

CIRCULAR ECONOMY GUIDANCE FOR THE IRISH CONSTRUCTION SECTOR

The Need to Understand and Embed Circular Economy Principles

Ambition

Challenges

Recommendations

Draft Text for Discussion

Definitions

BY-PRODUCT

substance or object, resulting from a production process, the primary aim of which is not the production of that item fulfilling the following points:

- a. Further use of the substance or object is certain;
- b. The substance or object can be used directly without any further processing other than normal industrial practice;
- c. The substance or object is produced as an integral part of a production process;
- d. Further use is lawful, i.e., the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.¹

CIRCULAR ECONOMY

Where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised, making an essential contribution to the EU's efforts to develop a sustainable, low carbon, resource efficient and competitive economy.²

PRODUCTION RESIDUE

A material that is not deliberately produced in a production process but may or may not be a waste.

RECYCLING

any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.

RESOURCES

Defined by UNEP and OECD as the naturally occurring assets that provide use benefits through the provision of raw materials and energy used in economic activity (or that may provide such benefits

¹ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance), <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0098>

² Closing the loop - An EU action plan for the Circular Economy <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0614>

one day) and that are subject primarily to quantitative depletion through human use. They are subdivided into four categories: mineral and energy resources, soil resources, water resources and biological resources. Resources for a business are more inclusive than just materials and equipment, including also (for example) human resources. This CWA uses 'resources' to have this breadth of interpretation.³

WASTE

Any substance or object which the holder discards or intends or is required to discard.⁴

LIFE-CYCLE ASSESSMENT (LCA)

LCA is a standardized, science-based tool for quantifying the impact in order to assess lifetime environmental impact.

LIFE-CYCLE COSTING

Life-cycle costing is a method for assessing the total cost of facility ownership. It takes into account all costs of acquiring, owning, and disposing of a building or building system.⁵

³ CEN "Industrial Symbiosis: Core Elements and Implementation Approaches" December 2018, https://www.cencenelec.eu/media/CEN-CENELEC/CWAs/RI/cwa17354_2018.pdf

⁴ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0098>

⁵ <https://www.wbdg.org/resources/life-cycle-cost-analysis-lcca>

Preface

This Circular Economy Guidance for the Irish Construction Sector has been prepared for the Department of Environment, Climate and Communications by the Sustainability and Climate Action Consultative Committee of the CSG Innovation and Digital Adoption Subgroup which is mandated to deliver crucial actions to improve productivity and sustainability in the construction sector.

The building and construction sector is a key area that has significant impacts on the Irish economy and environment. According to the Joint Committee on Housing, Local Government and Heritage Embodied Carbon in the Built Environment October 2022 this sector accounts for 37% of all emissions in Ireland and the continuation of these greenhouse gas emissions at the same rate is unsustainable.

In addition to these environmental impacts, according to the IGBC, the construction and demolition projects are also responsible for about 50% of all material extraction, 33% of potable water usage and 50% of the total waste (by weight) generated in Ireland. According to EPA 2022, National Waste Statistics Summary Report for 2021, 85% of C&D resources and waste was backfilled, 10% was sent for disposal, with only 8% being recycled. This presents serious environmental challenges during the entire lifecycle of buildings and infrastructure, especially during the operational and end-of-life stages. It is concerning to note that the EPA Demolition Waste Statistics for Ireland, released on 10th August 2023 with the Latest Reference Year 2021, indicates that the quantity of Construction and Demolition (C&D) waste generated and collected in Ireland in 2021 increased to 9 million tonnes from 8.2 million tonnes in 2020, an increase of 10%.

Given these critical environmental concerns, the construction industry faces urgent pressure to transition from the prevailing linear model to a circular economy approach. Embracing circular economy thinking entails extending the lifecycles of components, materials, and products through practices such as reuse, repair, recycling, remanufacture, maintenance and refurbishment. While circular economy concepts have proven successful in various sectors like electrical equipment, their application in the construction industry is relatively recent and has primarily focused on waste prevention and material management. Opportunities are presented to designers of buildings, infrastructure, and construction products to increase circularity through design for adaptability and design for disassembly and reuse. New business models will be required to bring about the changes required to reduce resource consumption.

Despite the challenges, the construction sector holds immense potential to implement circular economy strategies, particularly through embracing eco-friendly products and technologies, resource management, reducing extraction of raw materials; design for circularity and incorporating green criteria in procurement. Nonetheless, the sector's entrenched project-based institutional practices and market mechanisms often hinder the seamless integration of circular economy principles. With numerous stakeholders contributing to the environmental impacts and costs throughout the supply chain, both government and businesses can lead in guiding and supporting a circular economy transition within the construction industry through relevant guidelines and policy interventions.

This guidance document is the first step in envisioning a thriving Irish construction sector, fully embracing circular economy principles that maintain products, components, and materials at their highest use and value throughout their lifecycle. It aims to set out the necessary actions to replace the linear construction sector economy, characterised by a take-make-dispose approach, with a circular one that focuses on reducing the extraction of natural resources, recovery retention, refurbishment, remanufacturing, and reutilisation. Our future built environment and infrastructure must be designed to facilitate the reuse and adaptation of materials. Businesses should find value in reusing, recovering and remanufacturing products or salvaging parts and materials to bring benefit to clients and end users.

The guidance document is structured in three sections, with Section 1 looking at economic impact of the circular economy in construction, Section 2 setting out the approach to delivering our vision while Section 3 focuses on the vision, challenges, and solutions to implementing the circular economy in construction and the built environment across Design, Planning, Procurement, Manufacturing of Construction Products, Construction, Operations and Use, Reuse and Retrofit and Demolition.

Working with a group of experts from industry, government departments and agencies, local authorities, NGOs, academia, and others who possess extensive knowledge and expertise in resource use and waste within the construction sector has been a privilege. My sincere thanks is extended to the dedicated team that has diligently crafted this excellent guidance document and a full list of contributors is set out in the Acknowledgements section.

Looking ahead, the construction sector is poised for transformation, driven by early moves to digitalisation and offsite manufacturing, which promise greater productivity, new skills, reduced carbon footprint, support of circularity and expanded business opportunities. Embracing these

technologies is instrumental in creating a resourceful and less wasteful construction sector. Designing durable and adaptable buildings and infrastructure and maintaining a digital memory of their composition and maintenance will facilitate end-of-life decisions on materials' reuse, recycling, or recovery. Holistic life cycle assessments will underpin the interplay between material choices, carbon reduction, durability, and adaptability, ultimately leading to more sustainable outcomes.

This guidance document will be helpful to all participants and practitioners in the Irish design, manufacturing, construction, demolition and resource and waste management, built environment asset management sectors and to educators as it is providing guidance for the transition from current practice to circular practice and sets out the actions required in the education, value chain, research and development, digital delivery areas to achieve this transition.

It will also be valuable to policy makers in highlighting the many aspects of policy and regulation which need to be addressed to eliminate many roadblocks certain barriers and to support the transition of the construction sector to the circular economy model.

It is anticipated that this guidance document will be followed by CircularBuild which is an EPA-funded project, which aims at developing and designing the National Circular Built Environment Roadmap to 2040. The project lead, the Irish Green Building Council, in collaboration with Atlantic Technological University, Technological University Dublin and the University of Galway, will be broadly dedicated in defining and exploiting Circularity in the Irish Construction sector, an engaging process, with stakeholders from different backgrounds and expertise in the four key circular areas of the Construction sector. This will be carried out through dedicated workshops and a public consultation process, before the roadmap is prepared, and is being launched in September 2023.

The successful implementation and embedding of circular economy principles into the Irish construction sector necessitate unprecedented collaboration across value chains and government departments. This guidance document's development has been characterised by a highly collaborative process that transcends traditional silos and incorporates key stakeholders from central and local government, government agencies, NGOs, academia and the construction industry. Drawing on best practices from both national and international contexts, the guidance document encompasses key initiatives essential for driving the construction sector circular economy vision.

David Browne
Chairperson
Construction Sector Circular Economy Group

Executive Summary

Our vision for the built environment

Our vision is a circular built environment in Ireland by 2050 where the built environment takes a Cradle-to-Cradle Life Cycle approach to:

- minimise its negative environmental impacts across its whole life cycle, from the extraction of raw materials to construction, use/occupation, repair/refurbishment, and finally to the demolition and/or recovery and disposal of end-of-life components and materials.
- Maximise its positive environmental impacts across its whole life cycle such as enhancing ecosystems and biodiversity, through regenerative design that uses systems thinking to emulate natural processes (e.g. biomimicry).

Roadmap for delivery of our vision

By 2025
Planning authorities should stipulate a Circular Economy Guidance statement at planning stage covering circularity principles including design for adaptability, and design for disassembly.
Justification for demolition, pre-demolition audits following decision to demolish has been taken, life-cycle assessments and selective demolition to be mandatory in all planning applications (along with Resource and Waste Management Plans) to drive built asset reuse and the creation of a market and availability of reuse materials for design, specification, and costing.
All relevant education offerings from upskilling CPD and apprenticeships to secondary school, undergraduate, and post graduate degrees will include core modules on circularity.
Each of the Construction Industry Council organisations, the RIAI, CIF, SCSI, Engineers Ireland, and BMF to provide resources (e.g. playbooks, toolkits etc), and mandate circularity CPD for their members.
All relevant value chain actors involved in design, specification, procurement, and costing will have reviewed and updated their organisational strategies and business models to embed green procurement and circularity in operations.
Qualified Resource Manager (RM) with expertise in waste and resource management on site to implement circularity in each project.
Established metrics in place to be used to measure specific, measurable, and achievable goals for all building and infrastructure design proposals to feed into the statutory reuse reporting obligations.

In addition to harnessing existing funding from organisations such as EPA, the government, venture capital and philanthropic funds will work together with the Centres of Excellence (such as BuildDigital, Construct Innovate, etc) to establish research and development funding for projects to advance circularity in design, spec, procurement & cost on topics such as lessons learned from other countries (e.g. Netherlands, Scandinavia), new and innovative materials and technologies, case studies on reuse of built assets and materials, digital delivery, etc.

Government to support research and development, testing, and fast-track certification of additional circular products and materials (which may include, for example, straw, mycelium, hemp, timber) to give the sector confidence and assurance to design & specify these materials.

By 2030:

Obligations and requirements under the Government's Green Procurement strategy and action plan will be implemented within the required timeframe. Any requirements under the climate action plan relating to green be actioned as required.

Government to review regulations, and standards to ensure implementation supports circularity, e.g., updating regulations or standards where relevant, or provision of additional funding for implementation e.g., to the EPA to deal with applications for By-Product and End-of-waste decisions to allow for safe, legal, reuse of construction products and materials as well as supporting optimum use of natural regenerative materials such as timber.

By 2050:

All actors involved in the design, specification, procurement and costing of built environment projects will be fully conversant in the circular economy principles which underpin this roadmap and their practical application.

Policy, regulations, and standards will fully support circular design, specification, and costing, especially construction, maintenance, specification, procurement, costing and financial regulations.

Policy Context

This report is set within a wide matrix of policy drivers – including legislation, regulations, voluntary guidelines and statements of policy – which shape activity in the fields of construction and the built environment to bring benefits to the built environment including increased competitiveness, promotion of innovation, economic growth, and reduction in greenhouse gases.

The policy context of this report includes Ireland's international obligations, such as Ireland's commitments from the Paris Climate Agreement, and European policy instruments including (but not limited to) fields such as the European Green Deal, the European Circular Economy Action Plan, Fit for 55, the Waste Framework Directive, New European Bauhaus, Construction Products Regulation and Eco design directive.

The design, location, use, re-use, demolition and occupation of our buildings, infrastructure and the built environment is driven by a domestic suite of legislation, regulation, policies and statements under the remit of a range of departments and agencies tasked with delivery of the National Climate Action Plan 2023, the Whole of Government Circular Economy Strategy 2022 – 2023 'Living More, Using Less', national and regional development plans, the forthcoming National Waste Management Plan for a Circular Economy and regulations on the manufacturing of construction products and the environment. These principles also affect wider policy instruments including Housing for All, and the National Development Plan.

Ireland has a legally binding commitment to achieve a 51% reduction in GHG emissions by 2030.⁶ Significant efficiencies can be made by extending the lifecycle of existing buildings – whether residential or commercial, or publicly owned and occupied buildings – by ensuring that existing buildings can be retrofitted to ensure their continued use.

Published in 2020, Ireland's national Long Term Renovation Strategy (LTRS) outlines Ireland's existing building renovation policies which are set out in a range of policy documents, most notably the Climate Action Plan and the National Energy and Climate Plan, which in turn were developed in line with the targets of the EU's Green Deal and Renovation Wave.

⁶ Ireland's Long-term Strategy on Greenhouse Gas Emissions Reduction:
<https://assets.gov.ie/255743/35b2ae1b-effe-48af-aaf3-156dc5b01ee6.pdf>

Construction and Demolition Waste Management Protocol (guidelines on CDW management) and guidelines on pre-demolition audits are provided in the Directive. The circular transformation of the construction sector is covered under the Circular Economy Action Plan.

The EU also published a EU Construction & Demolition Waste Management Protocol in 2016⁷ which aims to:

- Improved resource and waste identification, source separation and collection;
- Improved resource and waste logistics;
- Improved resource and waste processing;
- Quality management;
- Appropriate policy and framework conditions.

Best practices for Pre-demolition Audits ensuring high-quality Raw materials (PARADE) Project is a pre-demolition guidance package to provide a base for preparing individual member states protocols.⁸

Pre-demolition audit basic principles guide was also produced by the PARADE project to assist practitioners with the process.

The EU Waste Framework Directive (Directive 2008/98/EC) set the basic concepts and definitions related to waste management, such as definitions of waste, recycling and recovery. It also included definitions for when waste ceases to be waste and becomes a secondary raw material (end-of-waste criteria) and how to distinguish between waste and by-product. The Directive, enacted in Ireland under the Waste Directive Regulations 2011 (S.I. No. 126 of 2011), requires Member States to apply the waste hierarchy to keep materials out of the waste stream, promote reuse and preparation for reuse activities, and establish resource and waste management planning procedures to track material flows and rates.

The policy context for reform

The next iteration of the Whole-of-Government Circular Economy Strategy (due for publication by end-2023) will include sectoral targets in relation to Construction and Demolition (C&D) Waste.

⁷ EU Construction & Demolition Waste Management Protocol:

<https://ec.europa.eu/docsroom/documents/20509/attachments/1/translations/en/renditions/native>

⁸ https://single-market-economy.ec.europa.eu/news/eu-construction-and-demolition-waste-protocol-2018-09-18_en

The Climate Action Plan 2023 targets a significant reduction in embodied emissions in the built environment and achieving net zero carbon. Circular construction will be a necessary element of achieving these objectives.

