



GREEN ENTERPRISE: INNOVATION FOR A CIRCULAR ECONOMY

WEBINAR

Tuesday 24 January 2 – 3pm

Register now at: cep@epa.ie

Carey Building Contractors and Galway-Mayo Institute of Technology:
Exploring Cradle to Cradle Opportunities on Small-to-Medium sized Construction Projects

ÉireComposites: Developing recyclable wind turbine blades



Rialtas na hÉireann
Government of Ireland



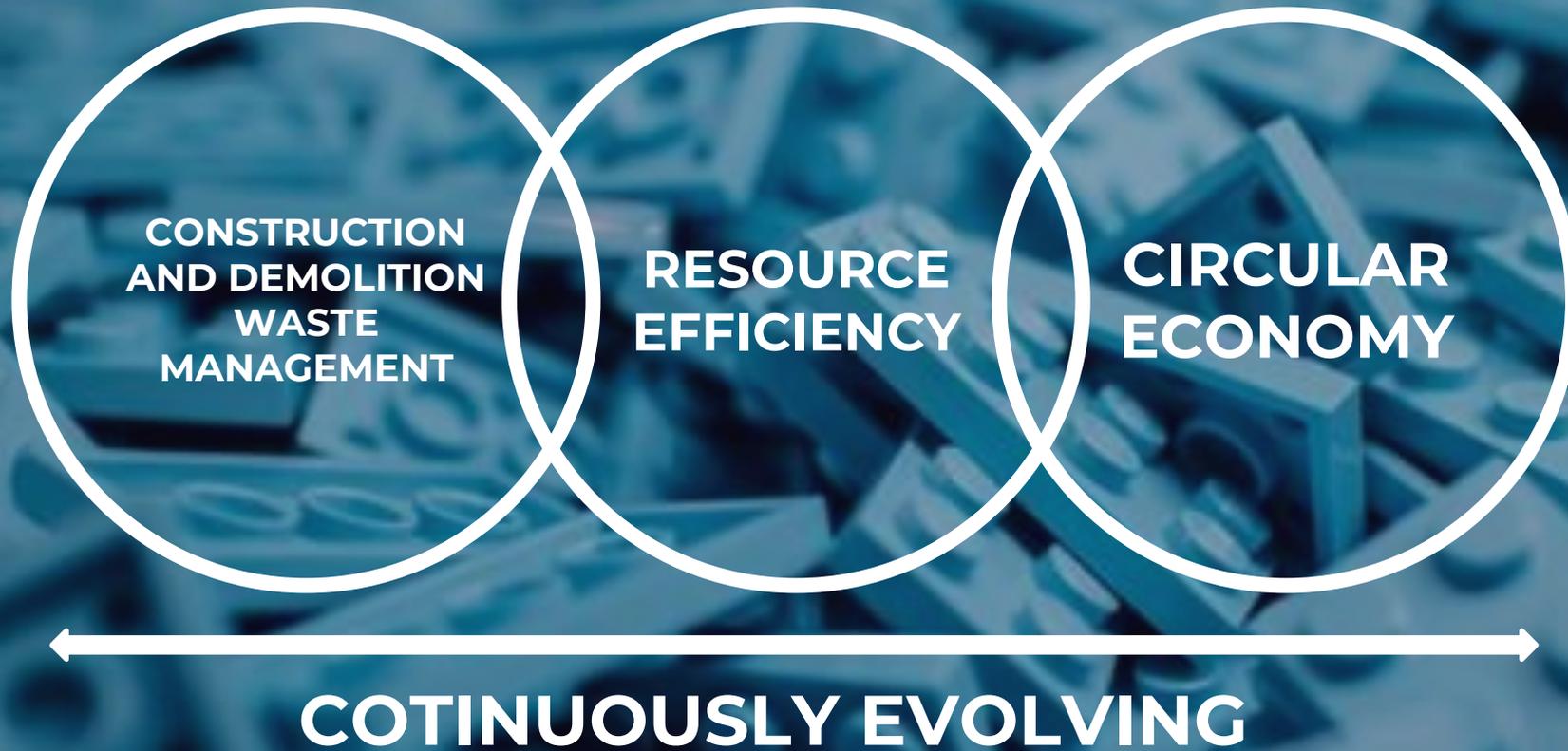
Dr. Mark Kelly

Head of ATU Galway-Mayo Centre for Sustainability
Senior Lecturer, ATU Galway-Mayo Department of
Building and Civil Engineering

Web <https://www.gmit.ie/about/sustainability>

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The main aim of the study was to identify and evaluate practical C2C opportunities for a construction-SME during the construction phases on selected case studies with a particular focus on the tendering, procurement, and pre-construction planning and construction phases of projects.

The main objectives of the study were to: identify and benchmark CDW management practice on selected case studies; identify and evaluate C2C challenges and opportunities embedded within the traditional organizational and construction processes on selected case studies; design and pilot a series of ‘quick-win/low-cost’ interventions; and review the impact to inform future best practice.



Reciprocal Learning Framework



The C2C philosophy is based on an understanding of materials as nutrients that can circulate in healthy and safe metabolisms focusing on material health, material reutilization, renewable energy, water stewardship and social fairness.

It promotes the design of products and processes that will have net positive environmental impacts based on the following core principles:

