



# **CIRCULARlife Project**

## **(2020-ET-CP-103)**

**GREEN ENTERPRISE: INNOVATION FOR A CIRCULAR ECONOMY**

**EPA RESEARCH PROGRAMME 2021-2030  
NATIONAL WASTE PREVENTION PROGRAMME**

Prepared for the Environmental Protection Agency  
by

Irish Green Building Council



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<sup>4</sup> Month/year/number of copies or “online publication” – will be provided by the EPA

## **Table of Contents**

<b>Acknowledgements</b>	<b>ii</b>
<b>Disclaimer</b>	<b>iii</b>
<b>Project Partners</b>	<b>iv</b>
<b>Executive Summary</b>	<b>v</b>
<b>1. Introduction</b>	
<b>2. Project Objectives</b>	
<b>3. Project Activities / Outputs (include any promotional/dissemination activities)</b>	
<b>4. Project Findings (including challenges and lessons learned)<sup>5</sup></b>	
<b>5. Project Recommendations</b>	
<b>6. Project Outcomes (short to long term outcomes expected and how these will be tracked)</b>	
<b>7. Next steps</b>	
<b>References</b>	
<b>Acronyms and Annotations</b>	
<b>Appendix</b>	

## Executive Summary

For the duration of this project, the IGBC has actively researched ways to encourage professionals in the construction industry to embed circularity principles into their projects. This research has consisted of mapping out what key information is needed by professionals in the construction industry to start their circularity journey.

Firstly, education was highlighted as a focus point which would need to be guided due to the lack of knowledge of the circular economy in the industry. IGBC created a mail course with 5 weekly educational emails and quizzes to engage the reader to expand their circular knowledge. Exciting webinars were designed with leaders in the circularity field in Ireland and abroad. Interactive workshops were held to pilot circularity statements. Lectures were given focusing on embodied carbon and circularity and green public procurement and level(s).

Secondly, tools were designed such as the Carbon Designer tool which allows design teams to calculate the embodied carbon of their project and thus, find ways to limit the projects carbon impact. Tools were tested by the IGBC so we could share this knowledge with professionals in the construction industry.

Thirdly, resources were created to enable self-learning. These resources such as the GPP policy handbook and the 27 webinars that were created as a result of this project were uploaded on the IGBC Resources and Circularity Learning Hub for professionals to engage with whenever they choose. Fourthly, knowledge was harvested by the IGBC regarding the barriers the construction industry is facing in transitioning from a linear economy to a circular economy.

This project allowed us to explore those barriers and research actions that could be taken to eliminate them. All this knowledge has been harvested and is laid out in this report.

### 1. Introduction

Currently in Ireland, circularity in buildings focusses on the later stage of the construction process focusing mainly on the downcycling of materials. To reduce overall resource consumption and embodied carbon, a radically different approach that focusses on the earliest stage of design projects is needed. Funded by EPA Green enterprise scheme, IGBC held circularity workshops with architects, structural engineers, QSs' and M&E designers to identify the gaps in building a more efficient circular economy in the construction industry. The workshops went through the process of creating circularity statements, the challenges specifiers and designers face and showed which parts of the circular process are difficult to apply and why.

As part of the project, IGBC delivered a circularity mail course to 267 people to educate about the circular economy and the built environment and delivered 3 sets of webinar series' and 9 one-off

webinars, totalling 27.5 hours of learning (all the recordings can be viewed on the [IGBC Resources and Circularity Learning Hub](#)). IGBC trained 501 people on how to use the [Carbon Designer tool](#). All these actions were conducted to guide anyone involved in the construction industry to incorporate circularity into projects and to aid the transition to low embodied carbon building in Ireland.

## 2. Project Objectives

The project objectives were:

- **Educate** - To introduce a structured approach to circularity that addressed the design of buildings at early design stage. The purpose was to build capacity within the building industry and third level education.
- **Collaborate** -To demonstrate and guide participants on the use of Circularity tools at early design stage of building projects. In these workshops, the teams worked towards the development of a circular economy statement for each of the projects similar to the requirements of the Greater London Planning Authority.
- **Early design LCA tool** -To encourage carbon impact assessments at early design stage.