The current Programme for Government commits to mandating the use of green (including circular) criteria in all public procurement from mid-2023. In pursuance of the Programme for Government commitment, DECC will be publishing a draft GPP Strategy and Action Plan for public consultation in the coming months, with aim of publishing final version by the end of the year.

Reducing the material footprint of the built environment and reducing levels of construction and demolition resource and waste would directly support both SDG 11. 'Make cities and human settlements inclusive, safe, resilient and sustainable' and SDG 12. 'Ensure sustainable consumption and production pattern'.

Further development of the EU Taxonomy in relation to Circular Economy will incentivise investment in circular construction.

In line with the 2020 Circular Economy Action Plan,⁹ the European Commission will propose minimum mandatory Green Public Procurement (GPP) criteria and targets in sectoral legislation and phase in compulsory reporting to monitor the uptake of GPP. In terms of EU sectoral legislation, the Construction Products Regulation support and require increased application of circular construction. The EU is currently revising its construction GPP criteria, and are anticipated to be published by end 2023 or early 2024.

⁹ European Commission, Circular economy action plan, https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

Economic rationale for circular economy principles in construction

[William Hynes, KPMG; forthcoming on completion of draft report]

Economic policy context;

Levers for reform.

Ministerial Foreword

[Forthcoming on finalisation of report text]

Policy context, and reform agenda.

What is our vision for circularity?

This roadmap adopts the definition of the circular economy from the Ellen MacArthur Foundation:¹⁰

“A systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution. It is based on three principles, driven by design: eliminate waste and pollution, circulate products and materials (at their highest value), and regenerate nature. It is underpinned by a transition to renewable energy and materials.

Transitioning to a circular economy entails decoupling economic activity from the consumption of finite resources. This represents a systemic shift that builds long-term resilience, generates business and economic opportunities, and provides environmental and societal benefits.”

What is a circular economy in the built environment?

According to the EPA, in the circular economy system, we use less raw material, we design products for long-life and recyclability, we share products, we use them for longer and we reuse and repair things before we recycle or throw them away.¹¹ The European Parliament further describes a circular economy as: “a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended. In practice, it implies reducing waste to a minimum. When a product reaches the end of its life, its materials are kept within the economy wherever possible. These can be productively used again and again, thereby creating further value.”¹²

A circular economy is a systemic approach to economic development designed to benefit businesses, society, and the environment. In contrast to the ‘take-make-dispose’ linear economy, a circular economy is based on three principles i.e. (1) to design out waste and pollution, (2) keeping the products and materials in use and, (3) to regenerate natural systems.¹³

¹⁰ EMF, Finding a Common Language – The Circular Economy Glossary
<https://ellenmacarthurfoundation.org/news/finding-a-common-language-circular-economy-glossary-launched>

¹¹ EPA Ireland, “What is the circular economy?” <https://www.epa.ie/environment-and-you/circular-economy/>

¹² European Parliament, “Circular economy: definition, importance and benefits” May 2023

<https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits>

¹³ Ellen Mac Arthur Foundation, “What is a Circular Economy?”

<https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview>.

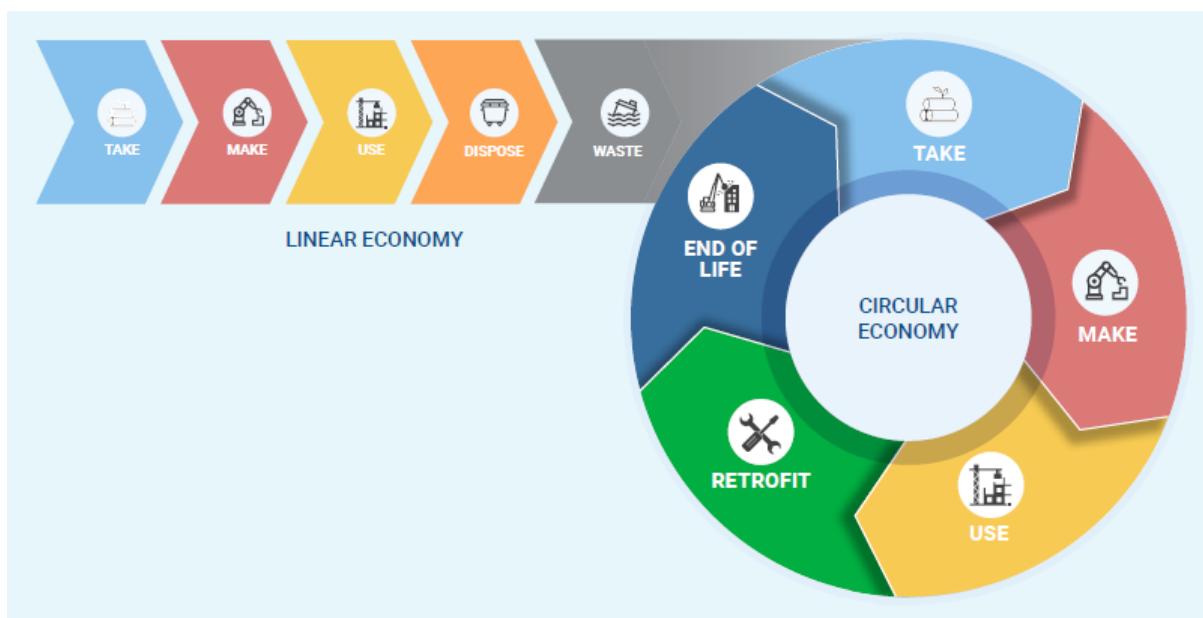
A circular economy for buildings, infrastructure and the built environment can be characterised by two broad principles:

1. Making our existing building and infrastructure stock more circular, through renovation, adaptation etc. In simple terms maximising the existing asset value and extending the functional life;
2. Designing new buildings and infrastructure to be as circular as possible.

This is achieved as follows:¹⁴

- The smaller the loop (activity-wise and geographically), the more profitable and resource efficient it is.
- Loops have no beginning and no end.
- The speed of the circular flows is crucial: The efficiency of managing stock in the circular economy increases with a decreasing flow speed.
- Continued ownership is cost-effective: Reuse, repair and remanufacture without a change of ownership saves double transaction.
- A circular economy needs functioning markets.

Figure 1: Circular Economy Principles¹⁵



¹⁴ McDonough.com, “Cradle to Cradle,” William McDonough & Michael Braungart, 2002.

<https://mcdonough.com/cradle-to-cradle/>

¹⁵ WGBC, “The Circular Built Environment Playbook,” 2023. <https://worldgbc.org/article/circular-built-environment-playbook/>

The construction and built environment should be stewarded by well-trained network of professionals working within a supportive policy and regulatory environment to design buildings and infrastructure that are sensibly located, that perfectly serve their purpose, that are flexible, adaptable and durable and that enhance the lives and experiences of those that use them and the natural environment. In constructing them we must make considered material choices to reuse for as long as possible materials and components, to use renewable materials and energy to allow for environmental sustainability and to design out and to reduce raw material resources, reduce consumption and prevent waste from design stage. Examining life cycles may make recirculation easier, ensure minimal loss of material resources and maximise the overall number of use-lives for any given material, including potentially indefinite reuse.

Embracing circular principles means resources are kept in use for as long as possible, creating a closed-loop system that minimises waste and maximises the value of resources, so that future construction and infrastructure activities and materials we choose are re-usable, repairable and recyclable. The selected resources and materials should remove toxicity from our built environment, minimise import of materials, focus on locally sourced materials and use reversible connections between buildings, infrastructure and the built environment to facilitate reuse.

All stakeholders should fully embrace circular design processes and procurement at the beginning of the design stage of any building, infrastructure or built environment construction project. The Irish Government as the country's largest construction client should require implementation of circular economy principles, including by Local Authorities in their role as planners and clients. Circular economy should influence all the stages of the life cycle, from the tendering, design, planning, building, maintenance, use and re-use.

These principles should extend through the life of all design and construction activity with built environment assets through designing for circular use, retrofitting and renovations.

Persistent Organic Pollutants (POPs) so called due to their persistent, bio-accumulative and toxic properties need to be considered at all phases of a circular construction project but particularly at design and demolition phases to ensure minimal exposure to POPs.

What is Design?

Design is creation with intention: Everything that surrounds us has been designed by someone: the clothes we wear, the buildings we live in, even the way we get our food. The Montreal Design Declaration defines design as “the application of intent: the process through which we create the material, spatial, visual and experiential environments in a world made ever more malleable by advances in technology and materials, and increasingly vulnerable to the effects of unleashed global development.”¹⁶

Put another way, design is the way we create products, services and systems, and is the mechanism by which we shape the material environment around us to meet our needs and desires.

Crucially, when something is designed, important decisions are made that impact how it is manufactured, how it is used, and what happens when it is no longer needed or wanted. It is exceedingly difficult to go back and undo the effects of those decisions if they are later found to produce undesirable consequences.

The Whole of Government Circular Economy Strategy 2022 - 2023 Living More, Using Less report commits to significantly reduce Ireland’s circularity gap, in both absolute terms and in comparison, with other EU Member States, so that Ireland’s circularity rate is above the EU average by 2030.¹⁷

¹⁶ Design Declaration, “Montreal Design Declaration,” Design Declaration Summit, 2017. <http://www.designdeclaration.org/declaration/>.

¹⁷ Whole of Government Circular Economy Strategy 2022 – 2023 ‘Living More, Using Less’ <https://www.gov.ie/en/publication/b542d-whole-of-government-circular-economy-strategy-2022-2023-living-more-using-less/>

What does embedding circular economy principles in the built environment do?

Improves	Reduces
Keeping products, materials, components, and buildings in use, at their highest or optimum value, for as long as possible.	Harm to the natural environment, atmosphere, biodiversity, habitats, flora, and fauna. Generation of waste in construction and demolition
Circular business models e.g., reuse, sharing, remanufacturing, leasing, take-back, product-as-a-service etc.	Use and extraction of raw virgin materials, generation of waste in construction and demolition
By-product opportunities for construction and demolition residual resources;	Generation of waste in construction and demolition
Recycling/recovery of construction waste into secondary products.	Use and extraction of raw virgin materials
Circular design tools and resources.	Green House Gas (GHG) emissions that cause climate change ¹⁸
Design in layers ¹⁹ (Shearing/Brand model: Site, Structure, Skin, Service, Space, Stuff).	Other harmful chemicals & gasses e.g., ozone depleting, per- and poly-fluoroalkylated substances (PFAS), etc.
EU Level(s) Macro Objective 2: Resource efficient and circular material life cycles.	Consumption (and wasting) of materials, energy, and potable water.
Lessons learned from other countries, research, and organisations.	Generation of waste in construction, operation, and demolition.
Circular design and specification principles.	Use of hybrids and composites materials that are inseparable at end-of-life, particularly where technical or synthetic materials have been combined with biological materials.

¹⁸ Generally referred to collectively as Carbon because they are measured in carbon equivalents CO₂e

¹⁹ For more information on designing in layers: <https://ocw.tudelft.nl/course-lectures/3-1-3-building-layers/>

Where are we now? Challenges to the delivery of our vision

Education and Training

- The need to change behaviours within those currently working in the sector through workplace training and education to ensure applied understanding of these principles.
- BIM (Building Information Modelling), circularity, and sustainable design need to be fully embedded into all third level education for architecture, engineering, construction, buildings and infrastructure operations and maintenance and cost management students (all levels) so there is a lack of mandatory education curricula in these critical topics for all third level students studying in these sectors. While there is some knowledge, expertise, and awareness across personnel in the built environment on issues such as BIM, circularity and sustainable design there remains a lack of mandatory CPD programmes for current professionals;
- There is a wide misconception in industry that circularity is about recycling, e.g. aggregates rather than a more fundamental way of design thinking and change to business models.
- Due to the relative lack of applied circularity experience, there will be a challenge in finding sufficiently qualified and experienced people to teach both students and professionals;
- The current pace of standard, policy and guidance change for practitioners can be overwhelming and there is a need for structured CPD education on these topics to support them.

Regulation and Standards

- Many pieces of legislation, building regulations and technical guidance documents do not yet include principles of circular design and sustainability. The complexity of updating these policies is made difficult as policy ownership is split across government departments and agencies, and there is a need for industry to work with government to embed circular economy principles across policy as a matter of urgency.
- Furthermore standards and regulation should reflect the fact that all new buildings should be designed with adaptability/deconstruction in mind.
- Highly restrictive Building Regulations, which are now an outlier compared with other EU jurisdictions, are restricting the use of circular and sustainable design and specification, in particular, the use of timber based solutions, and the re-use and recycling of straw, hemp and mycelium, and the restrictive use of structural timber above four stories.

<ul style="list-style-type: none"> Continuous change and updating of standards, policies, product and sustainability certification and guidance to try to keep up with circularity, sustainability and other issues creates unique difficulty for designers and specifiers of materials and components, and all stakeholder practitioners, in the sector;
<ul style="list-style-type: none"> Cost of testing and certification of new or innovative materials is prohibitive for all organisations, in particular smaller organisations and start-ups, resulting in a lack of options for designers and specifiers; there is an additional need for simple process of recertification for reused materials, e.g. suspended floor tiles, precast flooring etc. through further resourcing of NSAI to accelerate this process.
<ul style="list-style-type: none"> General application of the WFD and Waste Management Act, and by-product and end-of-waste application bottlenecks;
<ul style="list-style-type: none"> Standards may, in some cases preclude recycled and reused materials and components due to concerns about potential lower quality, wear and tear, poor construction and maintenance performance. There is a perceived challenge to maintaining standards with design and material specification based on recycled materials and components;
<ul style="list-style-type: none"> Lack of primary legislation for designers and specifiers to encourage circularity along with lack of penalties and incentives which encourage and favour circularity;
<ul style="list-style-type: none"> Lack of planning legislation to drive circular building practices;

Value Chain
<ul style="list-style-type: none"> There is a lack of knowledge understanding and often unwillingness amongst design teams and clients of how circularity can be integrated into the design and responsibility is often pushed wrongly onto contractor.