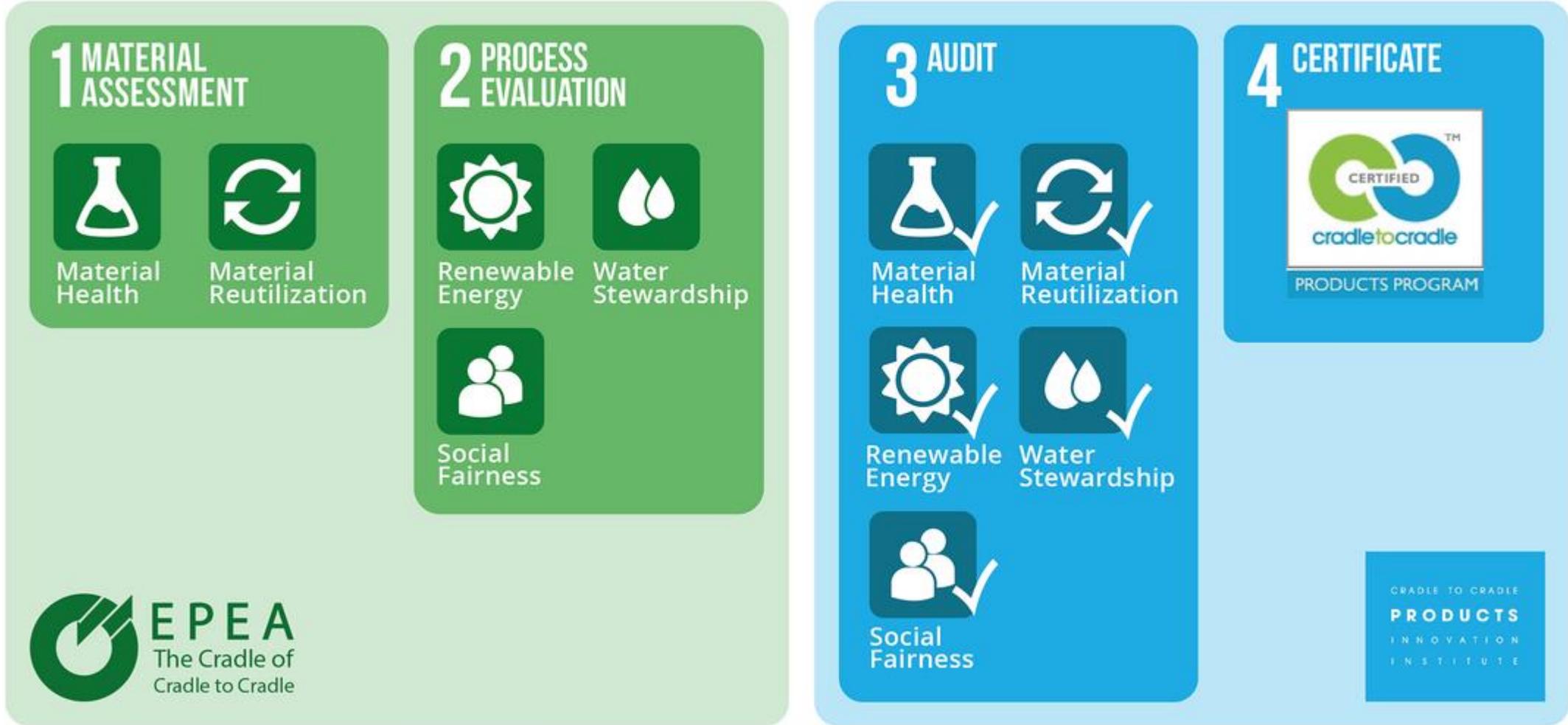
- **Waste is equal to food**, where everything is seen as a nutrient for something else with the explicit aim of eliminating the concept of waste.
- Use current **solar income** from renewable energy sources i.e., solar, wind, hydropower, biomass, geothermal, and hydrogen fuel cells.
- Celebrate **diversity** (species, cultural, and innovation) using social fairness as a guiding principle to have a beneficial social, cultural, and ecological footprint.

The Environmental Protection Encouragement Agency (EPEA) has been the main recognized body driving the C2C agenda internationally by offering support and expertise on C2C design principles to industry and the scientific community over the past 30 years. Their work primarily focuses on C2C product certification based on the following five categories and criteria:

- Material Health, using only optimized and where possible non-hazardous or benign materials/chemicals. This means removing materials that are carcinogenic, mutagenic, and reproductively toxic.
- Materials Reutilization, embracing the continuous flow of materials within their respective biological or technical metabolisms to ensure that biological nutrients can replenish natural systems and technical nutrients can be used repeatedly.
- Greater use of solar and renewable energy systems while also considering the embodied energy impacts associated with the product ingredients.
- Water stewardship to reduce the amount of water used and encouraging closed loop water use and considers the embodied water impacts of products and their ingredients.
- Social Fairness, by encouraging diversity to build strong networks of local supply chains who also embrace C2C principles within their own working practices.

| QUALITY CATEGORY | BASIC | BRONZE | SILVER | GOLD | PLATINUM |
|--------------------------------------|-------|--------|--------|------|----------|
| MATERIAL HEALTH | | | | ✓ | |
| MATERIAL REUTILIZATION | | | ✓ | | |
| RENEWABLE ENERGY & CARBON MANAGEMENT | | ✓ | | | |
| WATER STEWARDSHIP | | | ✓ | | |
| SOCIAL FAIRNESS | | | | ✓ | |
| OVERALL CERTIFICATION LEVEL | | ✓ | | | |

CRADLE TO CRADLE CERTIFIED™ – PROCESS



©EPEA - Part of Drees & Somer

Everything is a nutrient for something else by:

- Defining materials and their intended use pathways i.e., biological, or technical cycles from manufacturing through use and recovery; and use materials that are measurably beneficial for human health and the environment.
- Integrating and recycling biological nutrients and water i.e., greywater use, landscaping, air-cleaning vegetative walls, green roofs, bio-digestion, and composting.
- Enhancing air and climate quality i.e., integrate C2C materials and products (wall and floor coverings, wall materials, floors, window frames, HVAC systems, furnishings, office equipment etc.) and active carbon management using renewable energy technologies and appropriate vegetation.
- Enhancing water quality, where water is healthier for biological metabolisms that before it entered the building i.e., rainwater harvesting, nutrient recycling, green walls etc.

Use solar income by integrating natural light and renewable energy into buildings and area plans so the asset generates more energy than they use.

Celebrate diversity by actively supporting biodiversity and innovation associated with the well-being of occupants and the environment i.e., prevalence of C2C-certified materials, coatings that metabolize pollutants etc.





Review of International Case Studies

www.c2c-buildings.net

| Project Details | Everything is a Nutrient | | | Solar Income | Celebrate Diversity | | |
|--------------------------------------|--------------------------|-------------|---------------|--------------|---------------------|-------------------|------------|
| | Material Pathways | Air Quality | Water Quality | Energy Use | Biodiversity | Health/Well-Being | Innovation |
| La Maison de la Lainière | | | | | | | |
| Ampère e+ building | | | | | | | |
| Prado Vélodrome | | | | | | | |
| Green Solution Hotel | | | | | | | |
| The Netherlands Institute of Ecology | | | | | | | |
| Venlo City Hall | | | | | | | |
| Eser Hosue | | | | | | | |
| Lyceum School | | | | | | | |
| Backsippan School | | | | | | | |
| Fox Vakanties | | | | | | | |



Review of Irish Case Studies



C2C Case Study 1

The construction of a new eight-classroom primary school (1,420m²) and the demolition of an existing school, along with provision of temporary accommodation on the same site for the duration of the construction works, in addition to associated site works, services, treatments system, percolation area and new vehicular access, set down area and car park.