This is intended to allow Local authorities to ask for carbon impact assessments on projects.

- **Rate and advocate** - To embed strategies and tools for circularity into key organisations including local authority development plans, major state agencies and private developers.

## 3. Project Activities / Outputs (include any promotional/dissemination activities)

The project was divided into 4 work packages.

### **Work Package 1: Educate and disseminate**

**WP1.1 Update and develop mail course on Circularity in the Built Environment and develop the contents of IGBC learning hub- Resources and Circularity.**

**KPI** – Develop and update and expand IGBC’s existing pilot [Circular Economy in the Built Environment](#) mail course developed in conjunction with the UKGBC creating more specific Irish content and case studies. Allow these to be easily downloaded on demand to increase the number of those accessing the course. Further develop the contents of **IGBC learning hub** –to curate the best international learning material on circularity to offer several routes of advancement and self-learning.

**How many people were reached:** In total 268 people registered for the mail course which exceeded the target of 250. 3,300 people viewed the Resources and Circularity section of the Learning Hub.

**What was delivered-** IGBC developed and expanded the existing pilot Circular Economy in the Built Environment mail course and added specific Irish content and case studies. IGBC developed the

Resources and Circularity Section of the Learning Hub by researching resources which resulted in a selection of thought-provoking circularity podcasts, research papers, video clips and recordings of three new IGBC circularity webinar series and 9 new one-off webinars being uploaded to the platform. See updated mail course [here](#) and updated Resources and Circularity Learning Hub [here](#).

#### **WP1.2 Resources & Circularity Webinars**

**KPI-** Develop a circular economy 10 x one hour webinar series spread over the period of the project with special guests, such as David Cheshire- AECOM, Mark Kelly -GMIT and other leading international thinkers. The aim was to have 500 registrations.

**How many people were reached:** In total 1882 people registered for the webinars.

**What was delivered-** IGBC brought together an expert team of specialists to educate on the circular economy and the built environment in three separate webinar series. This correlated as 18.5 hours of learning with 18 webinars being run in total. The IGBC also organised 9 standalone webinars which added up to 9 hours of extra learning. In total 27 hours of circularity webinars were organised resulting in 27.5 hours of learning. See appendix for more information [Page 15].

#### **WP1.3 Train the trainer**

**KPI-** This will provide in depth training to develop competency in the use of existing free LCA tools such as One Click Planetary free embodied carbon calculator and the proposed Carbon designer tool. This was to be provided firstly to IGBC staff and to university tutors to all undergraduate and post graduate construction graduates focusing on schools of architecture. The aim was to train 20 university tutors in the use of the tool.

**How many people were reached:** 39 university tutors from colleges such as UCD, MTU and TUDublin.

**What was delivered-** The IGBC provided in depth training to develop competency in the use of the Carbon Designer tool. It was provided for university tutors in the departments of architecture and engineering. These webinars were recorded and uploaded to the IGBC Learning Hub.

#### **WP1.4 Carbon Designer Tool training**

**KPI-** Deliver training on Early Stage LCA tool – 250 trainees

**How many people were reached:** Training was delivered in 15 training sessions to 501 trainees.

**What was delivered-** IGBC ran several online demonstrations for organisations such as UCD, Trinity College, Engineers Ireland, Dun Laoghaire CoCo and others. See list in appendix, Page [15].

#### **WP1.5 Green Public Procurement Training**

**KPI-** Green Public procurement training – 100 trainees

**How many people were reached:** 100+ trainees

**What was delivered-** The IGBC collaborated with GUPP in October 2022 to deliver Green Public Procurement training to professionals. On 24 of October 2022, Rachel Loughrey and Stephen Barrett from the IGBC gave a presentation on Green Public Procurement, Level(s) indicators and Circularity to local authorities and state bodies. This was a two-hour presentation with a Q+A. The presentation was uploaded to the [GUPP platform](#) and is accessible as a self-learning tool.