<ul style="list-style-type: none"> Contractors are generally not involved in the design process early enough to support the construction projects' sustainability objectives and provide expertise in buildability, disassembly, deconstruction, and innovation in design.
<ul style="list-style-type: none"> There is a lack of regulation to change the culture of design for demolition. Clients, design teams, contractors and the supply chain should all be supported to deconstruct carefully for reuse at highest value particularly through the procurement process.
<ul style="list-style-type: none"> There can be serious difficulty in justifying reuse of retained structures and cores of existing buildings as a viable design option due to non-compliance of materials, components and dimensions with current standards and regulations;

- Clients will need to become the prime driver of what is considered of value and to direct the work carried out by the contractor, placing a greater value on disassembly as opposed to demolition and reuse of materials and assemblies utilising best practices to incentivise stakeholders.
- Limited incentives exist where quality of materials or existing building environment are fully considered which leads to a mindset of freely discarding materials at construction and demolition stages without assessing the quality of the materials.
- There is little or no physical infrastructure (buildings, yards, depots) and an almost complete absence of takeback schemes in Ireland to collect, provide information on available stock, store and process materials and products for a circular construction economy and a corresponding lack of volume of product to support business to develop in this area meaning that circular design and specification options are extremely limited;
- Circular design and construction, ideally requires material and component production to be adjacent to construction locations and there is a current very significant lack of manufacturing or extraction facilities for circular production in Ireland;
- Manufacturers and suppliers do not currently provide enough data to allow people to procure and specify based on circular criteria;
- Increasing demand for product data and certification will incur significant financial costs on the manufacturing and supply chain for investment in new facilities, equipment, systems training, R&D, design and product certification to provide products;
- The design, specification and presentation of most components and assemblies are not currently aligned with circular economy principles;
- Very fragmented silos in the value chain - there is a lack of cohesive strategies and frameworks that facilitate effective collaboration, hindering the seamless integration of circular principles throughout the value chain;
- Component and assembly manufacturers, suppliers and producers generally do not currently have a full understanding of the benefits which circular thinking can provide for their business;
- Some fears exist that the circular economy sourced materials and components may be unsafe and not long lasting because materials have been subject to wear and tear in their previous life and are less resilient and durable and not compliant with current standards;

Digital Delivery

- Lack of good quality asset data for buildings and built environment which by using digital systems and skills, seriously impedes meaningful life cycle assessments as part of the design and specification process;
- Centralisation of re-use data does not exist to be enabled by BIM or other digital asset platforms to provide timely information to designers and specifiers;
- There is a lack of good quality data across all aspects of the Irish built environment, from road and rail infrastructure to town planning to material and component availability, to circular economy design, or be comprehensively developed through the use of BIM or other digital asset platforms;

Delivery of our vision: Strategic Recommendations

Regulation and Standards

Recommendation	Responsibility	Timeline
Review Planning legislation in the context of circular economy and design principles, and provide clear guidance for integration into development plans of impact of density, infrastructure ratios, building typologies, development mix, car parking provision nature based solutions and demolition on resource consumption.	Department of the Environment, Climate and Communications Department of Housing, Local Government and Heritage; Professional bodies and industry leaders	2025
Introduce a Building Regulations Advisory Body, consisting of member of various stakeholders, e.g., RIAI, Engineers Ireland, Irish Planning Institute etc.		
Setting up a body responsible for oversight and achievement of targets - need power of enforcement & legislative backing;		
Justification for demolition should be part of planning submissions.		
The development of circularity strategies should remain material neutral based on performance and outcome.		
Provide recycled materials content, EPD etc;		
Wider context: introduce flexible floor-to-ceiling height to enable long-term flexibility in the next development plan.		
A national construction & demolition use hierarchy be developed as an output to set out preferred options for management of C&D resources and wastes.	Department of the Environment, Climate and Communications	2025
Amendment of current regulations mandating demonstration of waste	Department of the Environment, Climate and Communications	2025

<p>prevention and circular design, with a target for reused/secondary materials in construction, and requiring Life Cycle Assessments with all planning application submissions for buildings of 1,000 sq m and over.</p>		
<p>Appropriate State bodies to provide guidance to industry with exemplars showing implementing circular economy principles in case study projects.</p>	<p>NSAI EPA Professional bodies and industry leaders</p>	<p>2025</p>
<p>Better communication of policy and regulation from policy-makers in advance of implementation of changed standards.</p>	<p>Appropriate government departments; Professional bodies and industry leaders</p>	<p>2025</p>
<p>Regulations and standards: A complete review of Ireland's national standards to facilitate circular design for concrete, steel and other materials should be undertaken and led by NSAI.</p>	<p>NSAI Department of Housing, Local Government and Heritage</p>	<p>2025</p>
<p>Continuation of programme of reform Technical Guidance Document B - Fire Safety by a cross department/industry representative working group under Department of Agriculture, Food & the Marine to allow for multistorey timber frame buildings & high-rise mass timber buildings consistent with other European countries</p>	<p>NSAI Department of Housing, Local Government and Heritage Department of Agriculture, Food & the Marine</p>	<p>2025</p>
<p>Supporting circular uses of construction and demolition resources and waste through national by-product and end-of-waste decisions for multiple types of building products/materials and greatly increase resources at the EPA to deal with these applications.</p>	<p>NSAI EPA Department of Housing, Local Government and Heritage</p>	<p>2025</p>

<p>Local Authorities to take a long-term view and seek clear information on the end-of-life of built assets/components, and reuse scenarios (current and potential future use) and developing storage facilities for large quantities of high-quality construction materials for reuse.</p>	<p>Department of Housing, Local Government and Heritage Local government</p>	<p>2030</p>
<p>Introduction of Regulations & Standards applicable to re-used / second-hand products and materials, including a simple process for recertification of reused products including, major building elements such as precast flooring, facades, suspended flooring etc.</p>	<p>Appropriate State agencies</p>	<p>2025</p>

Education and Training

Recommendation	Responsibility	Timeline
Develop and build on existing circular economy design guidelines for designers and professionals with a focus on delivery and implementation:	Professional bodies and industry leaders Providers of CPD and training	2025
1. Provide practical workbooks and training modules for designers and professionals designed in collaboration between industry and third-level institutions;		
2. Each professional membership organisation (RIAI, Engineers Ireland, SCSI etc) should collaborate to develop a suite of cross-professional Circular Economy Guidelines to embed circular economy principles;		
3. Provide exemplar models of applied principles of design, specification and construction of sustainable and circular buildings and infrastructure;		
Compilation by industry and third-level educational establishments of existing CPD as a resource and to identify gaps in training needs, then develop and publish a comprehensive suite of learning modules that cover all aspects of circularity, for example, DASBE. ²⁰	Industry publications; Researchers	2025
Programme align with existing EU initiatives to deliver general awareness of Circular	Third-level institutions and industry bodies	2025

²⁰ See, for example: <https://www.gmit.ie/master-of-science-in-circular-economy-leadership-for-the-built-environment>

<p>Economy across society including general public communications campaign, teaching at primary and secondary School Level and other initiatives.</p>	<p>Providers of CPD and training</p>	
<p>Structured, programme of thematic CPD events for all professional bodies to support circular construction.</p>	<p>Third-level institutions and industry bodies Providers of CPD and training</p>	<p>2025</p>
<p>Develop a suite of Circular CPD Learning and Training modules to be delivered by RIAI, CIF and other consultant professional membership organisations, including the Irish Planning Institute aiming to upskill the construction section workforce based on examples of best practice.</p>	<p>Third-level institutions and industry bodies Providers of CPD and training</p>	<p>2025</p>
<p>Academia and industry to collaborate further on a range of applied pilot circular economy projects.</p>	<p>Third-level institutions and industry bodies</p>	<p>2025</p>
<p>Simplify circular economy objectives to assist in making conceptual framework easier for successful adoption and ownership.</p>	<p>Third-level institutions and industry bodies Providers of CPD and training</p>	<p>2025</p>
<p>Educate all industry members both at third level and throughout their careers, about circular economy in the built environment and the benefits of creating a regenerative built environment that prioritises retention and refurbishment over demolition and rebuilding, where material resources can be recirculated.</p>	<p>Third-level institutions Employers</p>	<p>2025</p>
<p>Develop existing good practice through the creation of basic level training of circular economy principles to local authorities.</p>	<p>Institute of Public Administration Local authorities</p>	<p>2025</p>

Government agencies, third-level institutions, professional membership organisations to publish a set of actions for each sector - education, design, construction, maintenance, operation, and client by 2030, actioned in the Circular Built Environment Roadmap.	Government, third-level institutions and professional membership organisations	2030
Educate designers on the end-of-life process.	Industry bodies Providers of CPD	2025
Pilot projects to enable and support mainstreaming of circular economy design and specification.	Design practitioners and clients	2025
Educate all sectors through examples of worked projects.	Design practitioners and clients Training providers	2025

Research & Development

Recommendation	Responsibility	Timeline
Ensure that the necessary financial and resource support is given to Construct Innovate, Ireland's National Research Centre for Construction Technology and Innovation, in its role of making Ireland a global research and innovation leader for sustainable construction and built environment technology.	Government Third-Level institutions and professional representative bodies	2025
Better co-ordination to develop a programme of applied research and development for the construction sector in relation to best practice, circularity and sustainable targets.	Third-level institutions and professional representative bodies	2025
Develop pilot projects, building on initiatives such as the CE-Con Project, a collaboration between IGBC, ATU, Limerick Twenty Thirty and the Southern Waste Region, that will lead the way for circular economy design and circularity to become mainstream as soon as possible.	Third-Level institutions Industry bodies Providers of CPD Government departments and agencies	2025
Promote research in sustainable and deconstruction design principles to align waste reduction and material re-use.	Construction material manufacturers Design professionals	2025
Development of the proper management of indigenous bio-based materials industry.	Government Third-Level institutions and professional representative bodies	2030
Manufacturers to research existing products and assemblies to explore how they might be disassembled and reused rather than discarded.	Construction material manufacturers Design professionals Clients/Procurement agencies	2025
Promote research into domestic bio-based materials – e.g., mass timber, hemp, etc.	Construction material manufacturers Design professionals	2025

assess current levels and set a realistic self-sufficiency target in building materials.		
Further research and development into reuse potential, including driving demand, resource mapping, safety, testing, and certification of reused products and materials, and business models for reuse.	Government Third-Level institutions and industry representative bodies	2025
Apply lessons Learned from Teagasc through the development of new bio-based materials, e.g. hemp materials; insulation, boards etc.	Construction material manufacturers Design professionals Clients/Procurement agencies	2025
More research into cleaning and preparation for reuse.	Government Third-Level institutions and industry bodies Waste management sector	2025
State supports for manufacturers to explore how materials and equipment could be disassembled and re-used at the end of life to include circularity principles in the manufacturing and installation stages to reuse or recover materials more effectively.	Construction material manufacturers	2025

Value Chain

Recommendation	Responsibility	Timeline
Encourage a greater awareness of the value and finite availability of materials and resources by price incentives and restrict non-circular activity in the form of a 'resource tax.'	Regulatory agencies Department of Finance	2025
Targets for 2030, develop a new approach, through EU Levels model for architectural and engineering design and specification process including designing for adaptability and deconstruction.	Design team	2030
Base designs (or elements of design) on the range of available construction materials.	Construction material manufacturers Design professionals Clients/Procurement agencies	2030
Involving the construction contractor earlier in the design process to promote integration and collaboration in the design and build process.	Design team	2030
Early circular procurement and research of construction material options, to secure supply and to explore alternative material options available.	Construction material manufacturers Design professionals Clients/Procurement agencies	2030
Reform of material warranties in the context of material re-use.	Construction material manufacturers Design professionals Clients/Procurement agencies	2030
Adopt material, component and equipment leasing instead of purchasing. Schiphol Airport has successfully implemented this strategy, and the lessons learned from this initiative should form the basis of future research.	Construction material manufacturers Design professionals Clients/Procurement agencies	2025
Further adoption of existing waste coding system to facilitate reuse and circularity. A	Regulatory agencies	2030

universal and standard coding system must be introduced across the EU to facilitate tracking of material use, waste generation, with a project based targeting system.		
Setting targets by 2030, as is currently the case in the UK's Construction Sector Deal, referred to in the ZAW Report of February 2020, providing for the construction sector deliverable targets.	Government Regulatory agencies	2030
Promotion of collaboration between planners, suppliers, operators, maintenance contractors and demolition/waste providers to provide a whole life cycle.	Industry bodies Providers of CPD	2025
Engage with maintenance teams to understand all of their requirements to avoid maintenance or demolition. Focus on planned preventative maintenance and its alignment with product-as-service models.	Design teams Construction teams Client/Procurement agencies	2025
Use of new financial disclosures regulations to push back on the supply chain and demand more full adoption and embedment of Circular Economy practices.	Government Regulatory agencies	2030
Mandate circular economy performance metrics certification for all construction products to drive up the number of certified materials (for example, asking for EPDs HPDs, C2C etc.).	Design teams Construction teams Client/Procurement agencies	2030
National register for all built assets, including current occupation, date constructed, dates renovated, and BER if available, updated on a five-year cycle.	Government Regulatory agencies	2025
Research into prestressed stone structures and brick.	Construction material manufacturers Design professionals Clients/Procurement agencies	2025

Digital Delivery

Recommendation	Responsibility	Timeline
Creation of Material Passports and building logbooks to include all the materials that are included in a product or construction during its life cycle to facilitate circularity decisions in supply chain management, and promotion of the use of digital material passports for tagging and tracking along the full lifecycle of a product, material or system.	NSAI Construction material manufacturers Clients/Procurement agencies	2030
Use of BIM for material passports, component and assembly labelling and identification.	NSAI Construction material manufacturers Clients/Procurement agencies	2030
Adoption of material exchange platforms already existing in other EU countries.	NSAI Construction material manufacturers Clients/Procurement agencies	2025
Develop material reuse 'Market Place' to include for storage and distribution of materials.	NSAI Construction material manufacturers Clients/Procurement agencies	2025
Utilisation of BIM across, cost, programme, sustainability, and operations so that it may be used as a tool to implement Circularity across the industry for various projects.	NSAI CPD and training providers Industry professional bodies	2030
Public sector to lead and mandate BIM levels/management in procurement.	Government Procurement agencies	2025
Ensure that the necessary financial and resource support is given to The Build Digital Project in its role to transform the Irish construction and built environment sectors by enabling all stakeholders, particularly SMEs, clients, and suppliers, to develop, maintain, and continuously improve their capabilities as digitally	Government Third-Level institutions and professional representative bodies	2025

enabled, standards-based, agile, collaborative, and sustainable participants in the delivery of Project Ireland 2040.		
Co-ordination of digital delivery education effort/findings/information both between educational institutions and between them and the industry.	Industry bodies Providers of CPD	2025
Use of digital tools and plug-ins to advance Revit models e.g., specifications, carbon assessment, etc.	Industry bodies	2025

Sector-Specific recommendations

Recommendation	Responsibility	Timeline
Designing and specifying to reduce Construction and Demolition Waste by up to 95% (excluding soil and stones and backfilling) and significantly increasing recycling offsite).	Designers and contractors	2025
Built asset maintenance, refurbishment, and repair strategies should form part of the overall procurement process.	Procurement agencies Occupiers Professional bodies	2030
Coding or use of materials passports of construction materials, components, and assemblies to facilitate deconstruction and re-use.	NSAI Construction material manufacturers	2030
Consideration of material and component leasing instead of purchasing.	Clients / Procurement agencies	2025
Develop a Circularity Rating (similar to a BER Rating) to demonstrate how circular a built asset is. Introduce in terms of building stock to promote circularity/sustainability.	Industry	2030

Who will do this?