Everything is a Nutrient for Something Else

- Roof tiles were removed for reuse on other projects and boundary wall materials were retained for reuse on site.
- The timber roof rafters were dismantled but were unable to be recycled due to bitumen and paint finishes.
- Some inert demolition materials were used directly on site as non-structural fill.
- An asbestos survey identified intact asbestos (Chrysotile) in the bitumen layer in the flat roof and roof gable (322m²) in the existing building. The asbestos material was removed by a registered contractor and taken to licensed facility in Co. Dublin.
- The preparation of a Site Waste Management Plan was identified as a planning condition by the local authority.
- The main contractor did employ a waste skip segregation policy on site for timber, metals, mixed recycling, food, canteen and mixed CDW.
- Specific floor finishes (marmoleum floors) had a specification of a minimum of 97% natural raw materials, a minimum 43% recycled content and proven bacteriostatic properties.
- Reuse of materials from other projects i.e., floor coverings, site hoardings, signage etc.
- A pallet take-back scheme was established on site.
- Offcut reuse policy on site i.e., plasterboard offcuts.

C2C Case Study 1

Celebrate diversity by actively supporting biodiversity and innovation associated with the well-being of occupants and the environment i.e., prevalence of C2C-certified materials, coatings that metabolize pollutants.

Supporting Innovation

The school building was designed to have multiple uses i.e., for community use in the evening.

Temporary accommodation for the school was provided during the construction works. This was decommissioned on completion with some remaining units were used to house a pre-school until 2020, when a new pre-school building will be constructed.

Local suppliers were used to supply site with the main bulk of required materials.

Classroom furniture was made offsite and installed as finished units on site.

Resource efficiency audits were undertaken on site to monitor energy use, water use and waste production.

Site observation sheets were prepared and disseminated to site management to ensure continuous improvement in relation to resource efficiency on site.



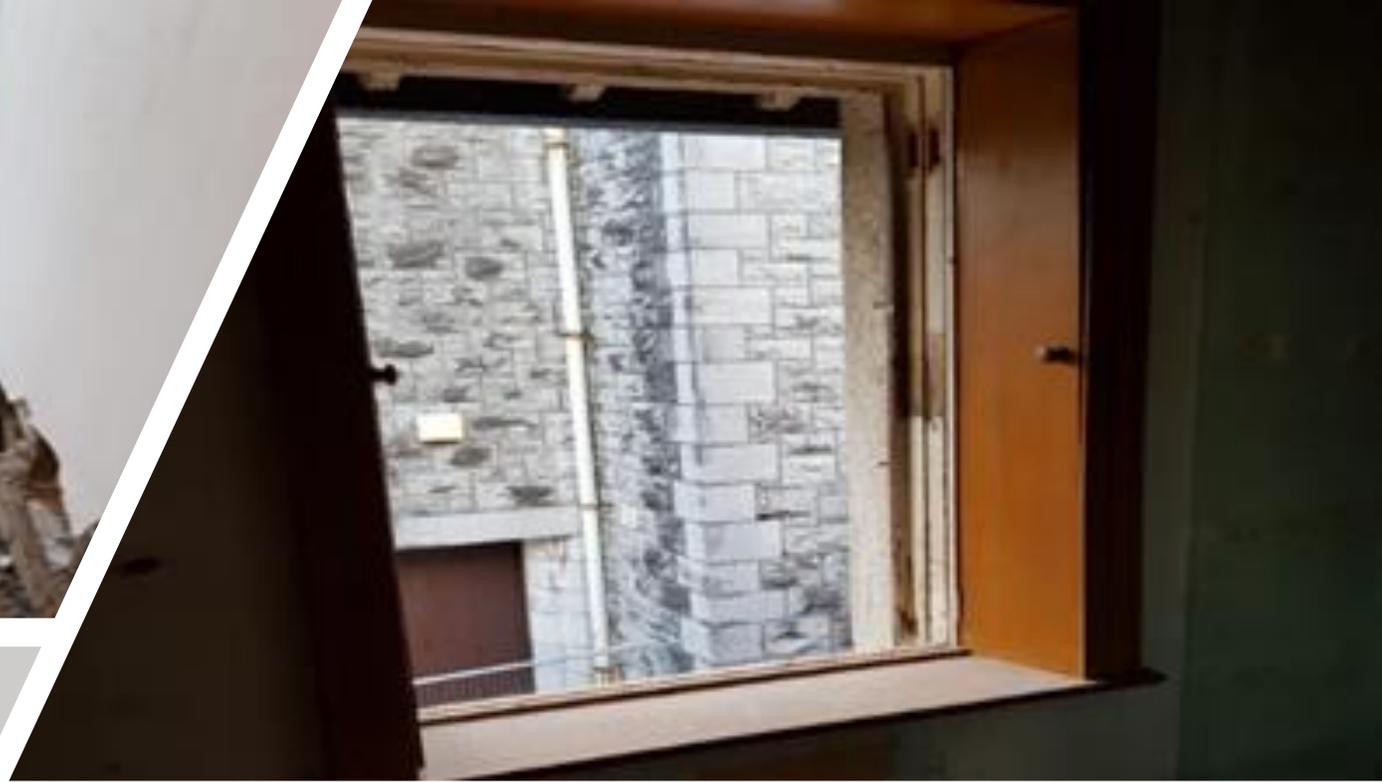
C2C Case Study 2

The project involved a change of use from an existing convent building (protected structure). The works included the demolition of the existing boiler house stores, rear corridor and other elements within the building and site, the construction of new extension to the rear, the construction of attic extension and refurbishment of the existing building both internally and externally to provide 9 self-contained residential units, staff accommodation, offices, outreach facilities, meeting room and childcare facility. The floor area of the existing building was 922m² and the new extension was 265m², which gives a total of 1,187m².

Everything is a Nutrient for Something Else

- A waste skip segregation policy was employed on site.
- Most of the demolition works was internal and ended up in a mixed waste skip as the materials had a low reuse value. Some demolition materials were reused on site when of sufficient quality.
- An asbestos survey identified intact asbestos, which was removed by a registered contractor and taken to licensed facility in Co. Dublin prior to the demolition and refurbishment works.
- There was a specific focus on reusing existing materials and features e.g., timber and tiled floors (201m² floor joists, 94.5m² timber flooring, 67.1m² tiled flooring, 12 no. windows and 9 no. shutters, the central staircase, front doorway features, 3 no. fireplaces, architrave and skirting, and roof elements.
- 5 skips of timber was prevented through reuse on site and other projects i.e., for hoarding etc. This equaled a direct saving of €1,100.