#### **WP1.6 Presentations at selected IGBC and other appropriate events and conferences throughout 2021 and 2022**

**KPI-** Presentations at selected IGBC and other appropriate events and conferences throughout 2021 and 2022. 1000 attendees.

**How many people were reached:** 1402 people attended these events.

**What was delivered-** Throughout 2021 and 2022, IGBC gave several presentations at events and conferences such as the RIAI conference and universities throughout Ireland. See appendix, Page [15].

### **Work Package 2: Collaborate**

#### **WP2.1 Questionnaire on impact of tools prior to and post workshop<sup>6</sup>**

**KPI-** Carry out a questionnaire pre workshop and post workshop to assess the impact of the workshop and any tools used on the design and whether the tool influenced the measures included.

**How many people were reached:** 45

**What was delivered-** The tools chosen to be surveyed were the Regenerate Tool and the Carbon Designer Tool. IGBC sent out a questionnaire pre and post the Regenerate Workshops. 60% of the people surveyed who used the Regenerate tool stated that the tool is a helpful aid to embed circularity principles into designs. 71.43% of the people surveyed stated that they would recommend the Carbon Designer tool. See reports in appendix [Page 15].

#### **WP2.2 Five no. workshops with full design team on Five no. case studies**

**KPI-** Carry out workshops with 5 design teams and contractors at RIAI stages 1-2 of projects to develop circularity strategy for projects using the Regenerate Tool. This is a strategic circularity tool and aids the development of a circularity strategy as required by the Greater London Council. This will be facilitated by David Cheshire of Aecom. Develop Circularity statements for these projects. These workshops will also assess and consider the use of the revised [EPA Construction Waste Template](#).

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<sup>6</sup> 40 people were surveyed



**How many people were reached:** 6 design teams [29 people]

**What was delivered-** A workshop was held facilitated by Jos de Krieger and Lizanne Dirkx of [Superuse](#). Each team who attended had a real-life project or building at early design stage (RIAI stages 1-2) for which they wished to create a structured circularity strategy. 6 interdisciplinary design teams attended; The teams all included at least one architect, structural engineer, QS and M&E designer. Post this workshop, IGBC facilitated six 1-1 workshops with each design team using the Regenerate Tool. During this workshop, [EPAs' Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects](#) was presented. EPAs' resource and waste inventory template and the general guidance was encouraged to be used along with the Regenerate Tool to holistically integrate circularity into projects. Six early-stage circularity statements and strategies were produced (see appendix, Page [15]).

### **WP2.3 Five circularity strategy reports and workshop reports**

**KPI-** 5 circularity strategy reports noting ideas and barriers identified.

**How many people were reached-** 6 design teams [29 people].

**What was delivered-** After the two workshops, the 6 design teams created 6 circular strategies which formed their circularity statements. These strategies included several circularity design ideas:

**-Circular Material Selection-** Reusing bricks from a façade that will be demolished on the site in the new build; implementing material passports, specifying to use reusable hoarding.

**-Design for Deconstruction-** Avoiding composite materials which enables the building to be easily deconstructed; avoiding the use of excess materials.

**-Leasing-** Leasing lighting and furniture for the project.

**-Adaptability-** The floor to ceiling heights have been designed at 3m from floor to soffit to allow for different change of uses; allowing extra thickness in the foundations so the building can be extended vertically in the future; the structure of the building and the location of the core allows the building to be adapted to other uses; the window sizes are generous; the service units are designed larger than needed which allows the services to be adapted to other building types in the future.

**-Resource Efficiency-** Reusing soil from one site on another site; the building will be prefabricated off site so there will be less waste.

*Barriers to circularity identified from the Regenerate workshop included:*

**-Lack of a readily available market for used materials.**

**-Cost of implementation.**

**-Warranties on reused materials or new types of circular materials is an issue for clients.**

**-Lack of awareness in the construction industry.** Refer to the appendix, Page [15], for the full report.

#### **WP2.4 Overall report on impact of tools including feedback with set of recommendations**

- **KPI-** Overall report on impact of tools including feedback with set of recommendations.