Delivering circular economy principles in construction and the built environment requires engagement across a wide range of stakeholders from government, institutes of education, professional bodies and training providers, industry and regulators.

Sector	Responsible body
Public procurement agencies	ESB
	Eirgrid and ESB Networks
	Enterprise Ireland
	Gas Networks Ireland
	Heritage Council
	HSE
	Irish Rail
	Irish Water
	National and Regional Roads Offices
	NRA
	Office of Government Procurement
	Office of Public Works
	Tailte Éireann
Policy-makers and State agencies	Teagasc
	TII
	Department of Agriculture, Food and the Marine
	Department of Education
	Department of Enterprise, Trade and Employment
	Department of Environment, Climate and Communications
	Department of Health
	Department of Housing, Local Government and Heritage
	Department of Public Expenditure and Reform
	Department of Rural and Community Development
	Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media
	Department of Transport
	Legislators and regulators

	Planning departments
	Environmental Protection Agency
	SEAI
	Regional and Local Authorities
Industry and professional representative organisations	ACEI
	IGBC
	Building Materials Federation
	Construction Industry Federation
	RIAI
	SCSI
	Engineers Ireland
	Irish Planning Institute
	Property Industry Ireland
	Passive House Association of Ireland
	Irish Concrete Federation
	Community Resources Network Ireland
	Chartered Institute of Building
Professional service providers	Circular service providers, IGBC
	Demolition teams and construction contractors and subcontractors
	Design teams
	Estate agents, property surveyors and building surveyors
	Financial and insurance companies and institutions
	Grant providers
	Investors, funds, and fund managers
	Licensed Waste Operators
	Mortgage and lending providers
	Other Contractors e.g., Conservation
	Planning consultants
	Procurement team
	Project managers
	Property managers

	Public and private building and infrastructure developers and their representatives
	Quantity surveying team
	Quarries and earthworks hauliers
	Recycling and processing companies
	Specialist/Hazardous Waste Removal Contractors
	Suppliers and manufacturers
Regulators	An Bord Pleanala, and planning authorities
	NSAI
Research and training Institutes	Circuléire
	Construction Industry Technology Alliance
	Construct Innovate
	Construction Centre of Excellence
	Digital Academy for the Sustainable Built Environment (DASBE)
	Material exchange platforms e.g., Excess Materials Exchange, Rotor DC, Wrpp It, etc
	Material passport platforms
	Materials testing laboratories
	Second and Third Level Institutions
	Sectoral NGOs and Charities
	Sectoral researchers (Academic and Industry)
	The Rediscovery Centre
	Build Digital

Sectoral Roadmaps

Implementing the principles of the circular economy in constructing the built environment requires reform of policy and regulations, development in training, research, the harnessing of digital delivery to support circularity and greater collaboration between stakeholders at all points in the construction process.

The following sectoral roadmaps provide greater detail about where we see the sector now, what our vision is for fully embedded circular economy thinking within the sector, and the targeted reforms which we believe should be undertaken to achieve the vision set out at the start of this Report.

We highlight seven critical junctures in the development of the built environment where specific reforms are needed to fully embed circular economy principles into the development of infrastructure and buildings.

1. Design;
2. Procurement;
3. Manufacturing of construction products;
4. Planning;
5. Construction;
6. Operations and Use;
7. Re-Use and retrofit;
8. Disassembly and recovery.

Critical Juncture 1: Design

What is our vision?

To create a genuine circular economy in the Irish Construction industry we need to change current practices and set ambitions for circular practice:

From current practice	To circular practice
Demolition	Building reuse and repurposing.
Planning for 5 years	Planning for lifetime of building
Design for cost minimisation	Design for maximising long-term value
Design focus on initial use including space and services	Designing for flexibility, repurposing, and upgrading
Design focus on current project	Designing for reuse at end of life of project
Using virgin raw materials	Reusing materials and secondary products
Use of Composite materials including materials using glue	Building in layers that are removable and reusable
Reducing waste	Reusing material and recovering waste into a resource
Consuming natural resources: energy, water, materials	Harvesting natural resources: energy, water, materials
Outsourcing waste disposal: land fill and wastewater treatment	Treating waste as a resource and dealing with waste on site.
Design based on the current take, make, waste approach	Facilitating material reuse system
Measure cost and time	Measure performance and quality
Using global environment and reducing biodiversity	Restoring global environment and promoting biodiversity

Consideration of carbon footprint	Mandatory carbon reduction towards zero emissions
Limited circular options	Vibrant circular economy in construction materials

Designers will need to reorganise their design process around the principles set out in Section 2 of EU Level(s) headings of holistic sustainable design which specifically deals with circularity.

- Design in Layers
- Levels 2.1: BOQs Materials & Lifespans
- Levels 2.2: C&D waste and materials
- Levels 2.3: Design for adaptability and renovation
- Levels 2.4 Design for deconstruction, reuse and recycling

This section is intended as direction to client organisations when undertaking public or private sector construction projects.

Design in Layers

1. Issue guidance to client organisations to consider a building as a series of layers & use layers to guide design as follows:
 - a. Shell;
 - b. Services;
 - c. Scenery;
 - d. Set.
2. Design to retain value of materials and components in buildings.
3. Components should be screwed or bolted together. Avoid gluing or sticking materials together. This makes it easier to disassemble and helps to retain a materials value at the buildings end of life.
4. Design to make it easier to replace and upgrade components and services. This will reduce life cycle maintenance costs.

Levels 2.1: Bill of Quantities, Materials and Lifespans

1. Consider buildings as a lifetime asset rather than a project lifecycle.

2. Use Whole Life Cycle Analysis and Life Cycle Costing to determine the most efficient long-term cost of a building including operational costs.
3. Incorporate Stage D of the WLCA process to measure circularity (Cradle to Cradle)
4. Establish 'Building Product Circulation Hierarchy' with the most circular and lowest carbon products being the priority products for specification: IGBC to provide guidance with this.
5. Design 'Buildings as Material Banks' (BAMB). This is achieved by developing and integrating two complementary value adding frameworks, (1) materials passports and (2) reversible building design.²¹
6. Factoring in replacement rates and maintenance in the design process is key to establishing accurate WLCA and LCC. This can be done in the object properties in BIM.
7. Design for adaptive re-use to extend the lifespan of a building e.g., Georgian terrace buildings are well known for their multi-functional uses through the ages.
8. Consider alternative procurement routes which treat buildings as a service so that the buildings or infrastructure will be designed to maximise circularity and to minimise life cycle costs and carbon content.

Levels 2.2: C&D Waste and Materials

1. Design out waste on site by using standardised dimensions to avoid off cuts.
2. Minimise replacement rates of components to make them last as long as possible (Whole Life Cycle Approach).
3. Instruct a 'Renovation and Refurbishment First' policy and avoid demolition to reduce waste and carbon emissions. Approximately 60% of a building's emissions are in its substructure and superstructure. This approach will significantly increase circularity and reduce carbon emissions.
4. An example of reducing material waste and maintaining material value would be to use lime mortar in masonry construction to enable easier recovery and reuse of masonry units. This would have to be incentivised through benefit and penalty schemes, led by public sector example.

Levels 2.3: Design for Adaptability and Renovation

1. Design for future change including:
 - a. Loose fit;
 - b. Alternative scenario planning;

²¹ <https://cordis.europa.eu/project/id/642384>

- c. Simple plan form;
 - d. Independent layers.
2. Use flexible and demountable components.
 3. Collaborate with operations and maintenance teams to simplify designs for renovation and adaption.
 4. Design regenerative built environment that prioritises retention and refurbishment over demolition and rebuilding, designing buildings and infrastructure that can be adapted, reconstructed, and deconstructed to extend their life and that allow components and materials to be salvaged for recirculation, reuse or recycling.
 5. Design for adaptive re-use to extend the lifespan of a building e.g., Georgian terrace buildings are well known for their multi-functional uses through the ages.
 6. Consider floor to floor heights, core design and universal design in buildings to enable future adaptability.
 7. Design services to be easily removable, deconstructed and upgradeable to enable future adaptability.

Levels 2.4: Design for Deconstruction, Reuse and Recycling

1. Embed DfMAD (Design for Manufacture and Assembly/Disassembly) and MMC (Modern Methods of Construction) where designed to circular and low carbon principles as the norm for construction projects.
2. Design based on modular (standardised) measurements so that components can be easily re-used on other projects.
3. By 2030 required designers of new architectural, engineering and infrastructure projects to:
 - a. Ensure they are future proofed and will last;
 - b. Demonstrate how they will adapt to potential changes in use and to climate change;
 - c. Design and specify out waste for new buildings, refurbishment projects and infrastructure by designing for better resource efficiency and for deconstruction and disassembly, efficient manufacturing processes, extending the life of buildings, disassembly for reuse and reducing surplus materials;
 - d. Demonstrate how they will be maintained over the long term so that major renewal such as façade replacement will not adversely impact occupants and how different layers of the development have been designed to be disassembled cost effectively to

- support recovery and reuse of the building's systems, components and parts as and when they need to be replaced;
- e. Interact with manufacturers and suppliers to work with them to provide materials, products and systems that minimise waste, can be assembled to support disassembly and retain value at the end of their life;
 - f. Be based on regenerative and nature based solutions as the mainstream design approach.

Critical juncture 2: Procurement

What is our vision?

That by 2030, circular economy principles and practices are included by default within the procurement processes for all built environment assets at all lifecycle phases, and these processes drive increased circularity and a reduction in the resource intensity of the built environment.

That procurement practitioners will have access to comprehensive and sufficiently detailed guidance/guidelines in relation to maximising circularity for all life cycle phases, and both upstream circular design decisions and pro-circular incentives, regulation and standards enable that circular procurement.

The current situation

Procurement is undertaken currently to facilitate the linear economy. The lowest price tender is often the successful one. It does not take into account the total life cycle cost or external costs such as environmental or social costs.

Procurement is purely transactional and short term focussed. Procurement methods are conservative and highly restrictive with little scope for variance.

Circularity is not considered at all in the procurement process and in Ireland we are one of the least circular countries in Europe.

What are the current challenges to delivering this vision?

The nature of the construction industry is highly fragmented. There are low barriers to entry and little spending on R&D. Consequently, procurement, particularly in the private sector, can be informal with the primary emphasis on lowest cost and maximum margins. This downward pressure on prices all the way through the value chain leads to lower quality, more adversarial interactions and negatively affect the lifetime cost of an asset.

What are our proposed solutions?

1. Move from a project life cycle (short term focussed) to an asset life cycle (long term value focussed);

2. Procurement is the function by which the circular economy can be implemented. It needs careful consideration;
3. State procurement to lead in the establishment of circular procurement in order to help to create the circular economy;
4. Consult with experts from countries with a more mature circular economy in order to learn current best practices and their past mistakes;
5. Move from short term business cases to long term value creation;²²
6. Focus on Total Cost of Ownership (TCO) and Total Cost of Use (TCU);
7. Implement Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) on all public projects
8. Experiment with different procurement methods such as Competitive Dialogue. Strike the right balance between competition and collaboration;
9. Establish Award Criteria that assesses and rewards circular performance;
10. Transition from technical specifications to functional specifications;²³
11. In civil engineering, undertake functional assessments at business case stage to establish if (a) a project is required and (b) what is the most circular way to deliver it;
12. Refocus procurement to purchase functions rather than material, e.g. light as a service, lift movements rather than lift cars;
13. Measure circularity. If something cannot be measured, it cannot be managed, but measuring circularity is difficult. Using programmes such as Circular IQ will help to put rigour on the process and avoid 'green washing';
14. Use internationally recognised standards which incorporate circular design such as BREEAM & the *EU GPP Criteria for Office Building Design, Construction and Management*;
15. Shift towards more 'bio-based procurement'. Bio based procurement does not always coincide with circular use, however when bio-based procurement is combined with circular procurement it leads to highly circular & sustainable, low carbon solutions;²⁴
16. Develop long term contracts or performance agreements that reward lower TCO / LCC.

²² Circular Procurement in 8 steps; van Oppen, Croon & de Vroe; p33

²³ Circular Procurement in 8 steps; van Oppen, Croon & de Vroe; p36

²⁴ Circular Procurement in 8 steps; van Oppen, Croon & de Vroe; p38

Recommendations

Recommendations for Procurement Policy	Timeline
LCA and LCC to be undertaken in all new major public projects	2024
Education on circular procurement to be undertaken throughout the public sector	2024
Undertake test projects to experiment with alternative procurement to facilitate circular delivery of projects and monitor results.	2025
Develop award criteria for the awarding of circular commissions for both design teams and project delivery proposals	2025
Develop long term performance agreements that incentivise lower TCO / LCC	2025
	2030

Critical juncture 3: Manufacturing of Construction Products

Summary

A wide range of construction products and materials are needed to construct buildings, infrastructure, and the built environment. While some products are made here in Ireland, many are imported. Reducing the importation of construction products and materials has the potential to create a stronger indigenous construction materials sector; reduce overall carbon emissions and also improve the circularity of the construction sector and make it more robust.

In simple terms manufacturing construction products requires four key elements:

- suitable raw materials;
- skilled workforce;
- energy/heat;
- facilities and investment.