Everything is a Nutrient for Something Else

Enhance air and climate quality i.e., integrate C2C materials and products (wall and floor coverings, wall materials, floors, window frames, HVAC systems, furnishings, office equipment etc.) and demonstrate active carbon management using renewable energy technologies and appropriate vegetation.

Lime plaster was used on the external of the building.

Hemp board was used on the dormer windows at the back of the building.

Celebrate diversity by actively supporting biodiversity and innovation associated with the well-being of occupants and the environment i.e., prevalence of C2C-certified materials, coatings that metabolize pollutants.

Supporting Innovation

The preparation of a site waste management plan was a planning condition of the project.

Environmental and quality audits were undertaken on site to monitor energy use, water use and waste production. Site observation sheets were submitted to site management to improve site practice.

Implemented resource efficiency initiatives included:

- Installation of door closers, light sensors and thermostats in site accommodation and welfare facilities to reduce energy use on site.
- Water use i.e., use of hoses, cleaning etc. was checked weekly.
- Waste segregation was employed on site.
- Office and canteen waste was segregated in wheelie bins placed outside site accommodation.
- Site inductions included information on environmental and waste reduction policies on site and recorded travel information of site personnel.



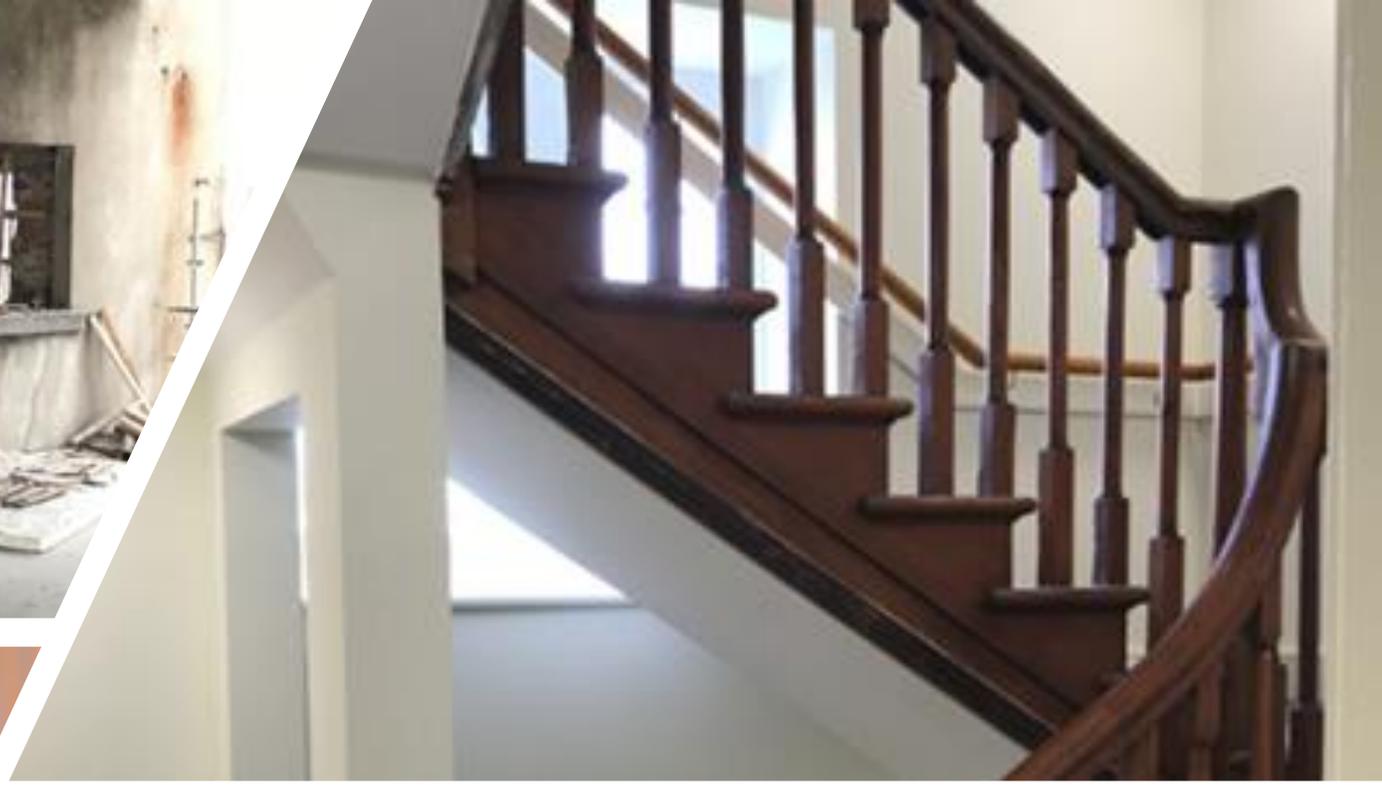
C2C Case Study 3

Refurbishment and extension of existing 3-storey Piscatorial School for a change of use to office space. The existing building dated from 1846 and was a protected structure. The refurbishment and conservation work had to retain the historical fabric of the existing building and included: removal and replacement of pitched roof structure and slate coverings to match existing; reinstatement of 2 no. former chimney features and barges at the gable ends at roof level; restoration of windows along the front elevation; removal and replacement of windows and doors to the side and rear elevations; erection of a replica of former statue at roof level to existing building; removal of single story shed to rear; removal and replacement of boundary treatment along the sides and rear of the site and construction of three-story flat roof extension to rear to accommodate office use with a total floor area of 490m².

Everything is a Nutrient for Something Else

Initiatives included: reuse of 3 no. roof timber rafters; restoration of 11 no. windows with 30 no. new windows installed; retention of external wall and railings; restoration of an existing chimney; 1st and 2nd level flooring retained (200m² floor joists and floorboards retained); reuse of architraves around door frames; retention of central staircase and reuse of skirting (40m); restoration of existing internal stonework; installation of a replica statue externally.

There was no segregation of CDW due to the confined nature of the site resulting in a total 41,700 kg of mixed CDW, 50,060 kg of rubble/soil, 3,260kg of timber and 720 kg of commercial waste taken off site to be processed at a local waste recycling facility.





