use-based service models that incorporate extended life practices such as repair services.

Table 9 provides a summary of the opportunities identified by the Circular Economy Coalition and our own research to increase circularity in this sector.

**Table 9: Circular Opportunities for Tourism**

- Build awareness of Circular Economy thinking to all actors in the sector.
- Invest in research to demonstrate the economic, societal and environmental benefits of circular, regenerative tourism ecosystems.
- Include circular considerations (resource use and material choice) and targets within a Northern Ireland Tourism Strategy.
- Support businesses wanting to adopt Circular Economy principles, e.g., via a toolkit or masterclass in sustainable tourism.
- Use the sector as a test-bed for behavioural change campaigns (people are more likely to try something new when on vacation).
- Provide training opportunities to build knowledge and capacity.
- Facilitate tourism collaborations and cross-industry coalitions to explore circular business models and transition pathways.
- Recognise and integrate circular tourism as an economic lever in all national strategies.

Material Flows

This section considers four material flows that play an essential part of our everyday lives. Each one examines the role of producers and consumers, the current challenges it presents as well as the opportunities and behavioural changes necessary to increase circularity.

Food

Globally, 25–30% of total food produced is lost or wasted, and food waste is estimated by the Intergovernmental Panel on Climate Change to contribute 8–10% of total man-made greenhouse gas (GHG) emissions.²⁶

Production and Distribution

EY undertook an economic impact assessment²⁷ of the agri-food sector in Northern Ireland and calculated that it employed 113,000 people and generated £4.9bn GVA (direct, indirect and induced). Agri-food also contributes to nearly one-fifth of the country's total material consumption, as calculated in the Circularity Gap Report, while agriculture alone was responsible for 27% of total GHG emissions in 2020.²⁸ Over 70% of land in Northern Ireland is used for farming and the sector provides the second-largest goods exported, with 77% of produce being sent elsewhere, including 50% to GB.

The high emissions associated with agriculture in Northern Ireland relate to the type of farming carried out here, which is predominantly (c. 80%) farms producing cattle and sheep. Only 5% is used to grow crops, which are largely used as animal feed (cereals). To sustain this level of livestock production, the industry heavily depends on the import of animal feed. Livestock farming has been cited as being a cause of water pollution (one-third of water pollution



incidents in 2018), as well as causing air pollution and leading to biodiversity loss.

Improving productivity and reducing environmental harm will be key to securing the industry's long-term viability.

Solutions for greater circularity:

1. Investment in AI, precision agriculture, digital technology including blockchain and data gathering will all be necessary.
2. Stakeholders need to understand the benefits of data, technology and innovation to support more sustainable farming practices.
3. Regenerative agriculture must also be promoted to optimise yields, reduce waste, enable monitoring, forecasting and minimise environmental harm.
4. Current subsidies for carbon sequestration, restoring peatlands and planting trees must be scaled up.

DAERA recognises the need for change and is taking a whole-system approach in its delivery of the food strategy and the agriculture policy framework.

Food Consumption and Waste

Food retailers and hospitality providers must be operating in compliance with the Food Waste Regulations in place since 2015. Theoretically these deter food waste from such businesses, but they are difficult to enforce across such a large number of businesses.

In recent years DAERA has considered extending the regulations to cover non-food businesses. Mandatory Food Waste Reporting may be considered in the future as a lever that could significantly cut food losses in the supply chain.

The Courtauld Commitment 2030 (previously known as Courtauld 2025) is another initiative to tackle food waste. It is a voluntary agreement, coordinated and promoted by WRAP, that takes a whole-system approach, aligned to the UN's Sustainable Development Goal (SDG) 12.3 target to halve food waste. It enables collaborative action across the entire UK food supply chain with the aim of:

- a 50% per capita reduction in food waste by 2030 versus a UK 2007 baseline
- a 50% absolute reduction in GHG emissions associated with food and drink consumed in the UK by 2030
- ensuring that 50% of fresh food in the UK is sourced from areas with sustainable water management by 2030.



Behavioural Change

WRAP advises that over 70% of the food waste in the UK is from households. Of that, some 4.5 million tonnes – valued at £14 billion – is still edible. In Northern Ireland too many residents are continuing to put food waste in the residual bin instead of the organic waste bin. Currently 25% of residual waste from households is food waste, which often ends up in landfill causing contamination and methane emissions.