To transition for the construction materials manufacturing businesses to become more sustainable, each of these elements must be examined:

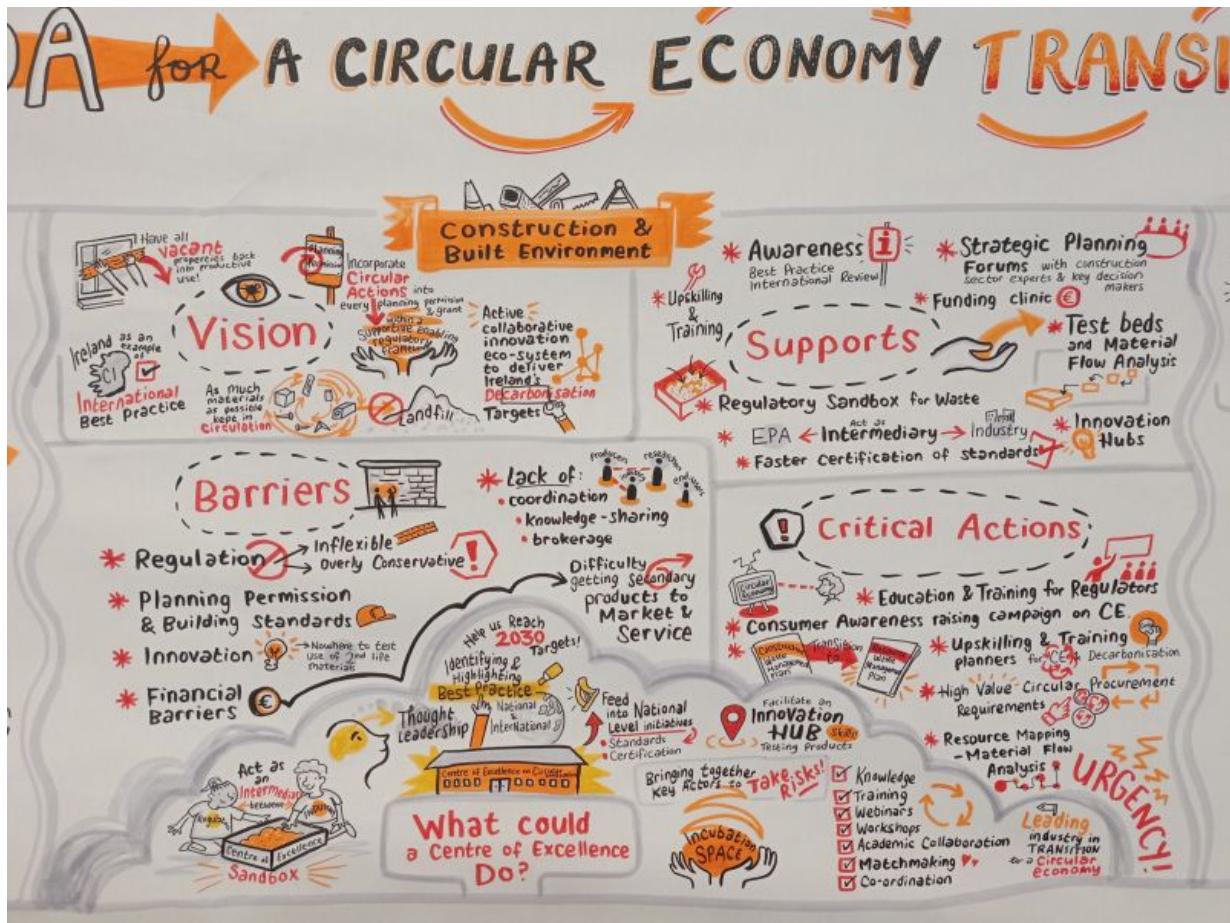
- **suitable raw materials:** Are they local? Can less raw material be used? How much waste is produced? Can other sources of raw materials be identified?
- **skilled workforce:** Do we have the necessary skills, or are new skills and training needed?
- **energy/heat:** How efficient is the manufacturing process? How much energy/heat is required? How much is or could be renewable? Is it sourced locally?
- **facilities and investment:** Is funding or investment in new facilities needed? What supports are currently available? What supports should be available?

CIRCULÉIRE - The National Platform for Circular Manufacturing in Ireland²⁵ ran a series of Circular Economy Innovation Workshops during 2023 on different sectors including 'construction and the built environment' with a focus on developing a National Centre of Excellence.

Some of the outputs include the graphic below from a recent workshop.²⁶

²⁵ National Platform for Circular Manufacturing in Ireland <https://circuleire.ie/>

²⁶ Circular Economy Hotspot: Dublin 2023 <https://www.dublincirculareconomyhotspot.com/>



What is our ambition?

- Narrowing resource loops (reducing the input of resources) by reusing buildings and refusing the use of products (i.e., prevention) when possible, intensifying the use of products or reducing the use of materials through more efficient manufacturing or efficiency in using them;
- Slowing down or elongating resource loops (longer and high value use of materials and products) by reuse, repair, and remanufacturing of products;
- Closing the loops (reducing loss of materials through waste) by recycling and recovering energy from materials when all the previous options are no longer possible.
- Substitution where applicable. This includes using biobased, renewable materials instead of primary abiotic materials.
- Minimising waste produced per functional unit of product produced. Manufacturing products for construction purposes include a diverse range from insulation materials, precast walls, cements, and timber beams. Manufacturers should, if they have not already, consider setting

measurable KPIs to reduce the production of waste year on year as a percentage of their production output. The reduction of unnecessary product use overall in construction, planning and design are identified in those sub-sections.

- Development of a publicly available large database of EPDs for construction products that will provide transparency and ease the life-cycle assessments, life-cycle costing and indoor air quality assessments.
- Creation of a metric or scoring system for buildings, which would be made available on a public database.

Where are we now?

In Ireland under current waste legislation, certain rules apply to the use and classification of secondary materials. The EPA is preparing guidance on reuse which shall include a chapter dedicated to the construction and demolition sector. This should serve as a useful tool to support industry in determining their legislative requirements in this regard.

A by-product is a material which is produced as an indirect consequence of a production process i.e., the main aim of the production process was not to produce that material. Construction and/or demolition can be considered as a production process from which by-products can be produced. In order to be considered a by-product, certain conditions as set out in Regulation 27 of the European Union (Waste Directive) Regulations 2011-2020 must be fulfilled. A by-product must be notified to the EPA on a single-case base for determination, or if associated European level criteria or National criteria exist, it must be registered on the EPA website.

If a material is discarded or intended to be discarded, then it is considered a waste. To be able to reuse a waste material, it must be reclassified as a product by achieving end-of-waste status. End-of-waste status can be achieved through compliance with European level criteria or National criteria, where published, or on a single-case basis through application to the EPA for a decision under Regulation 28 of the European Union (Waste Directive) Regulations 2011-2020. An overarching requirement of end-of-waste is that a waste authorisation is in place to control the waste treatment (recovery) process that results in the reclassification of waste to non-waste.

The uptake and engagement on the by-product (Regulation 27) and end-of-waste (Regulation 28) regulatory provisions has gathered significant pace in recent years. This is evidence of a clear ambition within many industries to identify practical solutions to support the circular economy. The majority of

applications and notifications received by the EPA relate to construction-based waste and materials. In 2022, the EPA commenced a more strategic approach of developing national by-products²⁷ and end-of-waste criteria²⁸ for the construction-based materials, including greenfield soil and stone, site-won asphalt and recycled aggregates. These criteria will ultimately eliminate the need for multiple single-case decisions for those materials.

What are the current challenges?

Achieving these goals requires stakeholders, including construction professionals, to overcome the following challenges:

We need to consider how businesses involved in manufacturing construction materials quantify or account for the longer-term value of the resources they put on the market. Both business and consumers need to know that they can track the value and how they are rewarded for that value. We need better information to answer whether their customers are interested in or aware of the differences or benefits of more circular production.

One of the challenges includes difficulties in putting innovative, circular products on the Irish market. There needs to be a clear pathway for manufacturers of innovative, circular products to help them launch new products in Ireland. Required certification and other alternative routes to put innovative products on the market must be clearly defined. The current Agrément certification assessment does not cover the sustainability and circularity of the certified product. Environmental Product Declarations may go some way to addressing those issues; however, they are voluntary.

Many new solutions and innovations still need to be developed for high-quality recycling and reuse of materials, sustainable production, and service-life extension of materials. While the EPA have excluded structural applications from the scope of the upcoming National decision end-of-waste decision for recycled aggregates, they have stated that they would however support and steer industry to build on the criteria already developed to establish national-criteria for structural uses.

We need to find measures to overcome the reluctance of companies to provide more sustainable manufacturing process due to their lack of knowledge or additional upfront manufacturing cost, and in parallel develop a market demand for these products.

²⁷ By-products Regulation 27, <https://www.epa.ie/our-services/licensing/waste/by-products-regulation-27/>

²⁸ End-of-waste criteria in Ireland, Levels of end-of-waste criteria, <https://www.epa.ie/our-services/licensing/waste/end-of-waste-art-28/end-of-waste-criteria-in-ireland/>

There need to be more regulations to encourage or force manufacturers to declare the environmental impacts and circularity performance of their products. Currently, there is no requirement to provide third-party verified environmental performance metrics. This can lead to confusion among businesses about which construction material products are genuinely circular. Producers who take the bold steps and initiative to publish an EPD openly are not necessarily rewarded with more business, so they might be disincentivised. This is particularly relevant in markets with no existing EPDs. Producing one sets the benchmark and gives competitors opportunities to improve. Forced declaration might be a solution, but further supports would be required to aid smaller businesses beyond those already provided by Enterprise Ireland.²⁹ We note, however, that new regulation such as revision of the CPR and the Ecodesign of Sustainable Products Regulation is coming.³⁰ Construction Product Regulation will be revised to make sustainable products the norm in the EU and boost circular business models. However, we have yet to determine when this policy will be implemented, or the criteria which will be used. Green Public Procurement will also support use of sustainable products.

There are opportunities to promote bio-based materials such as hemp. Current issues with the Department of Health licensing of hemp production needs reform. Farmers want to grow hemp but are currently restricted by both licensing rules and lack of processing facilities. For example, there is a potential launch and use of hemp insulation in Ireland in coming years, and while some hemp is available for sale here, further research and development is needed to launch a product with Hemp sourced in Ireland at scale. Hemp is not the only biogased material with potential. Others include Jute, Woodfibre, Sheepwool, Cellulose, Cork board, Ecococon straw panelised system, bio based insulating lime boards and natural insulating plasters for heritage buildings. Some of which are in a more mature phase of development.

The lack of fire testing and certification facilities in Ireland means delays in getting new products to market. The current challenges with achieving combustibility classification for bio-based insulations needs more research and development in order to provide an opportunity for this to be used at scale domestically. Additionally, we need more competence in this area, beginning at an educational level. If fire concerns are restricting the potential use of a sustainable material, it is paramount that we, in

²⁹ Enterprise Ireland: GreenStart: <https://www.enterprise-ireland.com/en/Productivity/Build-a-green-sustainable-Business/GreenStart>

³⁰ Revision of the Construction Products Regulation
[https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI\(2022\)739243#:~:text=On%2030%20March%202022%20the,and%20boosting%20circular%20business%20models.](https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2022)739243#:~:text=On%2030%20March%202022%20the,and%20boosting%20circular%20business%20models.)

the construction sector, all develop a better understanding of it. It should be mandatory learning. This should be addressed by Construct Innovate, which was established last year to bring testing facilities and universities together.³¹

What are our proposed solutions?

Manufacturing construction products can generally be seen as a series of internal economies within the construction sector. Many manufacturers are already very efficient and have very little waste arising within their own production facilities. Much of construction waste arises later in the supply chain and on construction sites. Each producer should endeavour to control what they can as a starting point by, for example, setting annualised targets on waste reduction. This might eventually be in the form of publicly published waste data but beginning with internal reporting and measurement. Grants should then be offered to those manufacturers to develop innovative processes that first minimise waste, and, secondly, maximise the use of any remaining construction and demolition resources and waste internally. Local support networks should be encouraged to develop creative solutions that could then see one manufacturer's waste become another manufacturer's raw material; for example, timber processing waste into insulation materials.

Bio-based materials are, one of a number of product solutions, which require particular attention as their impact extends beyond the circular economy. Bio-based building materials have potential to reduce the embodied carbon footprint of new buildings and refurbishments. The production of such materials must be subject to robust assessment under e.g., the WWF GWPbio biogenic assessment tool (with all advanced data profiles completed), or similar, to ensure that any carbon savings are verifiable and auditable. The impacts on land use, land use change and forestry (LULUCF) should also be included in such an assessment. This will also enable the quantification of any biogenic carbon capture and storage possible as a result of the switch to bio-based building materials use. Given the dynamics of the economic impacts, any biogenic carbon advantage will need to be mapped for each bio-based material for the years from 2025 to 2050 compared to their decarbonising competitor materials over the same period to inform the economic cost-benefit and the carbon cost-benefit that may accrue in any switch from mineral to bio-based building material use.

In order to fully co-ordinate and facilitate the development of new sustainable products to meet the need of a decarbonised construction industry, Enterprise Ireland should be tasked with setting up a

³¹ Construct Innovate: Ireland's National Research Centre for Construction Technology and Innovation <https://constructinnovate.ie/>

sustainable construction products division, linked to the existing Innovation Hubs across higher education, to identify and support high potential low carbon or carbon negative products which would have export potential. The service would include support with achieving product certification, EPDs and voluntary circular economy certification.

This would incorporate and promote existing supports which currently need to be more widely known.

Mapping resource flows is critical to identifying new raw material opportunities or more circular flows for existing materials in the construction sector and beyond.

EPA: The EPA to support and steer industry to build on the national end-of-waste criteria for recycled aggregates to establish national criteria for recycled aggregates for structural uses.

Industry to set up an industry led quality assurance scheme, as exists in other member states, to streamline the process of quality management, certification against technical standards and compliance with end-of-waste criteria. Industry also to lead on the development of national end-of-waste criteria for recycled aggregates for structural uses.

Local Authorities: along with the private sector, to provide depots for storing reused products, or allow testing of soil or stones for safe reuse.

Department of Housing: To provide additional guidance on the use of Agrément certification and, where there are exemptions, allow alternative European equivalent or where original certification covers reuse.

Department of Housing: To ensure environmental impact indicators (e.g., Levels(s)) are incorporated into the public procurement process. Level(s) should be mandatory for building projects with environmental criteria incorporated depending on building type, usage, year, etc.

Contractors: To engage in a new certified deconstruction scheme to provide assurance of safety, ensuring non-contamination of segregated wastes.

Manufacturers: To provide take-back schemes for repair and recertification of their products for reuse.

Design Professionals: To engage in applying Level(s) indicators from the early design stage and understand how they can be applied in design. Designers integrate circularity into designs that contractors then deliver. It is not the contractor's responsibility to create circularity out of a linear design.