C2C Case Study 3

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Celebrate Diversity – Supporting Innovation

Environmental and quality audits were undertaken on site to monitor energy use, water use and waste production. Site observation sheets were submitted to site management to improve site practice. Implemented resource efficiency initiatives included:

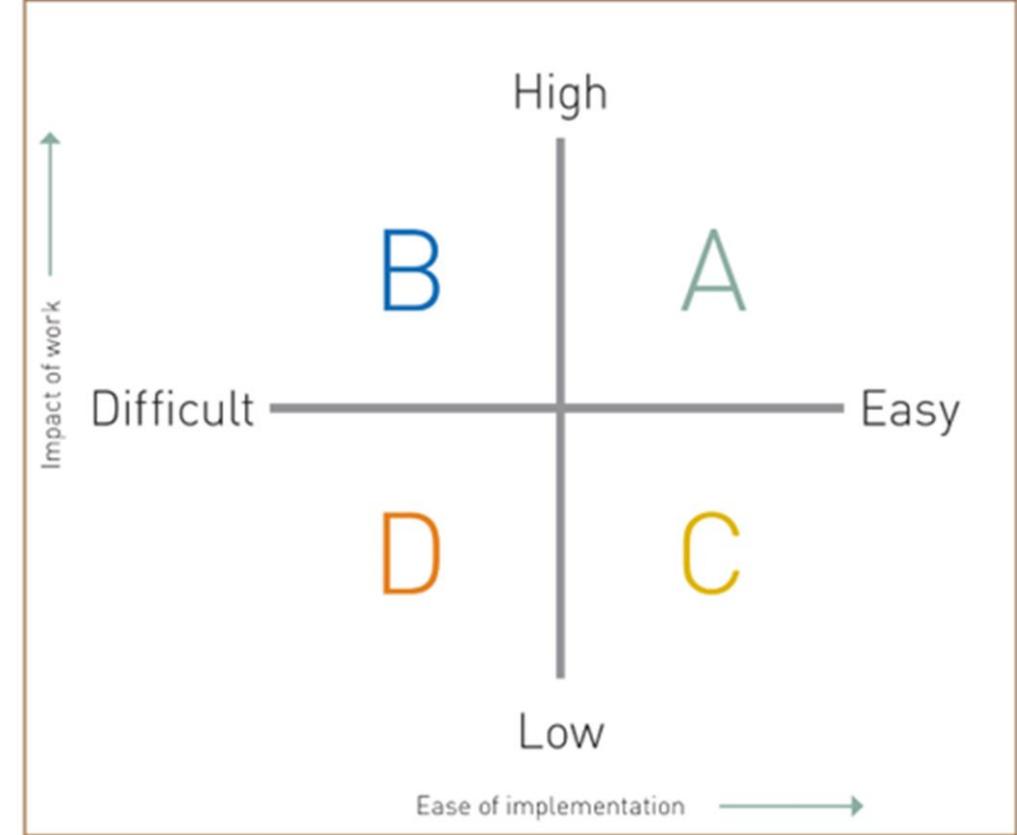
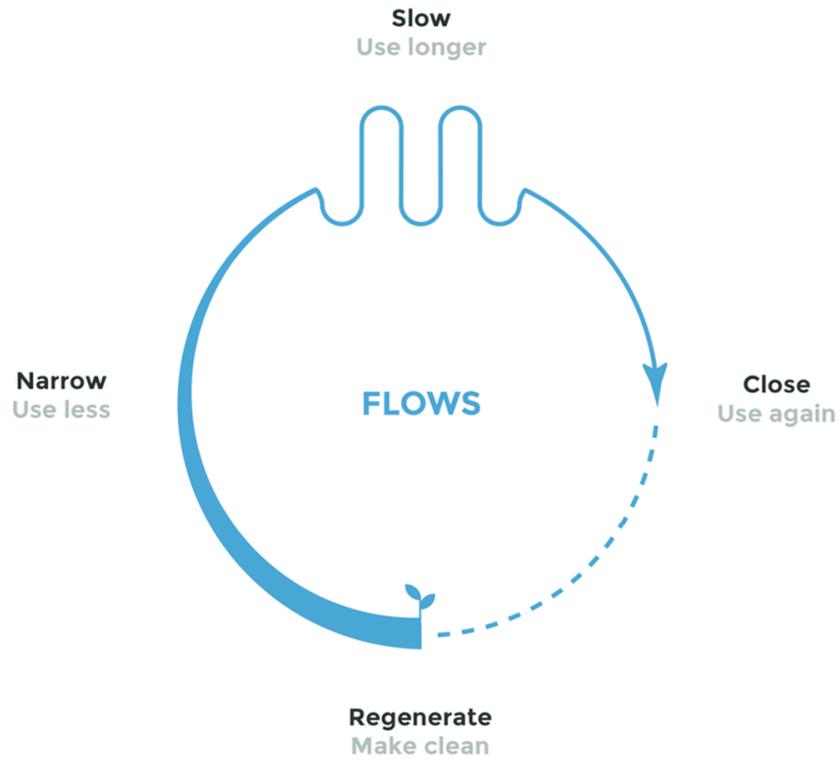
Installation of door closers, light sensors and thermostats in site accommodation and welfare facilities to reduce energy use on site.

Reduced plant idling on site.

Water use i.e., use of hoses, cleaning etc. was checked weekly.

Site inductions included information on environmental and waste reduction policies on site and recorded travel information of site personnel.

| Project Details | Everything is a Nutrient | | | Solar Income | Celebrate Diversity | | |
|-----------------|--------------------------|-------------|---------------|--------------|---------------------|-------------------|------------|
| | Material Pathways | Air Quality | Water Quality | Energy Use | Biodiversity | Health/Well-Being | Innovation |
| Case Study 1 | | | | | | | |
| Case Study 2 | | | | | | | |
| Case Study 3 | | | | | | | |
| Case Study 4 | | | | | | | |



Lessons Learned



Opportunities reduce as any project moves through the different phases with C2C strategies best implemented at the earliest stage possible i.e., as a planning condition, in the client brief and/or detailed design.

The SME contractor has limited opportunities to embed C2C principles as they are usually guided by directly responding to the planning conditions, client requirements and the design brief.

The preparation of a Resource Management Plan (RMP) does provide a consistent framework for SME contractors to address waste prevention and reduction, energy and water use on site, materials management/logistics etc., that can all contribute to promoting net environment benefits.

The 'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects' (EPA, 2021) provide an excellent resource for all supply chain stakeholders in this context.

<https://www.epa.ie/publications/circular-economy/resources/Careys-Green-Enterprise-case-study.pdf>



A wooden letter 'A' is positioned on the left side of the image. The background is a dark blue surface with a white grid pattern. The text 'Next steps...' is centered in the middle of the image, with a white underline beneath it.

Next steps...

The preparation of the 'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects' (EPA, 2021), a collaboration between ATU and RPS.

HCI Pillar 1 and 3 funding for the development of a Postgraduate Diploma and M.Sc. in Circular Economy Leadership for the Built Environment under the DASBE project.