Zero Waste Scotland advises that sending just 1kg of food waste to landfill produces the same emissions as landfilling 25,000 500ml plastic bottles.²⁹

- Food is thrown away when people buy too much and don't know what to do with it, or when the food has gone past its recommended '*best before date*', regardless of whether it is edible or not.
- Unhelpful labelling causes people to throw away perfectly good food. WRAP recommends that no more than one '*use by*' date label is placed on food, and only on food that is highly perishable and would cause danger to human health if consumed.
- WRAP recommends against using other '*best before*' dates and suggests that '*display until*' is coded by the retailer to avoid confusion for the customer.
- Any interventions in relation to food will need to recognise recent changes in consumer behaviour, including the rise of plant-based diets.

CASE STUDY

Between 2020–21 **FareShare**, a social enterprise in Northern Ireland, distributed 798 tonnes of surplus food from supermarkets to the most vulnerable in society, which is double that of the previous year.

WRAP leads a number of effective campaigns to tackle food waste such as 'Love Food – Hate Waste' that provides advice to households and Guardians for Grub, which aims to support the hospitality sector. It also provides support and advice to industry across the food supply chain as part of the Courtauld commitment 2030.



Table 10 provides a summary of the opportunities identified by the Circular Economy Coalition and our own research to increase circularity in this area.

Table 10: Circular Opportunities for Food
<ul style="list-style-type: none"> • Promote regenerative farming. • Fund and support innovation in the food supply chain. • Procure local suppliers through government contracts. • Review current food labelling regulations to reduce food waste. • Increase enforcement of the Food Waste Regulations and review Mandatory Food Waste Reporting to reduce food waste from businesses. • Engage with the hospitality sector to raise awareness of the economic and environmental cost of food waste. • Support retailers, distributors and hospitality providers in transitioning to models that will reduce food waste and increase circularity. • Support collaboration across the food supply chain and foster new relationships with the bioeconomy sector. • Support food redistribution schemes. • Ban biodegradable waste from landfill. • Deliver education and behavioural change campaigns on food use and waste prevention and promote proper disposal when all other options have been exhausted.

Textiles

Textiles is an umbrella term, encompassing all forms of clothing as well as other household-type textiles. However, for the purposes of this strategy, most of the messages relate to clothing, as it offers the greatest opportunity to influence behavioural change.

In recent years there has been a major shift in consumer behaviour as customers increasingly want to know where their clothing was manufactured, what it is made from, how the material was grown and who it was made by. A growing proportion of customers want to understand the environmental and human impact of their choices.

Textile Production

Textile production puts extreme pressure on virgin materials, in particular water use for the growing and colouring of fibres. WRAP's 2017 report 'Valuing our Clothes: the cost of UK fashion'³⁰ calculated that the total footprint of clothing in use in the UK, including global and territorial emissions, was 26.2 million tonnes CO₂e in 2016.

Much of the clothing we buy in the UK is produced elsewhere, offshoring its human and environmental cost. However, given we spent £57.3bn a year (2021)³¹ on clothing, we have a significant opportunity to influence the market with the choices we make.



Producers are being influenced by the implications of a future Extended Producer Responsibility (EPR) scheme for textiles, which will consider the impact of fast fashion and will support re-use and closed-loop recycling to reduce the environmental impacts of the industry.

Behavioural Change

Recent research³² from Keep Northern Ireland Beautiful has revealed that just 4% of local people recognise the production and consumption of clothing and textiles as harmful to our environment. The research also found that only 17% of shoppers normally buy second-hand clothing on a regular basis but over 60% said they would like to explore buying more preloved clothing rather than brand new.

The average UK household owns around £4,000 worth of clothes, around 30% of which have not been worn in the last year. This unused clothing is collectively valued at £30 billion.

Post-consumer textiles are discarded in a variety of ways, including household waste, direct to charity shops, textile banks, collection schemes and at Household Waste Recycling Centres.

In 2020/21 households in Northern Ireland disposed of 1,000 tonnes of textiles for recycling through Council collections and amenity sites. Councils also reported collecting 1,473 tonnes per year for reuse.

According to WRAP, the UK exports 60% of used textiles³³, valued at £4bn, making the UK the second-largest exporter in the world. There is a lack of data on where these textiles end up, although a proposed digital waste tracking system would increase transparency.



CASE STUDY

After launching in Australia, the **Good on You** app³⁴ attracted 10,000 users within 8 days, strongly signaling the demand for more brand information from customers. Since 2015 it has built a database of thousands of fashion brands and through the assessment process and rating system, it provides information to customers on the impact of each brand's operations taking into account people, planet and animals. It equips consumers to make sustainable choices.

What is being done?

Initiatives to tackle the vast quantities of waste textiles, include campaigns to help people rethink their purchases, considering the durability of clothing and the sustainability credentials of brands. There is also work being done to support UK-based producers, through collaborative programmes that enable innovation, research and development. Addressing the challenges caused by textile production and over-consumption requires a supply chain-wide effort.