Industrial Symbiosis

Industrial symbiosis refers to the practice of an industry or organisation using the waste or by-products from another. This could take the form of using waste heat, energy, water, or materials. The industrial park at Kalundborg in Denmark, where sixteen organisations share twenty different resource streams, is a good example. Each year they save tens of thousands of tonnes of CO₂ and raw materials, and millions of litres of potable water through these exchanges.³²

Industrial symbiosis is something that could be applied within the construction sector and further stimulation and awareness of its merits are needed in the Irish economy. In fact, it is already taking place in the use of ground granulated blast furnace slag (GGBS), a waste product from the steel industry, for use in cement products. Concrete is the most widely used construction product in Ireland, and a major contributor to greenhouse gasses due to the high emissions associated with traditional cement.

The cement industry is working with partners and customers to maximise the value of discarded resources by returning them to the cement manufacturing process. The unique features of the cement factories, the fact they are transforming raw materials at high temperatures into an essential construction material. Given the huge scale of the industry here in Ireland, there is significant further opportunity for suitable materials to be cycled back in the cement manufacturing process.

Combining waste heat capture with district heating systems is another example. South Dublin Council and Codema initiated a project in 2021 that would capture the waste heat from a data centre and use it to heat buildings belong to the council, TUDublin, and some homes in the adjacent surrounding area in Tallaght.³³

Recommendations for policy reform	Timeline
Industry working groups should be established working with the Department of Housing, The Department of Environment, National Standards Authority of Ireland, EPA and others to develop detailed solutions to deliver all of the above, with a focus on:	2025
Reform of the national implementation of the EU waste framework;	2025

³² CEN, 2018. CEN Workshop Agreement: Industrial Symbiosis, Core Elements and Implementation Approaches.. p. Ref. No.:CWA 17354:2018:7.

³³ CODema, Tallaght District Heating Scheme, <https://www.codema.ie/projects/local-projects/tallaght-district-heating-scheme/>

Revise Part D to allow for circularity and provide additional guidance;	2025
Implement GPP and provide guidance on circularity particularly Level(s) indicators 2.1 -2.4 for integration from early CWMF stages;	2030
Building Regulations – limiting environmental impacts (determination of LCA, LCC, IAQ (for example, through Level(s) or HPI))	2025
Consider Whole Life Value on Infrastructure projects	2025

Recommendations to industry	Timeline
Start with the Level(s) framework, particularly the Macro objective – Resources and Circularit and integrate indicators 2.1-2.4 into the early design stage of projects onwards. The manuals and checklists provide an easy entry into how circularity can be integrated from the early feasibility stage.	2025
Designers to use the Regenerate Tool ³⁴ or the Ellen MacArthur Circular Buildings Toolkit develop with Arup ³⁵ or the London Mayor's Office template for the preparation of Circular Planning Statements ³⁶ to create circularity statements for their projects to create a structured approach to the key circularity indicators.	2025
Train design staff in the development of Resource & Waste Management Plans through Enterprise Ireland or similar training providers.	2025
Train all construction site operators rigorously in EU protocols for waste segregation to avoid contamination.	2025
Promote green, sustainable products to clients and procurement agencies in design.	2025
Establish environmental impact indicators, and identify which areas for constant improvement in circular economy principles.	2025
Designers, manufacturers and contractors will need to work together to collaborate on how buildings can be easily disassembled to allow reuse of all components.	2030
Certification that reusable construction elements and materials are 'fit for purpose' will be required to encourage the widespread adoption of these circular practices.	2030
Manufacturers need to transition to long-term leasing of their products or provide a maintenance service on their products to maintain them in operational condition.	2050

³⁴Urban Flows Observatory - University of Sheffield <https://urbanflows.ac.uk/regenerate/>

³⁵ Circular Buildings Toolkit: <https://ellenmacarthurfoundation.org/articles/circular-buildings-toolkit>

³⁶ Mayor of London: Circular Economy Statement Guidance: <https://www.london.gov.uk/programmes-strategies/planning/implementing-london-plan/london-plan-guidance/circular-economy-statement-guidance>

Critical Juncture 4: Planning

The planning system in Ireland refers to the framework of laws, regulations, policies, and procedures that govern land use and development. It is administered by the Department of Housing, Local Government, and Heritage and is overseen by local authorities across the country. The planning system aims to ensure that development occurs in a coordinated and sustainable manner, taking into account factors such as environmental protection, infrastructure provision, economic development, and the overall well-being of communities.

Key features of the planning system include:

Development Plans: These are long-term strategic plans created by local authorities, outlining their vision for the development and land use of the area. They address issues like housing, transportation, amenities, and environmental protection.

Zoning and Land Use: The planning system designates different zones for various types of development, such as residential, commercial, industrial, agricultural, and conservation areas. Zoning regulations determine what can be built where and to what extent.

Planning Permission: Developers and property owners typically need planning permission before carrying out certain types of development or making significant changes to existing structures. This process involves submitting plans and information to the local authority for approval.

Environmental Considerations: The planning system currently takes environmental factors into account, including the protection of natural habitats, historic sites, and landscapes. Environmental Impact Assessments (EIAs) whether undertaken by the applicant or the local authority are often required for projects.

Public Participation: Public participation is encouraged in the planning process. Local authorities often seek input from residents, community groups, and other stakeholders before making decisions on development proposals.

Appeals and Enforcement: There are mechanisms for both appealing planning decisions and enforcing planning regulations. Appeals are typically made to an independent body, such as An Bord Pleanála.

Strategic Infrastructure Development: For projects of strategic importance (such as large-scale infrastructure), a separate planning process called the Strategic Infrastructure Development (SID) process exists to streamline decision-making.

Within the context of the planning process in Ireland there exists a separation between the information submitted as part of the planning process and the actual construction on the ground due to the omission of detail design as part of the process.

For the circular economy a more in-depth analysis is required of the whole-life cycle information associated with an application and the capture of the digital analysis undertaken to supplement a digital portfolio which needs to be centralised and accessible by all.

What is our ambition for embedding circular economy principles in planning?

Embedding circular economy principles in planning involves setting ambitious goals and strategies to transform the way urban and regional development is approached at every scale. The overarching ambition is to create sustainable, regenerative, and resource-efficient communities that minimize waste, maximize resource use, and enhance overall well-being. The key ambitions for embedding circular economy principles in planning are as follows:

Resource Efficiency: The primary ambition is to optimize resource use throughout the entire lifecycle of products and infrastructure. This involves designing for durability, repairability, and disassembly, as well as promoting the reuse, recycling, and recovery of materials.

Digitisation: The realisation that an overhaul of the Planning and Development Act needs to put the collection of digital information as the backbone rather than as an aside. Statutory Bodies including Local Government bodies to have dedicated centralisation teams to collect information throughout the respective organisation to ensure shared access for all.

Waste Prevention: The goal is to significantly reduce waste generation by shifting away from the linear "take-make-dispose" model. The planning process can be utilised to prevent waste at the source, encouraging businesses and consumers to prioritize products with longer lifespans and lower environmental impact.

Closed-Loop Systems: An ambition is to create closed-loop systems where materials are continuously cycled within the economy. This includes developing circular supply chains, establishing take-back programs for products, and supporting industries that rely on recycled materials. Justification as to the selection of potential products can be used to ensure that consideration of the history of a product built into the planning process.

Climate Mitigation: Circular economy principles contribute to reducing greenhouse gas emissions by curbing the extraction of raw materials, minimizing energy-intensive production processes, and reducing landfill emissions through increased recycling.

Innovation and Collaboration: An ambition is to foster innovation in product design, business models, and technology that align with circular principles. Collaboration among governments, businesses, research institutions, and communities can drive the development of new circular solutions.

Education and Awareness: An ambition is to raise public awareness about the benefits of circular economy principles. By educating the public about responsible consumption, repair culture, and sustainable choices, communities can drive behaviour change. At planning stage there can be advocacy through a prescribed set of guidelines ensuring the whole life design of a project.

Responsible Consumption: Circular planning encourages a shift towards responsible and mindful consumption patterns. This involves encouraging consumers to prioritize durable, high-quality products and services that align with circular principles.

An ambition is to embed circular economy principles as a foundational element in long-term planning and policy frameworks. This ensures that sustainability considerations become integral to decision-making processes.

Our ambition is that circularity (i.e., elimination of waste and continual use of resources (including land) is considered at project/plan inception stage. Adopting the lifecycle approach which in turn directly influences planning outcomes/the environment.

That Local Authorities/ Statutory Bodies and applicants should be encouraged to design for reconstruction or reuse at project inception, this includes reusing spaces, buildings, etc. Policy/legislation will influence practices i.e., national to local policy (development plans) signposting how

applicants can adopt a circular economy approach in development plans leading to more sustainable planning applications being submitted and positive outcomes through the planning system.

What are the current challenges to achieving our ambition?

1. The existing Planning and Development Act 2000 and the addendums to such do not consider any requirement for the Whole Life Cycle of any development with particular regard to carbon value.
2. The assumption that cost effective means build new. The current market conditions suit the purchase of new materials in lieu of the retrofit or rehabilitation of an existing building fabric
3. There is no mechanism as legislated currently in Ireland for the digital submission of a planning application.
4. There is no requirement for the verification of the submitted data for a planning application other than the checks undertaken by the Local Authority
5. While there is a legal basis for the use of datums to be used for a planning application , these are typically disassociated with smaller developments including one-off housing where local grid references are used.
6. It should be noted that one-off housing accounts for approximately 40% of all planning permission granted in 2022; as such developments should be mandated to provide whole life analysis so that the effect of these one –off houses units can be considered on a national scale.
7. All topographical/ Ground Penetrating Radar information is submitted in paper format and this invaluable resource is not centralised.
8. No general policy for the sharing and archiving of information centrally within government departments. Each team within a prospective department has a singular goal.
9. Legislation, building regulations, and TGDs currently do not include for information gathering and shared access through public portals and need to be revised.
10. Their existing a lack of standards for executing data collection and collating from public submission.
11. A need to lead from a public perspective on data collection which will lead to uptake in the public sector, particularly as a cost reduction exercise i.e. preparation of gathered materials to a template standard

What are our proposed solutions?

Embedding circular economy principles in planning requires a multi-faceted approach that involves collaboration between government bodies, businesses, communities, and other stakeholders. Here

are some solutions and strategies for effectively integrating circular economy principles into the planning process:

Policy and Regulation: Develop and revise planning regulations to incentivize circular practices, such as requirements for sustainable design, material recovery plans, and adaptive reuse. DRAFT National Waste Management Plan for a Digital Data Capturing environment. Compulsory digitisation and centralisation at a planning stage to provide survey information to ensure a robust application.

Integrated Planning Approaches: Incorporate circular economy principles into urban and regional development plans, addressing land use, waste management, transportation, and infrastructure. Promote cross-sectoral collaboration to integrate circular principles across different planning domains, such as urban planning, transportation planning, and waste management.

Demolition: For existing planning permissions, it should be acknowledged that the term demolition is an umbrella definition— this is in line with the BS6187: 2011 Code of practice for demolition. This clear acknowledgement will assist and clarify the transition with existing and new planning permissions.

Design for Circularity: Collaborate with architects, designers, and developers to encourage the design of products and buildings for durability, repairability, and disassembly. Incorporate circularity criteria into the Technical Guidance Documents and standards to promote sustainable construction and design practices.

Industrial Symbiosis and Innovation: Foster collaboration among businesses to identify opportunities for exchanging resources. Centralisation of all data gathering with a singular resource with a layered and filter approach to data access.

Waste Management and Infrastructure: Develop recycling and resource recovery infrastructure to facilitate the separation and processing of materials for reuse and recycling. Define circularity in the Planning Reform, specifically in the areas of forward planning and development management processes. To support this, a guidance document could be developed to showcase examples of both successful and unsuccessful projects.

Circular Procurement: Integrate circular criteria into public procurement processes to encourage the purchase of products and services that align with circular principles. Prioritize suppliers that offer products with longer lifespans, repairability, and recyclability.

Education and Awareness: Launch public awareness campaigns to educate residents, businesses, and communities about the benefits of circular economy principles. Organize workshops, seminars, and training programs to teach individuals about repair skills, responsible consumption, and waste reduction. Programs should be encouraged as part of a checklist at pre-planning for any development.

Data and Metrics: Develop metrics and indicators to track progress toward circular economy goals, such as waste diversion rates, material recovery rates, and circular business growth. Use data to identify areas for improvement and make informed decisions in planning processes. Ensure a requirement for waste audits/ material reuse audits at the planning stage. Legislate the requirement for submission of digital mapping of all developments in Geographic Information Systems compatible formatting.

Collaboration and Partnerships: Collaborate with academia, research institutions, NGOs, and industry associations to gather expertise and insights for effective implementation. Form partnerships between public and private sectors to co-create circular solutions and strategies. A dedicated team within each department to locate, digitise, screen, and centralise data information assists which have been procured through public money for upload to a data portal.

Community Engagement: Development Plans to incorporate policies/objectives to support circularity in design and construction which in turn will influence planning applications i.e. applications could be required demonstrate how they are delivering on the Local Authority sustainability targets or Climate Action Plan targets, as appropriate. Guidance will likely to be required and project examples to help support applications.

Pilot Projects and Demonstrations: Launch pilot projects to test circular economy concepts and showcase their feasibility to stakeholders and the public. To support this, a guidance document could be developed to showcase examples of both successful and unsuccessful projects. The successful projects would demonstrate how they have embraced a regenerative circular economy approach. Where waste is and resource consumption is minimised. The guidance could emphasise how alternate decisions at specific stages could have led to different outcomes.

Continuous Monitoring and Evaluation: Regularly monitor and evaluate the outcomes and impacts of circular economy strategies. Adjust planning approaches based on lessons learned and emerging best practices.

By employing these solutions and strategies, planners can effectively integrate circular economy principles into their decision-making processes and contribute to building more sustainable, resource-efficient, and resilient communities.

What are our recommendations?

Recommendation	Timeline
Planning authorities should stipulate that a Resource & Waste Management Plans (RWMP) should be submitted for all construction and demolition projects as best practice to inform the planning consent process.	2024
Define circularity in the planning reform agenda, specifically in the areas of forward planning and development management processes.	2024
All planning permissions granted include compliance with the RWMP as a standard condition of planning. The level of detail presented in the RWMP should be reflective of the scale and complexity of the project. (in accordance with the EPA Best Practice Guidance).	2025
Pre-development audits, site investigation/material classification reports and pre-demolition audits are a mandatory planning condition.	2025
Whole Life Cycle Assessment should be submitted with all planning developments.	2025
A carbon value assessment to existing buildings making any restoration / retention more carbon and resource efficient than demolition and re-build	2025
Compulsion at a planning stage to provide survey information to ensure a robust application. Information to be submitted in a GIS compliant format Centralisation of all data gathering with a singular resource with a layered and filter approach to data access.	2025
A dedicated cross-departmental team within Local Government to locate, digitise, screen and centralise data information assists which have been procured through public money for upload to a data portal.	2025
Development Plans to incorporate policies/objectives to support circularity in design and construction which in turn will influence planning applications i.e. to the existing	Addendums to the existing

applications could be required demonstrate how they are delivering on the LA sustainability targets or Climate Action Plan targets, as appropriate.	Development Plans/ Local Area Plans
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Critical Juncture 5: Construction

The environment in which construction of new buildings and infrastructure takes place is significantly more complex than in the past - and there is potential that embedding circularity may bring more complexity and uncertainty. Contractors will align their tenders to the client's design team's scope, so clients and their design teams will have to be highly accurate and detailed in the procurement process.