EPA LAPN Southern Waste Region/ATU project designed, developed and facilitated an online 6-week CPD course for local authorities entitled 'Implementing Construction and Demolition Waste and Resource Management Best Practice to move towards a Circular Built Environment'.

EPA LAPN Southern Waste Region/ATU project designed and developed a dedicated Circular Built Environment resource, Build360.ie to be launched in March 2023.

EPA Green Enterprise ATU/Carey Building Contractors project focused on developing a Resource and Waste Management Protocol for SME Contractors.

EPA Green Enterprise IGBC/ATU/Limerick 2030 'Lighthouse' Demonstrator Project for the Circular Built Environment, funded under the 2022 call.

Design and Development of a Circular Built Environment Playbook in collaboration with IGBC, ATU, TU Dublin, and UoG funded under the 2022 EPA Research call – due to commence on 1 March 2023.

ATU/SETU/UCD co-lead the Sustainability and Circular Economy Pillar in the Build Digital project.



Implementing Construction and Demolition Waste and Resource Management Best Practice to move towards a Circular Built Environment

Are you interested in learning more about construction and demolition waste prevention, resource management and moving towards the circular built environment then this is the course for you.

Introduction to the Course
October 1st 2021
11.00am-12.00pm

COURSE FACILITATORS

The Speakers will in general attend the workshop following their presentation study week/s.



Philippa King
 Regional Co-ordinator,
 Southern Region Waste
 Management Planning Office



Dr. Mark Kelly
 Head of Sustainability,
 GMIT

FOR MORE DETAILS

Email philippa.king@limerick.ie
 or phone 061 556842

LINK TO INTRODUCTION

<https://tinyurl.com/57kx2vbw>

This course is funded by the EPA under the LAPN Network

WEEK 1 📅 OCT. 8TH – 15TH STUDY WEEK

Introducing CDW Legislation and Policy Drivers

- Overview of Legislation: Warren Phelan, RPS
- Article 27 & Article 28: Rosin Griffin, EPA
- End of Waste A Case Study: Cian O'Hora, IMS

WEEK 2 📅 OCT 15TH ⌚ 10.00-11.30

- Interactive Workshop

WEEK 3 📅 OCT. 15TH – 22ND STUDY WEEK

What role can local authorities (as a regulatory authority and a client) play in preventing and reducing CDW?

- Circular Economy for the Built Environment: Andrea Charles "Relondon"
- Developing A Circular Economy for the Built Environment: Nick Fichlock Brighton & Hove

WEEK 4 📅 OCT. 22ND – 29TH STUDY WEEK

Introducing the principles of Designing out Waste

- Designing out Waste Principles: Allan Sandilands Resource Futures
- Case Study Scotland: Tom Warren, Collective Architecture
- Principles of Sustainability for TII: Vincent O Malley, TII

WEEK 4 📅 29TH OCT. ⌚ 10.00-11.30

- Interactive Workshop.

WEEK 5 📅 OCT. 29TH – NOV. 5TH STUDY WEEK

Introducing the principles of Waste Efficient Procurement across the value chain & Environmental Assessment Methodologies

- Principles of Waste Efficient Procurement: Allan Sandilands Resource Futures
- Introduction to Environmental Assessment Methodologies: Stephen Barrett, IGBC

WEEK 6 📅 NOV. 5TH – 12TH STUDY WEEK

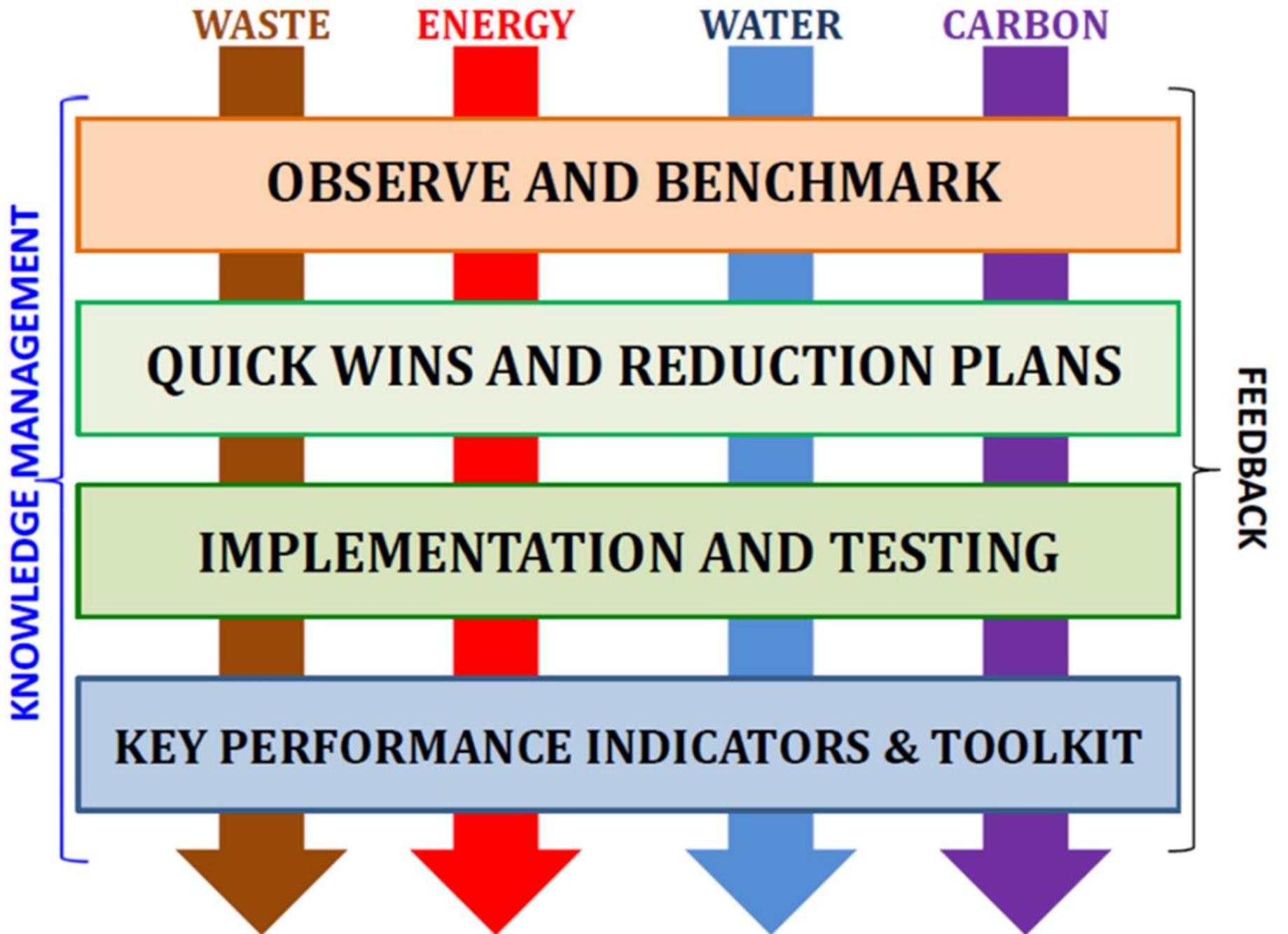
Introducing the principles of Site Resource & CDW Management Best Practice