**How many people were reached-** 6 organisations (Regenerate tool) and 6 organisations (CD Tool)

**What was delivered-** A survey report (see appendix, Page [15]). 100% of the participants of the Regenerate circularity workshops stated that they benefitted from attending the workshops.

The feedback of the Regenerate Tool shows the impact the tool had on the participants:

- *“It makes you question your current approach. It helps to start the thought process of circularity early in a project rather than as an afterthought.”*
- *“Prompting the user to think more in depth about one’s design. Collaboration is key with all design team members and the tool promotes and encourages collaboration. Pie charts/Dashboards are good visuals.”*

70% of the users of the Carbon Designer tool surveyed stated that they found the tool useful. The feedback of the Carbon Designer tool shows the impact the tool had on the participants:

- *“The tool is great; it is excellent for the quick assessment for early-stage design ideas.”*
- *“It is good for showing the comparisons of using alternative materials.”*
- *“The Carbon Designer Tool for Ireland was very effective in the early-stage assessment of Life Cycle Impacts and certainly provided food for thought in terms of the choices of materials; it gave us a much greater appreciation of the cradle to grave impacts of materials in terms of base materials, production, transport and installation costs.”*

Refer to the appendix, Page [15] for full report and feedback for Regenerate Development team.

#### **WP2.5 Carbon Designer Case Studies and testing of other circular tools**

**KPI-** Test the proposed Carbon designer tool (WP3) on minimum 5 projects. Review other circular economy guidance and tools developed for example through EPA funding, immediately prior to or simultaneously occurring during life of project to map current practice at each stage of the process.

**How many people were reached:** Six project leads from six separate projects.

**What was delivered-** *Carbon Designer Tool Case Studies-* The IGBC had a call out for Carbon Designer Case Studies [there are now 1162 projects registered] and received six case studies of a range of projects from offices to factories. Refer to appendix on Page [15] for Carbon Designer Tool Case Study report. *Testing of Tool-* IGBC tested several other circular tools available to be used now in the construction industry such as [ARUP and Ellen MacArthur Foundations Circular Buildings Toolkit](#), [Loopfront](#), [SmartWaste](#), etc. Refer to appendix on Page [15] for the report on testing of Circular Tools.

## **WP2.6 Minimum 3 innovative ideas/ recommendations that allow further collaboration**

**KPI-** Set of recommendations

**What was delivered-** *Idea #1-* The IGBC proposal for a pilot was funded, and work commenced in mid-November 2021. The pilot is called the CMEx project. Please see information [here](#) and the construction material exchange platform [here](#). *Collaborators:* Excess Materials Exchange – Holland.

*Idea #2-* The IGBC proposal for CEIG grant to run workshops focusing on reclaimed materials and pre demolition audits. Submitted proposal in December 2022. *Collaborators:* Rotor DC -Belgium.

*Idea #3-* Proposal to the EPA for funding Call “Pathways to a more Circular Built Environment” <https://www.epa.ie/our-services/research/epa--research-funding/epa-research-call/> This is starting on 1<sup>st</sup> March 2023. *Collaborators:* ATU, TU Dublin, University of Galway.

*Idea #4-* Circular Economy Construction demonstrator. This proposes to develop high quality case studies on circularity from the development of the Opera site in Limerick. This was granted under the EPA Green Enterprise call and starts in April 2023. *Collaborators:* ATU, Southern Region Waste Management Office, Limerick 2030.

## **Work Package 3: Tools**

**Deliverable** - Development of an early-stage Carbon assessment tool. This was to be part funded by this project. The LDA provided the remaining 50% of funding for the development of the tool.

### **WP3.1 + 3.2 + 3.3 IGBC to provide Irish data to Carbon Designer Tool developers One Click LCA**

**What was delivered-** A tender process was issued to several companies with the capacity to develop a tool for free use in Ireland within the time frame and budget. The tender was awarded to OneClickLCA. IGBC developed a range of typical Irish construction element build ups such as walls, floors, roofs, partitions and alternative lower carbon options including CLT, hemp etc. The most suitable data emissions associated with the materials was identified including national generic data developed as part of the Lifelevel(s) project and national fuel mixes for electricity. This data was then programmed into the Carbon Designer for Ireland tool. Pilot testing was done in house to test the results and revisions were made where necessary where anomalies were identified. The IGBC has been conducting Carbon Designer demos and training continuously since the launch of the tool. The tool allows early stage optioneering to identify opportunities not just from changes to materials but also due to material efficiencies from more compact and efficient design. The carbon impacts of different build ups can vary significantly and early understanding of likely differences is clearly noted with this quick assessment tool. The tool could allow all Local Authorities to ask for basic LCA calculations for planning applications and the tool provides a reporting template to present the information.