Table 11 provides a summary of the opportunities identified by the Circular Economy Coalition and our own research to increase circularity in this area.

Table 11: Circular Opportunities for Textiles

- Improve collection methods for textiles and raise awareness to reduce the volume of used textiles in residual waste.
- Fund research and innovation to improve the sustainability of supply chains and encourage the take-up of more CE business models.
- Promote participation in the Textiles 2030 voluntary agreement led by WRAP,⁶² which sets targets to improve the supply chain and reduce the environmental impact of textiles.
- Find innovative solutions to track and trace materials.
- Communication campaigns to drive behavioural change, e.g., Love Your Clothes.
- Support the reuse and repair sector, including the development of skills in repair.
- Support research to assess feasibility of local reprocessing and closed loop recycling of textiles including the technology needs.
- Introduce more take-back infrastructure, including digital and physical platforms to expand the market for secondary textiles.
- Grow local manufacturing or remanufacturing of textiles.



CASE STUDY

Interface, Inc. has a manufacturing plant in Lurgan and it has been focused on using circular principles for many years. Through this it has succeeded in becoming the first global flooring manufacturer to sell all products as carbon-neutral across their full life cycle. Interface takes used carpet tiles and puts them to good use – by making sure they get reused by charities, local businesses and others who need support. Its products are designed to be fully recyclable, to make new carpet tiles for the future. Nothing goes to landfill.

Electricals and Electronic Equipment

Advances in Electricals and Electronic Equipment³⁵ (EEE) have enabled the UK to become a world leader in the development of semiconductors – the brains of modern electronics. One report³⁶ predicts that the global electrical equipment market will grow by nearly 8% between 2021-2027.

However, while the number of products available has grown, the level of collecting and recycling of these products has fallen. Every year an estimated two million tonnes of electrical items are discarded by householders and companies in the UK. WRAP estimates that 7% of these are re-used and around a third go to landfill.³⁷

According to the UN Global E-waste Monitor (July 2020), the UK generates the second-highest amount of E-waste per person in the world³⁸.

The components themselves, such as valuable rare earth metals and materials, are also problematic. The mining, crushing and grinding of these has caused significant biodiversity loss and water stress globally. Some of the materials – such as cobalt used in lithium batteries and indium used to make touchscreens and solar panels – would be classed as Critical Raw Materials. Other materials (such as arsenic, cadmium, lead and mercury) are hazardous, difficult to process and must be handled very carefully.

The methods of managing E-waste can range from large-scale shredding technologies to smaller scale, manual or automated disassembly processes.

The Circularity Gap Report advises that there is a lack of adequate infrastructure and technologies in the UK to repair or recover the critical materials from these devices. It identifies this as an opportunity if suitable investment was made available. Given the level of investment required and the scale of material needed to ‘feed’ these facilities, planning for such needs to be done on a UK-wide and all-island basis.



Circular Electronics Initiative

The European Commission is developing a 'Circular Electronics Initiative'³⁹, which will complement the sustainable products policy framework. It will include:

- regulatory measures for electronics and ICT, including mobile phones, tablets and laptops to ensure products are designed for energy efficiency and durability, repairability, upgradability, maintenance, reuse and recycling
- a right to repair for electrical devices
- regulations requiring use of a common charger to reduce waste
- improved collection and treatment of waste electrical and electronic equipment by exploring an EU-wide take-back scheme
- review of EU rules on restrictions of hazardous substances in electrical and electronic equipment.

In 2021, the EU also introduced new rules obliging manufacturers of electrical goods such as fridges and televisions to make their products repairable for at least 10 years, requiring them to provide repair manuals and make parts available.

Locally, the statutory framework that covers this material is the Waste Electrical and Electronic Equipment Regulations (WEEE) 2013 (updated in 2018). The WEEE Regulations stipulate that 65% of the weight of EEE placed on the market for sale must be collected each year for reuse or recycling. To comply, producers often pay, according to their market share, into a Producer Compliance Scheme (PCS), which takes on responsibility for complying and meeting targets. The PCS then enters a contract with local Councils to collect the WEEE, mainly through Council Household Waste Recycling Centres (HWRCs).

In Northern Ireland, we have seven Approved Authorised Treatment Facilities (AATFs) and two Approved Exporters (AEs). Enva operates one of these facilities and processes 75% of the discarded fridges in Northern Ireland. It is in the process of developing a new facility to specifically deal with small electrical domestic appliances.

Companies who do not meet their annual WEEE collection targets can pay a compliance fee. This mechanism allows Producer Compliance Schemes to achieve compliance even if collection targets are not met. It also means there is little incentive to design out waste, address built-in obsolescence or switch to CE business models e.g. products as a service.