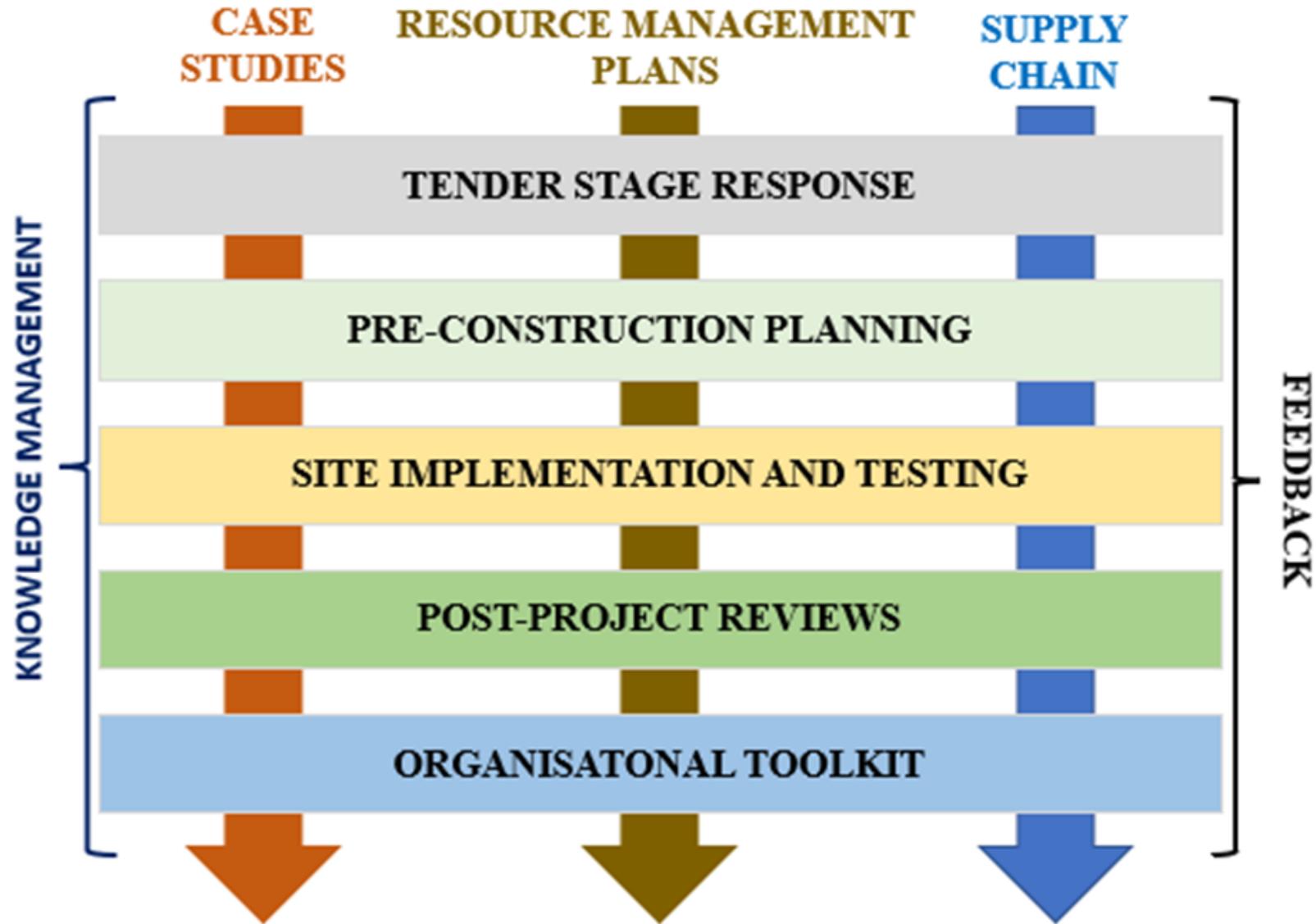
- Site Resource Waste Management Plans Paul Chadwick RPS
- Case Study Alan Cawley John Sisk & S

WEEK 6 📅 NOV. 12TH ⌚ 10.00-11.30

- Interactive workshop







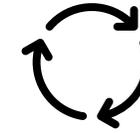
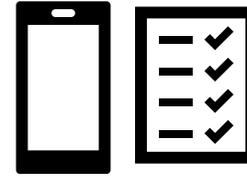