#### **Work Package 4: Rate and Advocate**

**WP4.1 + 4.3 Resource efficient and circular material life cycles indicator templates integrated into Home Performance Index (HPI) and integration of qualitative circularity indicator into HPI.**

**Deliverable-** Integrate measurable benchmarks on circularity that can be used in Ireland within HPI.

**What was delivered-** [Version 3.0 of the Home Performance Index](#), launched in November 2022, included the additional circularity indicators: *EN 8.1*: Pre-Demolition Report, *EN 8.2*: Design for Disassembly, *EC 3.2*: Adaptability. See reporting templates in the Appendix on Page [15].

**WP4.2 + 4.3 + 4.4 Proposed Level(s) compliant template for Green Public Procurement and integration of qualitative circularity indicator and short policy handbook for use by local authorities and other state organisations**

**Deliverable-** Integrate measurable benchmarks on circularity that can be used in Ireland for Green Public Procurement and Policy handbook focused on Green Public Procurement.

**What was delivered-** IGBC created a guidance document on the implementation of [Implementation of Circularity, WLC and LCC in Public Construction Projects](#) based on Level(s) indicators for public bodies for Green Public Procurement. This provides guidance and helpful tools that can be used at each stage of the project. This distributed with the assistance of the Office of Government Procurement to professionals working in Local Authorities and other state organisations to some of the key green indicators that should be applied in public construction projects.

## **4. Project Findings (including challenges and lessons learned)**

Several findings came from this project:

- From the survey results, 48% of people in the construction industry had fair knowledge of the circular economy. 36% had poor knowledge and 16% had good knowledge of the circular economy.
- Post the workshop, 100% of the attendees stated that they planned to spread awareness of the importance of circularity in construction in your office due to their new circularity knowledge and 80% of the attendees stated that they discussed circularity at design team meetings since the workshops. This shows that the workshops are very affective at encouraging attendees to spread awareness.
- From the survey and workshop feedback, the top barriers to implementing the circular economy in construction are cost, regulations, time, knowledge and a lack of secondary materials available.

Challenges that were encountered included:

-Some design members were just focusing on meeting Building Regulations such as Part L and were not aware of the importance of implementing circularity principles into projects.

Lessons learned include:

-It was important to follow up post the workshops to see if the design teams are implementing circularity principles throughout the 8 RIAI work stages rather than just at Stage 1-2.

## **5. Project Recommendations**

Based on the findings from the project, IGBC has made the following recommendations:

- From the experience of running the circularity workshops and webinar series, several participants stated that the Article 27 and Article 28 notification processes is a barrier to transitioning to a circular economy in the construction industry in Ireland due to the time it takes for the notifications to move through the system. From this awareness and the fact that Ireland has one of the lowest rates of circular material use in Europe<sup>7</sup>, it would be helpful for workshops to be run focused on how and when one should engage with the Article 27 and 28 notification processes and how long these processes will take on average.
- The Irish Construction Industry is responsible for over 50% of the total waste generated nationally<sup>8</sup>, it would be helpful to have training focused on reducing construction waste at each 1-8 RIAI stages.
- A workshop on skills that are needed in order for one to become a waste and circular economy champion on site was mentioned by Alan Cawley from SISK as a workshop that is needed in the industry to reduce our construction and demolition waste.
- Monthly workshops focusing on leading design teams through the Regenerate Tool.

## **6. Project Outcomes (short to long term outcomes expected and how these will be tracked)**

This project led to several short-term outcomes including:

- Educating professionals in all areas of the construction industry on the circular economy in the built environment through webinars and workshops. These were tracked through an attendance report on the IGBC website.