Behavioural Change

As consumers we all have a role to play in cutting E-waste, by thinking differently about our purchases and exploring if there are opportunities to hire or borrow products instead of owning them. We need to embrace the idea of ‘product stewardship’ rather than ownership and seek to extend the lifetime of the products we use, with a view to passing them on in usable condition.

Finally, when a product is at the end of its life, we must ensure it is properly disposed of to maximise the value of its components and materials and reduce E-waste being sent to landfill or incineration.

Table 12 provides a summary of the opportunities identified by the Circular Economy Coalition and our own research to increase circularity in this area.

Table 12: Circular Opportunities for Electronics and Electricals

- Increase awareness and education on the impact of E-waste to bring about behavioural change.
- Promote and incentivise CE business models where products are shared, leased and can be taken back.
- Introduce an Extended Producer Responsibility scheme for EEE that evokes change in the production process and supply chain.
- Introduce stricter eco-design criteria, right to repair legislation and end-of-life regulations to support development of new business models.
- Support the Repair and Reuse sector through funding and skills development.
- Introduce tax reductions for labour in the reuse, repair and remanufacturing sector to help mainstream these activities in the medium term.
- Introduce warranties, guarantees or a quality mark system to increase attractiveness of second-hand goods.
- Promote ‘design out waste’ and ‘reduce obsolescence’ of electrical and electronic equipment with producers to increase the reparability of equipment.
- Research and development to reduce the amount of Critical Raw Materials used within Electrical and Electronic Equipment.
- Improve the collection options available for WEEE to improve the quality of the appliances collected.
- Consider a ban on export of WEEE to encourage home-grown dismantling and separation of components.
- Invest in the development of facilities to extract critical raw materials closer to home.



Packaging

A 2017 study undertaken by WRAP found that over 40% of the material put in the residual bin by householders contained packaging material, and 85% of material in the recycling bin contained packaging material. This demonstrates the scale of packaging material in the system – but also highlights the lack of awareness as people are placing material that can be recycled in the wrong bin. If it goes in the residual bin, it is more likely to end up in landfill or incineration.

Production of Packaging

Packaging can be made from a variety of materials including metal, aluminium, glass, paper, card and plastic. New packaging solutions are presently coming to market to increase use of reusable packaging, recycled content in packaging as well as using biodegradable or compostable forms of packaging.

Levers for Change

To increase recycling rates for packaging, the EC directed all EU countries to establish Producer Responsibility Schemes by 2024.⁴⁰ Post-Brexit, these schemes have been transposed into UK law and compliance is being taken forward centrally in partnership with the devolved administrations. The Directive sets out the following targets in relation to the recycling of packaging materials.

	Current targets (%)	By 2025 (%)	By 2030 (%)
All packaging	55	65	70
Plastic	25	50	55
Wood	15	25	30
Ferrous metals	50 (incl. Al)	70	80
Aluminium	-	50	60
Glass	60	70	75
Paper and cardboard	60	75	85

Local councils currently carry the cost of collecting, sorting and treating packaging materials through their waste management responsibilities – which is often the costliest service they provide. While there is value in some of the material collected, and income is generated through selling it to recycling or reprocessing companies, the current revenue is much less than the cost of managing the material.

While producers contribute to these costs through the existing producer responsibility schemes, the contributions are insufficient to cover costs and the value of the material is lost.



A new UK Extended Producer Responsibility (EPR) scheme will be introduced in 2024 and will pass back the costs for dealing with waste packaging materials to producers. This will in turn incentivise changes from design to production, increasing the uptake of reuse and refill business models. The fees will also go towards growing reprocessing capacity to deal with recyclable material and developing solutions to deal with non-recyclable material.

The UK government is also working towards a Deposit Return Scheme (DRS) for drinks containers to increase the circulation of the materials used. The DRS will likely force an increase in the sales price, to cover a deposit which would be recouped when the customer returns the container.

Local Reprocessing

Northern Ireland has several companies reprocessing packaging materials including plastic, glass, paper and card. These material flows, along with garden waste and food waste, account for nearly 80% of the recyclable waste collected by Councils.

Reprocessing is a vital means of keeping materials in use, and while some value may be lost in the processing, it is still preferable to landfill, recovery or exporting the waste elsewhere. Invest Northern Ireland has set up a network of these reprocessors to support indigenous companies to grow, recognising the economic opportunity it presents and the crucial role it plays in shortening and securing crucial supply chains as part of a local Circular Economy.