Circularity Scan

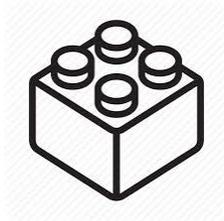


Preparation and Brief

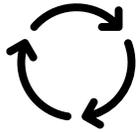
Pre-Demolition/Pre-Refurbishment Survey



Circularity Scan



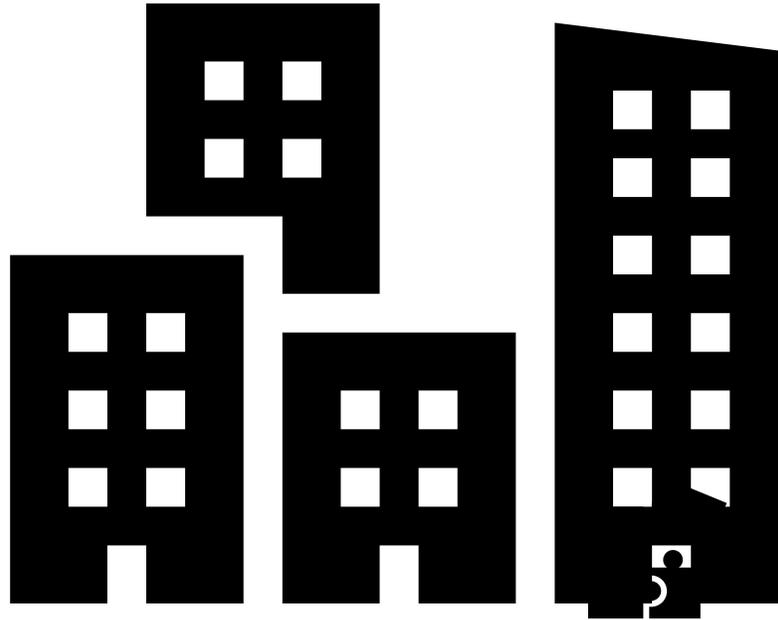
End-of-Life



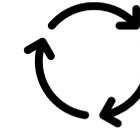
Circularity Scan



Maintenance/Operation



Concept Design



Circularity Scan



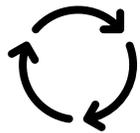
Technical Design



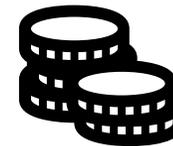
Circularity Scan



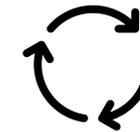
Construction



Circularity Scan



Procurement/Tendering



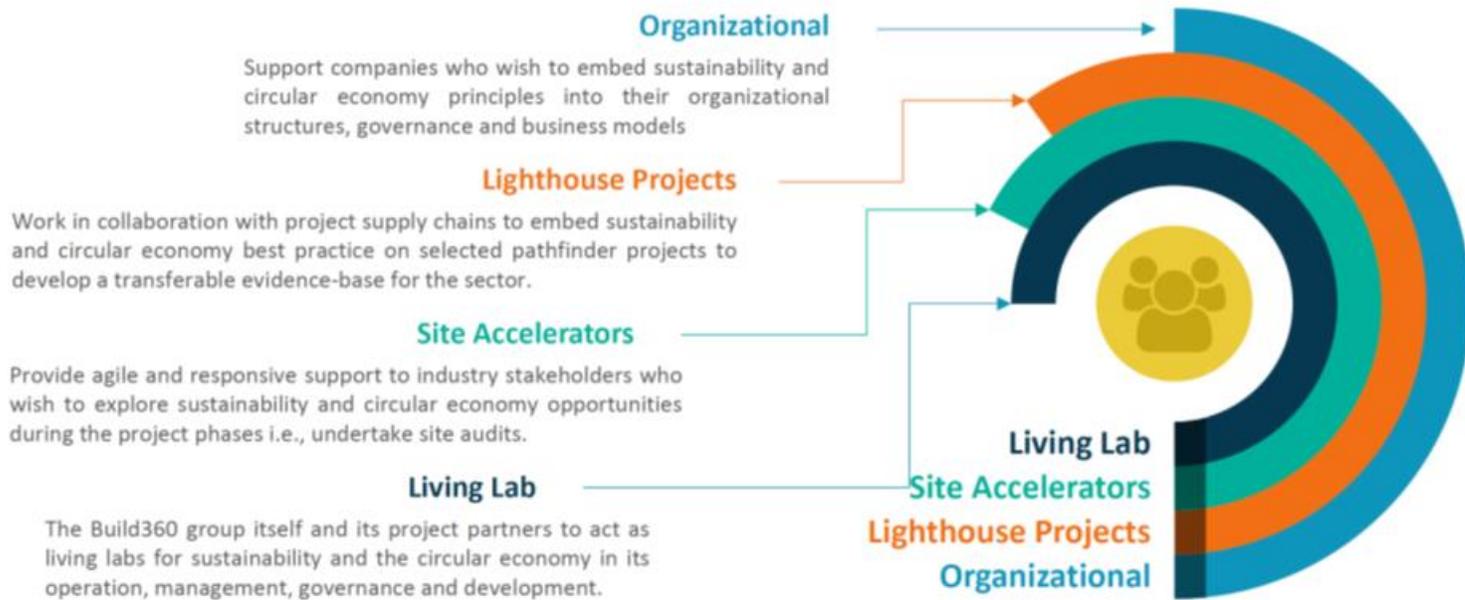
Circularity Scan



SiteZero
(Zero Carbon Sites)



Recommendations



Develop a Resource Efficiency and Circular Built Environment Accelerator Programme (Figure 1) to support the value chain in transitioning towards a circular built environment in the following ways:

- Collaborate with different stakeholder groups to embed the Best Practice Guidelines on Resource and Waste Management Plans and circular economy principles into their working practices i.e., planning authorities, clients, design teams, contractors, waste management contractors.
- Work with selected 'Lighthouse' living lab projects from inception to completion to pilot and benchmark the impact of the development and implementation of the Best Practice Guidelines on Resource and Waste Management Plans and circular interventions at each stage of the project to develop a robust research-informed evidence base.
- Support industry to develop circular business models and organizational strategies.

Recommendations

Sustainability and Circular Literacy to Leadership Programme using the Triple-A (Awareness, Action, Attitudes) Approach



Develop a Resource Efficiency and Circular Built Environment Literacy to Leadership Framework to support the Accelerator Programme (Figure 1).

This will employ a Triple-A (Awareness, Action, Attitudes) approach that will employ several lifelong learning strategies e.g., ‘traditional’ flexible and industry-focused undergraduate and postgraduate programmes, digital badges, micro-credentials, MOOCs, CPD elements, project-based and site-based clinics, be-spoke organizational and project-specific training, target leadership programmes.

These activities will be co-designed with the sector to address their evolving needs.

References

EPA STRIVE 'Design Out Waste Factsheets', led by GMIT in collaboration with Scott Tallon Walker Architects and John Sisk and Son.

<https://www.epa.ie/publications/research/waste/research-146-design-out-waste-factsheets.php>

EPA Green Enterprise 'Resource Efficiency Toolkit for the Irish Construction Sector', led by Carey Building Contractors in collaboration with GMIT and BAM.

<https://www.epa.ie/our-services/monitoring--assessment/circular-economy/circular-and-sustainable-sectors/sectoral-sustainability/>

EPA LAPN 'Circular Economy Checklist for Construction', led by Southern Waste Region in collaboration with Resource Futures and GMIT.

<https://southernwasteregion.ie/content/circular-economy-checklists-construction>

HCI Pillar 3 'Digital Academy for a Sustainable Built Environment' (DASBE), led by TUS in collaboration with ATU, IGBC, and TEA.

<https://dasbe.ie/>

HCI Pillar 1 'Postgraduate Diploma in Circular Economy Leadership for the Built Environment'

<https://www.gmit.ie/postgraduate-diploma-in-science-in-circular-economy-leadership-for-the-built-environment>

Build Digital Project Pillar 5 Sustainability and the Circular Economy

<https://www.builddigitalproject.ie/sustainability-circular-economy>

DANKE!

THANK YOU!

MERCI!

GRAZIE!

GRACIAS!

DANK JE WEL!