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<sup>7</sup> [Waste statistics - Statistics Explained \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&code=sdg_12_2_1)

<sup>8</sup> [Waste statistics - Statistics Explained \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&code=sdg_12_2_1)

- The Carbon Designer tool which aids design teams to easily calculate the embodied carbon of buildings at early design stage when there is the most potential to reduce carbon. The number of users was tracked through OneClick LCA, with 1162 projects registered at time of writing report.
- Creating circular resources for the IGBC learning hub and a resources list for the construction industry. These are listed on the IGBC Resources and Circularity section in the IGBC Learning Hub. Currently the page has 3,300 views.

Long term outcomes from the project include:

- Hosting Circularity workshops and presentations. These will be tracked through an attendance report on the IGBC website.
- The Carbon Designer tool training workshops will be run-in universities and for public and private design offices. Number tracked with an attendance report on the IGBC website.
- Showcasing circular tools and waste management tools that are available on the Circular Hub on the IGBC website. Number will be tracked through the IGBC website.

## 7. Next steps

- **Circularity Roadmap** : As part of the Build Circular EPA funded project IGBC will build on the work of CircularLife working with ATU, TU Dublin and University of Galway to develop a national circularity roadmap over the next 18 months.
- **Knowledge sharing online** IGBC will initially create a Circular Hub on the IGBC website but this will be transitioned to Build360 website as part of the Build Circular project. This will be similar to the [Whole Life Carbon Hub](#).
- **Workshops on Circularity** IGBC will continue running Circularity Workshops for Design teams using the Regenerate tool to promote the early input of circular principles into buildings.
- **Training on Circularity tools** IGBC will continue to run Carbon Designer trainings for university tutors, students and designers in the public and private sector in the construction industry.
- **Dissemination** IGBC will continue running its Circular Webinar Series with Q+A and will develop recordings that will be uploaded to the IGBC learning hub.
- **Community of Practice** IGBC will develop a circularity COP to promote circular economy in the construction industry. IGBC currently has templates of COPs for ESG and Whole life carbon.

- **Advocacy** IGBC will advocate for: A Circularity Statement to be mandated at planning for all buildings by 2025. This will enable circularity to be embedded into the early design process. The template and planning process can be modelled from the Circularity Statement that is mandated by the Greater London Planning Authority. See [here](#) for more information; Keeping material out of waste streams through streamlined end-of-waste [Article 28] and by-product [Article 27] decision-making processes, and national end-of-waste decisions for specific construction and demolition waste streams; Regulating embodied carbon in construction by bringing in PART Z Regulation such as what is being implemented in UK, see [here](#). The Carbon Designer tool could be used as the national calculation tool noted in the regulation.

## References

[Carbon Designer for Ireland - Irish Green Building Council \(igbc.ie\)](#)

[Regenerate - Urban Flows Observatory](#)

<https://homeperformanceindex.ie/wp-content/uploads/2022/12/HPI-Technical-Manual-v3.0.pdf>

<https://ec.europa.eu/docsroom/documents/31521>

[https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities\\_en](https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en)

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

## Acronyms and Annotations

IGBC – Irish Green Building Council

UKGBC- UK Green Building Council

QS- Quantity Survey

M+E – Mechanical and Electrical

RIAI- The Royal Institute of the Architects of Ireland

## Appendix

1. IGBC Resources Document (WP 1.2) + Dates of webinars (WP 1.2) +IGBC Carbon Designer Training Dates (WP 1.3) + Conferences and Presentations lists (WP 1.6)
2. Regenerate Workshops -Pre and Post workshop Survey Results + Carbon Designer Survey Results (WP2.2 +2.2) + Facilitated Circular Design Workshops and Circularity Statements (WP 2.3 + 2.4) + Regenerate tool Recommendations + Carbon Designer Case Study Report (WP 2.5) +Circular Tool Trial Report (WP 2.5)
3. Tender Evaluation (WP 3)
4. Home Performance Circularity Report + Circularity Template (WP 4.2) + Handbook (WP 4.4)