Many reprocessing companies are importing recyclate materials to feed business processes because the local supply is not of sufficient quality. At the same time, Councils, through waste management companies, are exporting recyclate materials overseas for onward processing – so the value of these materials is lost domestically.

The latest report from the Circular Economy Collaborative Network, funded by Invest Northern Ireland, highlights the opportunity and growing need for an expanded reprocessing sector in Northern Ireland, in terms of capability and capacity. To make this happen the report recommends enhanced collaboration and transparency across the supply chain and establishment of a Recyclate Reprocessing Circularity Hub. The Hub would be expected to help address the current mismatch in the quality of local recyclate collected and the quality specifications required by the local reprocessing companies.

Plastic

At a global level the environmental damage from plastic packaging, in particular to our marine ecosystems, is beyond dispute. According to a 2016 report we will have more plastic than fish (by weight) in the ocean by 2050 if we do not tackle the plastics problem with circular solutions.⁴¹



The study from the EMF advises that more than half of global plastic packaging ends up being landfilled or incinerated, one-third is discarded into the environment and only 14% collected for recycling.

The same study advises that greater circularity of packaging has the potential to:

- reduce the annual volume of plastics entering the ocean by 80%
- reduce GHG emissions by 25%
- generate savings of USD 200bn per year
- create 700,000 net additional jobs by 2040.

The UK Government has introduced an environmental plastics tax designed to provide a financial incentive for businesses to use recycled plastic in the manufacturing of plastic packaging. The tax came into effect in April 2022 and levies £200 per tonne on plastic packaging that contains less than 30% recycled plastic.

Here, DAERA has been working on plans to eliminate plastic pollution as well as funding a Tackling Plastics Project through Keep Northern Ireland Beautiful (KNIB). DAERA has also recently been collaborating with Department of Finance on a plan to reduce single-use plastics within the government estate. The focus is on catering, packaging, facilities and office supplies.

The Polymer Processing Research Centre at Queen's University will become an extremely important source of expertise as the packaging sector seeks to increase use of secondary materials and make changes to design to increase recycling and reprocessing potential.

CASE STUDY

Plastics Pact

On behalf of the EMF, WRAP has been leading the voluntary Plastics Pact and represents two-thirds of all producers of packaging. It brings together businesses from across the value chain with government and NGOs to transform the whole system from design, production, use, collection, sorting, reuse and recycling of plastic packaging.

Since 2018 there has been a 10% reduction in consumer plastic packaging, a 46% reduction in problematic and unnecessary plastic and 70% of plastic packaging is now reusable or recyclable. This demonstrates the potential of collaboration in creating value through the entire supply chain.



Behavioural Change

This shift in cultural attitudes to packaging has led to numerous ‘zero waste’ shops, which sell goods without packaging, encouraging customers to bring and use their own.

CASE STUDY

Global corporations like Tesco are also making major changes to reduce packaging and help customers change their shopping habits. Recently the company entered into a partnership with Loop to create Reuse Stations in stores across England, providing everyday essentials in reusable packaging. It operates on the basis that the customer pays a deposit to borrow the packaging, which is refunded upon its return. Once it is returned, Loop professionally cleans it for reuse. The packaging can be tracked via QR code stickers or a phone app, which allows the deposit to be returned online – and highlights the growing importance of technology in tracking material flows.

Our role as consumers addicted to a ‘throw away’ culture also needs to change. The introduction of recent policy levers, fees and taxes will force businesses to modify their practices and processes to reduce costs. But if we as consumers don’t change our behaviours, those increased costs will be passed onto us.



Table 14 provides a summary of the opportunities identified by the Circular Economy Coalition and our own research to increase circularity in this area.

Table 14: Circular Opportunities for Packaging

- Raise awareness to help consumers make informed choices.
- Ban on certain materials from residual bins to ensure no packaging that could be recycled ends up in landfill or going for incineration.
- Ban the export of particular products to encourage repair and reprocessing, while also preventing exports to lower income countries.⁷¹
- Ban problematic single-use items or put a levy on their use.
- Ensure recycling collection systems operate efficiently to increase the supply of quality recyclate that would support local reprocessing markets.
- Improve labelling of products to increase consumer understanding of the impact of materials and the potential for circularity.
- Develop a viable treatment and recycling infrastructure.
- Incentivise businesses to make ‘refill and bring your own’ packaging the norm.
- Utilise smart technology to trace material and encourage reuse.
- Increase the range of packaging materials that can be reprocessed by investing in research and development into packaging that is easier to reuse or recycle, including biodegradable films and plastic substitutes.
- Introduce a sustainable packaging certification programme.
- Research and development to map material flows and explore opportunities to invest in innovative solutions and so increase circularity of materials.



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