Within construction there is a need to focus on the preparation of Resource Management Plans, material logistics, site layout and management, supply chain engagement and on-site training to deliver circular economy principles within the built environment.

What is our ambition for embedding circular economy principles in construction?

- Clients and their design teams will make the right choices when selecting how to construct their built asset and support contractor involvement and innovation;
- The transportation of resources and waste from construction sites should be kept to a minimum by ensuring that as much construction and demolition material can be processed on site for re-use. The planning system and local authorities should be aligned and support this concept;
- Primary legislation, regulations and construction standards will ensure that all construction and demolition waste and resources are reused in the construction process or recycled/recovered and are banned from landfill, with the onus on the Client to ensure that this is planned and implemented during the design and construction process;
- A manufacturing eco-system will exist whereby all construction by-products, residues, resources and waste can be processed to be reused within the construction process;
- The Construction Works Management Framework has been reformed as per the NDP.
- There will be robust and effective standards based on international benchmarks to support the reuse of secondary construction products, and all Government agencies, such as the EPA and NSAI will be aligned to ensure that new recycling processes can be quickly approved and certified;
- The insurance industry supports the use of construction by-products and innovative solutions;
- An integrated supply chain with open-source information on environmental performance;
- All construction sites will have access to the national grid to allow the use of electrical vehicles on site, including the use of HVO as an alternative to diesel in machinery, with site accommodation powered by renewables;

- A scalable network of fuel depots will be implemented to support alternative fuel use in heavy plants and equipment;
- Open-source access to Product Performance Declarations such as EPDs;
- Grants for SMEs to implement upskilling and certification such as ISO 14001 in a meaningful way onsite;
- Government funding allocated to provide additional training for Local Authority Staff who are working on small-scale projects for upskilling the engineering staff who are managing/designing these projects.

What are the challenges to achieving this ambition?

The Construction Works Management Framework is not fit for purpose and the OGP's Medium Term Strategy,³⁷ as outlined in the NDP is not being effectively resourced and delivered, particularly regarding:

- Whole life cycle costing;
- Whole Life Value;
- Quality in Award of contract – quantitative criteria;
- Insurance, liability and indemnity;
- Risk Management;
- Digitalisation and MMOC;
- Green Public Procurement;
- Inappropriate requirements in green procurement.

Secondary construction products, such as crushed concrete, require robust testing criteria to determine if reuse on-site is feasible. Local Authority noise restrictions can sometimes prohibit onsite crushers where reuse of concrete is possible. Utility providers should review their specifications to consider soil stabilisation as an option for the reinstatement of utilities instead of using virgin aggregates as the default for the backfill of trenches.

There is no national testing centre dedicated to the testing of new innovative products and materials, and the certification and inspection system is underfunded and resourced.

³⁷ Office of Government Procurement: <https://www.gov.ie/en/organisation/office-of-government-procurement/>

What are our recommendations?

Recommendations	Timeline
Reform of the Construction Works Management Framework, including the procurement process and public works contract, recognising the need to train procurers who need to understand that procurement of a green building starts before the site is acquired and brief developed not at tender stage for the contractor.	2030
Effectively fund and resource the OGP.	2025
Introduce whole life cycle costing, with resource Whole Life Value and carbon budgeting.	2030
Reform of Liability, indemnity, and insurance.	2025
Collaborative forms of contract designed to avoid disputes and incentivise innovative performance. Circularity during construction requires contracts that rewards innovation	2025
Clear definition of a Design Scope of Services, Standard of Design and clear identification of design responsibility in the Contract documents, Bill of Quantities and Specifications.	2030
Effective risk management.	2025
Integration of early contractor involvement in the design process.	2025
Compliance with commencement notice requirements under Building Control, particularly the listing of incomplete design.	2025

Adapting procurement methods to align with circular economy goals necessitates client-driven decisions and the support of their design teams. Clients should determine how their constructed asset can maintain performance throughout its lifecycle and define how this performance is measured. Understanding the link between sustainability, performance, green procurement, and project scope is crucial. Environmental performance relies on measurable metrics, which must be outlined by the client and design team.

This should occur during the project's early stages, prior to construction, within the business case and design phase. The contract functions as the project's operational guide, while the scope outlines work descriptions, features, and performance criteria. Detailed documents, including material specifications, work requirements, and systems needed, are pivotal for effective green procurement.

Critical Juncture 6: Operations and Use of infrastructure and the built environment

Once constructed, the way in which occupiers can operate and use buildings and physical infrastructure provides an opportunity to embed principles of the circular economy into the built environment. Our ambition is that buildings should be constructed, designed and located in a network of infrastructure, so that their running costs can contribute to extending their life-cycle and options for occupation and use.

Improving the use of buildings

1. Greater engagement with potential occupiers of buildings in the design phase with greater consideration given to how buildings are to be used and operated at the earliest project stages. Appointment of operators early in the design process to allow for integration of sustainable facilities management practices early in a project.
2. Appointment of operators early in the design process can also allow for integration of their requirements into overall brief requirements. Consideration should be given to allow operators and procurers to enhance their collective ability to deliver sustainability objectives e.g. 'green partnerships'

Operational Phase:

1. A clear specific finite defined action (not an ongoing principle or best practice);
2. A person/organisation/group responsible for carrying out the action;
3. A deadline for when it should be completed/achieved.

Behavioural Change:

- Enhancing the concept of networks of infrastructure so that individual infrastructure projects are not seen as working in isolation, but can achieve greater sustainable outcomes by being designed and used as a network of inter-connecting projects.
- Buildings as living labs and learning environments to nudge behaviour change by occupiers.

What are our proposed solutions?

Design Phase

1. Maximising the potential to use solar energy through building orientation, window size, and heat recovery ventilation systems.

2. Digital technologies such as building information modelling (BIM) and digital twins can be used for planning, designing, constructing, and managing property. Through more direct collaboration with stakeholders, facilities managers can use technology such as BIM to identify performance and use patterns and the costs of maintenance.
3. Technology and parametric modelling can permit facilities managers to make real-time changes for multiple users. Different models can be discussed with the design team.
4. Design can also be optimised for the total cost of ownership. Typically, the cost of repair is multiple times the cost of monitoring the performance of buildings to avoid a defect occurring in the first place. Better planning, forecasting, speed and quality of maintenance when hardware has been designed to be easy to upgrade, together with long-term collaborations between stakeholders, can further reduce these costs.

Operations Phase

- Consideration of implementing a system of Soft Landings³⁸ whereby there is a process for a gradual handover of a new or refurbished building, where a period of professional aftercare by the project team is a client requirement, planned for and carried out from project inception onwards, and for up to three years post-completion.
- Strategies for fit out and replacement of furniture and fittings around longevity, reuse, take back schemes. Use of modular partitions that can be easily reconfigured rather than demolished.
- Harnessing technological innovation in intelligent buildings to help promote the circular economy in building to improve the ability and speed with which occupiers can self-diagnose some maintenance requirements by using sensor technology integrated into BIM.
- Embed circular principles at a neighbourhood scale by integrating waste management into the circular economy; for example, waste collection companies can specialise in processing waste such as textiles, plastics, paper and organic materials. The case study of van Gansewinkel in Rotterdam which operates a circularity centre collecting waste for re-use and recycling should be explored further in Ireland.³⁹
- The following waste reduction programmes are important to help move to zero waste buildings:
- source separation of resources and waste to derive maximum potential reuse;

³⁸ https://www.designingbuildings.co.uk/wiki/Soft_landings

³⁹ Van Gansewinkel: Rotterdam organisations join forces in Circularity Center

<https://www.wendelgroup.com/sites/default/files/2014-april-04-rotterdam-organisations-join-forces-in-circularity-center.pdf>

- infrastructure for waste reduction and education of occupants;
- use of local digestors and clean technologies for organic waste streams, including black and grey water;
- collecting and re-using rainwater locally; and
- making buildings biodiversity-friendly.
- Monitoring and continuous improvement can entail:
- BIM to monitor building health throughout its lifecycle.
- Closing the following loops on site, where possible, will also help:
- organic waste can be dealt with by bio digestion, heat recovery, mineral extraction, using compost as input for on-site food production or general soil amendment; on-site food production improves user engagement and education;
- greywater can be recycled for toilets or landscaping;
- heat recovery through geothermal heat pumps and extracting heat from waste and cooking;
- sorting and pre-processing resources and waste on the site to maximise recycling or reuse and educate users;
- Use of less resource intensive solutions such as nature-based solutions including landscaping for biodiversity and species protection which reduce the need to use commercial fertilisers;
- using renewables where possible, such as combined photovoltaics and solar hot water, small-scale bio digestion and battery storage of electricity for emergency back-up, reduces the need to use other fuels, which are typically fossil fuel-based; and
- 3D printing for on-site manufacturing or re-manufacturing will be possible in the future, cutting down on transport costs and emissions.

Behavioural

- Regularly conduct sustainability audits through collaboration between all stakeholders in the design and operation of buildings to understand what is and is not working when it comes to reducing the carbon footprint (including matters such as conservation of water, reduction of waste) of company facilities. A sustainability audit, followed by meaningful changes to the way in which the buildings are used will help occupiers analyse current sustainability efforts and find areas for improvement to achieve targets and a plan.
- Sustainable facilities management policies and guidelines to be implemented in organisations to help occupiers know what and how to recycle workplace resources from paper, and cans, to large e-waste such as old computers and batteries, with specific tasks assigned to colleagues to champion participation in building-wide recycling programme.

- Wellbeing at work is vital for productivity and staff retention. Current trends include changes in space use, such as activity-based work (ABW) stations and decreasing the space per person, which reduces the amount of physical resources required per staff member, thereby reducing the environmental footprint. However, ABW layouts can simultaneously reduce opportunities for social interaction and collegiality, thereby reducing social sustainability.
- Commercial space providers should also consider access to childcare and other user amenities; further measures which have a proven track record in success may include the following:⁴⁰
 - Decentralised access to heating and lighting controls increases productivity as users manage their own environments.
 - Natural ventilation and access to green space is related to good indoor air quality and wellbeing, improving productivity by more than 11%.
 - Natural daylight and views increase productivity by 23%, and having windows that can be opened, 18% thereby improving the usefulness of the building itself.
 - Collective goals and incentives to achieve performance targets result in greater levels of teamwork and outputs.
 - Designing for function by focusing lights on working areas is more economic than ambient lighting.
 - Enhancing existing tools such as LEED, WELL etc in ensuring behavioural incentives can be offered, such as shower facilities for cyclists.

⁴⁰ Circular economy: role of facilities manager - Virtuous circle:

https://www.isurv.com/info/390/features/11568/circular_economy_role_of_facilities_manager

Critical Juncture 7: Re-use and retrofit of buildings and infrastructure

Synchronising & Identifying Shared Strategic Outcomes

As noted in the previous section, initial stakeholders involved in the design of new buildings or infrastructure are often not involved in ongoing operations. This absence has the potential to negatively impact the optimisation of circular economy principles once the building is in use. Owing to this absence of a long-term vested interest, the opportunity to optimise circular economy principles may not be fully capitalised on as it does not form part of their client's brief.

Cost & Budget Constraints

There is a challenge in gaining buy-in from all stakeholders to factor whole life cycle costings and circular economies at the outset of design and planning. Planning and design can often place a greater focus on aesthetics and space optimisation rather than the use of materials and building systems which offer greater flexibility in lending themselves to optimising circular economy potential.

Knowledge and perception

The reuse of building components and mechanical and electrical parts is often perceived as achieving upfront savings which, in the eyes of the occupiers, may have an impact on the quality and safety of both the building and its component parts, thereby carrying additional risk. Moreover, there can be an ingrained perception that building systems may fail owing to the reuse of parts which can increase the perceived risk profile of the building. This perceived risk profile may extend to encompass the insurance of the building, with insurance providers potentially also deeming reuse as increasing the risk profile of the building.

Retrofitting & Conservation

Challenges result in devising solutions which capitalise on potential for circular economies owing to existing building structure, age, building regulations and if a building or any of its features are protected.

What is our ambition?

As noted in the policy context of this report, Ireland's national Long Term Renovation Strategy (LTRS) outlines Ireland's existing building renovation policies which are set out in a range of policy documents,

most notably the Climate Action Plan and the National Energy and Climate Plan, which in turn were developed in line with the targets of the EU's Green Deal and Renovation Wave.

What are the challenges?

Many of the changes required to reuse and retrofit buildings and infrastructure of all types involve a significant initial outlay, and Government support should particularly assist SMEs and those without resources to undertake major refurbishments to make the necessary transition to extend the life and use of their buildings.

Every renovation project is different and unique, dependent on the use, nature and age of any particular building or piece of infrastructure – which makes it difficult to aggregate projects into a size that funds or banks will accept or that could be securitised by financial institutions. With each project being undertaken in isolation, there is a lack of coherent oversight of how Ireland's building stock is, and should be, renovated.

What are our proposed solutions?

Dublin Chamber has proposed that Government should consider a tax credit for SMEs that have undertaken and completed three items from an approved list (or 'Sustainable Business Register'), to significantly reduce GHG emissions or otherwise improve sustainability of its operations. For the purpose of this roadmap, items on the list could for example include: retrofit and energy efficiency measures; green supply chain guarantees; effective waste management practices; circular economy measures; and adoption of low-emissions transport.⁴¹

Eco-certifications and Third-Party Environmental Ratings: There are many established rating schemes used for commercial buildings in Ireland, including are LEED and BREEAM, and Home Performance Index in for residential properties. Level(s) can be applied to civil infrastructure projects. These ratings can act as a baseline or a benchmark for comparing investments and performance to inform decision-making. They can also demonstrate that a building goes above and beyond mere compliance with regulations (potentially standing out from, and above the competition) and could be used as a marketing tool to attract investors and tenants for (circular) renovation.

⁴¹ Dublin Chamber, Sustainability: <https://www.dublinchamber.ie/Influencing/Policy-Priorities/Sustainability>

Whole Life Cycle Assessments: Whole Life Cycle Assessments submitted with planning for projects over 1000m² (as is now law in Denmark⁴²), undertaken for all buildings, including considering reuse within the project of materials generated or an external use or recycling. Design should consider the full life cycle of the project and include reuse options for next project and to take account of easy disassembly at the end of life.

Local authorities should evaluate their own development plans in terms of resource consumption. For example, increased density, restrictions on certain typologies, such as detached and semi-detached homes, sizing, greatly reduced car parking provision, preference for nature based solutions over infiltration tanks, influence resource reductions at construction and maintenance phases for buildings and infrastructure. LCAs are now commonly carried out at the infrastructure level in Europe not just the building level. IGBC/ UCD through Viable Homes and Re-Cugi are currently looking at connection between carbon, density and typology to create guidance.

Direct Reuse: Resources are directly reused for the same purpose, where possible. This includes some repair, which by extension, may include refurbishment. Direct reuse is considered for doors, windows, pillars, fences, cut stone and other masonry structures when used for the same purpose, on the basis of forthcoming EPA guidance.

Pre-Demolition Audit (Including An Audit Of Haz Materials): Pre-demolition audit presumes demolition will take place. It should be incorporated into the pre-construction audit report. As identified within the EPA Resource and Waste management guidance, pre demolition audits should be developed in line with EU requirements.

Resource & Waste Management Plan: Prepared in accordance with the EPA Guidance.⁴³ The EPA best practice examples provide a useful tool in the delivery of this goal.⁴⁴

⁴² Nordic Sustainable Construction, Buildings' Life Cycle Assessments gain ground in the Nordics: <https://nordicsustainableconstruction.com/news/2023/january/denmark-introduces-co2-limit-for-new-constructions>

⁴³ Government of Ireland, Construction and Demolition (C&D) Waste <https://www.gov.ie/en/publication/c305a-construction-and-demolition-cd-waste/>

⁴⁴ EPA, Best practice guidelines for the preparation of resource & waste management plans for construction & demolition projects: <https://www.epa.ie/publications/circular-economy/resources/construction--demolition-guidelines.php>

By-Products: By-product options are availed in accordance with legislative requirements, so that the resource can be used in other projects. For example, site-won asphalt used as a feedstock to reclaimed asphalt plans or soil and stone used in landscaping.

End-Of-Waste: Where waste prevention such as reuse or by-product options are not available, recycling/ recovery of waste to secondary products is undertaken in compliance with end-of-waste requirements. For example, demolition concrete recycled to produce aggregate.

What are the challenges?

Cost & Time: There is a need for the client to lead the decision-making process and value allocation in relation to how buildings are demolished/disassembled. Currently, demolishing a building is a cost factor and currently, demolition is seen as a cheaper and quicker form of reuse of the land on which the building stood. Developers and clients may require full-scale demolition completed as quickly as possible to focus on delivery of a new building and thereby achieve occupation (and therefore a return on investment) quickly. Time and cost are strong drivers for selecting a certain method of demolition.

Building Resources: As natural building resources are limited, use of virgin materials is often prioritised. Secondary replacement products should be procured to reduce carbon tonnage and climate and environmental impacts.

Insulation Materials are difficult currently to recycle, reuse and deconstruct and may cause difficulties in the demolition phase.

What are our recommendations?

Recommendations	Timeline
Planning authorities should stipulate that a Resource & Waste Management (RWMP) should be submitted for all construction and demolition projects as best practice to inform the planning consent process.	2025
circularity statements should be submitted at planning stage that require design team to address the design aspects of adaptability and design for disassembly and conceptual approaches to waste reduction.	2025
Local authorities should also be mandated to produce a RWMP on their project, irrespective of size and scale.	2025

All planning permissions granted should in accordance with the EPA Best Practice Guidance.	2025
Pre-development audits and reports should be a mandatory planning condition.	2025
Whole Life Cycle Assessment should be submitted with planning.	2025
The Government should produce Pre-Demolition Audit Protocol.	2025
BIM Methodology/Technology & Governance should be considered mandatory for all construction and demolition projects.	2025
Government should provide grant-aided training for BIM for SMEs.	2025
Undertake a building census for the Irish building stock development as well as the material stock and flows –based on the Dutch Model already in place.	2030
Consider an Extended Producer Responsibility (EPR) scheme for insulating materials, as there are many difficulties dealing with these materials in a demolition phase.	2030
Government should consider introducing a tax on virgin aggregates to encourage use of secondary aggregates.	2030

Critical Juncture 8: Disassembly and Recovery

What is our ambition?

To encourage more sustainable development by avoiding demolition and selective disassembly or deconstructing where required to maximise reuse and recycling of materials

To enable and encourage informed sustainable disassembly practices by treating buildings and infrastructure as material banks. The implementation of a circular economy culture by utilising selective disassembly techniques and strategies to maximise the reuse and recycling of materials at their highest economic value, with the ultimate goal of heading towards a zero waste goal.

What does best practice look like?

Design For Disassembly: Design for partial or full selective disassembly considering reuse within the project of materials generated or an external reuse or recycling. Development design teams should receive specialist demolition advices as early as possible to inform potential for circular economy opportunities in disassembly methodology, etc. Design to consider the full life cycle of the project and include reuse options for next project and to take account of easy disassembly at the end of life. Design should consider whether renovation is more circular and sustainable option to demolition.

BIM Methodology & Governance to be considered for all new projects, renovations and additions. It allows construction managers to create a virtual project model that can be analysed and modified before any physical work begins. The application of BIM also captures all building materials used in the construction – this will in turn inform future reuse and recycling, while creating a culture of buildings as material banks.

Prepare A Pre-Demolition Audit (including an audit of hazardous materials)

Pre-demolition audit presumes demolition will take place. It could be incorporated into the pre-construction audit report. As identified within the EPA Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects⁴⁵ pre demolition audits should be developed in line with the (EU, 2018). The pre-demolition audit will identify materials for reuse and recycling. A material inventory for the project can be established and material flows can be tracked from demolition.

⁴⁵ <https://www.epa.ie/publications/circular-economy/resources/CDWasteGuidelines.pdf>

Prepare a Resource & Waste Management Plan in accordance with the EPA Guidance.⁴⁶ This should include both building fabric and materials to be excavated. Excavated materials should be assessed and classified for potential reuse or recovery potential.. Where there is contamination identified it should be delineated and assessed for appropriate treatment on or offsite. This should be carried out by a qualified and experienced environmental professional following recognised standards such as the EPA Code of Practice⁴⁷ and BS10175. Material volumes should be quantified in the RWMP and tracked throughout the project. A project closure report should be submitted to the regulator at the end of the construction phase.

Direct Reuse: Resources are directly reused for the same purpose, where possible. This includes some repair, which by extension, may include refurbishment.

Measuring the material flows from a disassembly and construction project is an effective measure. All materials generated through a demolition and construction project are documented along with their destination (i.e. reuse, by-product, recycling, waste etc). This also allows Ireland track progress against EU waste reduction targets at the site of generation as opposed to relying on waste facility statistics which will become less meaningful as reuse and recycling rates increase.

By-Product (Regulation 27): Review if the materials generated can be considered by-product for reuse in other projects such as soil and stone or Site-won asphalt/ road planings to go back to a reclaimed asphalt plant (RAP).

End-Of-Waste (Regulation 28): Where waste prevention such as reuse or by-product options are not available, recycling/ recovery of waste to secondary products is undertaken in compliance with end-of-waste requirements. For example, demolition concrete recycled to produce aggregate.

Purpose built recycling facilities should be used where on-site product production is not possible due to space, time and environmental constraints where environmental and quality controls are easily monitored and the market is established and effective as is the norm across Europe.

⁴⁶ EPA, Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects: <https://www.epa.ie/publications/circular-economy/resources/CDWasteGuidelines.pdf>

⁴⁷ <https://www.epa.ie/our-services/compliance--enforcement/waste/contaminated-land/>

What are the challenges to the delivery of best practice?

Improving Quality Secondary Materials: Quality secondary materials must be produced to ensure no adverse environmental, health or structural impacts. Material specifiers and designers need to have confidence in secondary materials.

Lack of competency in relation to the preparation of pre-demolition audits, pre-development studies that incorporate whole lifecycle assessment and circularity

Over Reliance On Backfilling: Ireland relies on backfilling to deal with 82% of demolition wastes.⁴⁸ Materials which could be reused or recycled are backfilled into former quarries or agricultural lands hence taking them out of circulation. This is a low economic but potentially high environmental cost as the embodied carbon of materials is lost.

Current Status of the Industry

In the demolition sector project safety is the first priority. Prevention sits at the top of hierarchy so the first question that should be asked can the demolition be avoided. When demolition is agreed, reuse must be considered first. The direct reuse on the development site is generally the first port of call and then direct reuse off-site is the second option for consideration. In some cases the materials may only be suitable to be directed for recycling off-site or disposal to landfill.

There is confusion in the demolition sector around by-product, reuse, recycling and material classification. In a recent OECD report on the circular economy in Ireland stated that this to be addressed to give comfort to those wishing to embrace a circular economy in the construction sector

Until the EPA finalises a National end-of-waste decision for recycled aggregates, production of recycled aggregates is restricted to those who hold a single-case end-of-waste decision for recycled aggregates. Once the EPA has issued this decision, various stakeholders will need to work together to ensure that product standards, product certification, waste enforcement and materials specifications are aligned to accommodate and promote use of recycled aggregates in appropriate uses.

⁴⁸ EPA: <https://www.epa.ie/our-services/monitoring--assessment/waste/national-waste-statistics/construction--demolition/>

Raised access flooring (RAF) is a material that should be considered for direct reuse as an expensive and high carbon content material. Options are available in the UK for RAF but need to encourage an Irish Solution and train Irish assigned certifiers.

Consistency in approach around the use of crushers on the projects sites needs to be addressed by the local government sector. Some local authorities require permits while others do not; similarly, some local authorities permit the reuse of the material on site while others do not.

Currently there is difficulty with building control and fire certification when reusing materials or using secondary products and training for this sector needs to be encouraged urgently.

Current practices tend to move towards requiring demolition and removal as soon as possible. So tender proposals are generally decided on cost and time but this needs to change whilst the project has to remain viable. All development projects should have to demonstrate that they include circular economy practices as a minimum not unlike that requested in the Circular Planning statements in London. Demolish to segregate at the highest value is what is required to ensure that a project is more circular and a minimum reuse on site target based on the total tonnage of material produced in demolition phase. Tracking of material flows and rate will allow this to be measured and assessed.

There are few outlets available for contaminated or hazardous construction materials and therefore the country is reliant on export which is expensive and is not circular.

Public Fixed price contracts are a big issue when it comes to try and implement circular economy practices as they do not encourage time for demolition for reuse. All Public Projects should demonstrate an element of circularity and this should be included in the Capital Works Management Framework.

In the education sector cost per square metre is the standard cost metric, additional cost for selective demolition be given as for example and abnormal cost.

The demolition sector should be encouraged to move away from backfill and landfill of construction materials where they are suitable for reuse or recycling and the introduction of regulations to include a landfill levy per tonne should be considered at a rate similar to the UK of £3.25/tonne.

Tax incentives on demolition should be considered to tweaking tax terms of plant depreciation for recycling and recovery infrastructure possibly a higher annual depreciation rate.

What are our recommendations?

Government	Timeline
Government produce “ A Pre-Demolition Audit Protocol” in 2024 and this could be done with the EPA and Local authorities under CEP fund.	2025
BIM Methodology/Technology & Governance should be considered mandatory for all construction and demolition projects and needs to demonstrate the synergies between digitalization and circularity.	2025
Consider grant aiding training or an accelerator programme for circularity that would incorporate digitalization for SMEs.	2025
Consider implementing a building census and building logbooks for the Irish building stock development as well as the material stock and flows – based on the Dutch Model already in place.	2025
Government to consider an EPR scheme for insulating materials as there are many difficulties dealing with these materials in a demolition phase.	2025
Government to consider introducing a tax on virgin aggregates to encourage use of secondary aggregates.	2025
Government and Local Government to consider updated training for building regulation and fire certification teams on materials reuse and secondary products.	2025
Government to consider training of certifiers for assigning recertification of raised access flooring.	2025
Consideration of tax incentives for demolition such as for recycling/ recovery plant a higher depreciation rate could be avenue for incentivisation.	2025
Introduce a backfill/landfill levy for construction and demolition materials at a rate similar to the UK of £3.25/tonne to encourage backfill/landfill diversion where reuse or recycling is possible.	2025
Provide guidance on reuse to support industry in determining their legislative requirements and encourage reuse and resource efficiency and ensure that all new buildings are designed for adaptability and deconstruction.	2025

Public Sector/Local Government	Timeline
The public sector should lead by example and mandate maximum circularity for the procurement of all public projects, including the reuse of existing structures where possible, use of reclaimed and recycled materials and design for disassembly.	2025
A review of the over national over reliance on backfill and export as waste solutions should be undertaken. Reuse and recycling should be encouraged above backfilling through a range of incentives.	2025
Consideration should be given to considering demonstration of circular economy practices in all developments/tenders from.	2025
Update the Capital Works Management Framework to include the demonstration of circularity potentially by adding a column to page 14 main project processes.	2025
A minimum reuse on site target of 15% for all demolition projects based on the total tonnage of material produced in demolition phase.	2025
The demolition industry must be enabled to reuse/recycle on-site where possible, for use directly on-site or directly off site particularly for selectively demolished single stream material. The liberalisation of the market will encourage the demolition industry to invoke circular economy practices and create more sustainable culture. Furthermore, enabling the demolition industry to maximise reuse/recycling will potentially reduce unnecessary lorry movements but where there are site and space constraints and any other barriers this will also enable the recycling industry to develop in tandem to cover all potential avenues to circularity.	2025
Local Government Sector to have a consistent approach in terms of mobile crushing permits and reuse permissions on the development sites.	2025
Government and Local Government to consider updated training for building regulation and fire certification teams on materials reuse and secondary products.	2025
Government to consider training of certifiers for assigning recertification of raised access flooring.	2025

Industry	Timeline
Requirement for on-site separation of materials on site to allow the materials to be reused or recycled at the highest possible value.	2025
Production of high quality recycled materials through adhering to legislative requirements and follow international best practice from countries with established recycling markets (e.g. through a quality production protocol).	2025

Provide accurate data on material flows and fates using electronic recording systems.	2025
Standardise site investigation and material characterisation reports for excavated materials to ensure that materials are assessed in terms of their reuse potential, not just the landfill waste classification as currently used by many consultants by 1 st Jan 2024.	2025